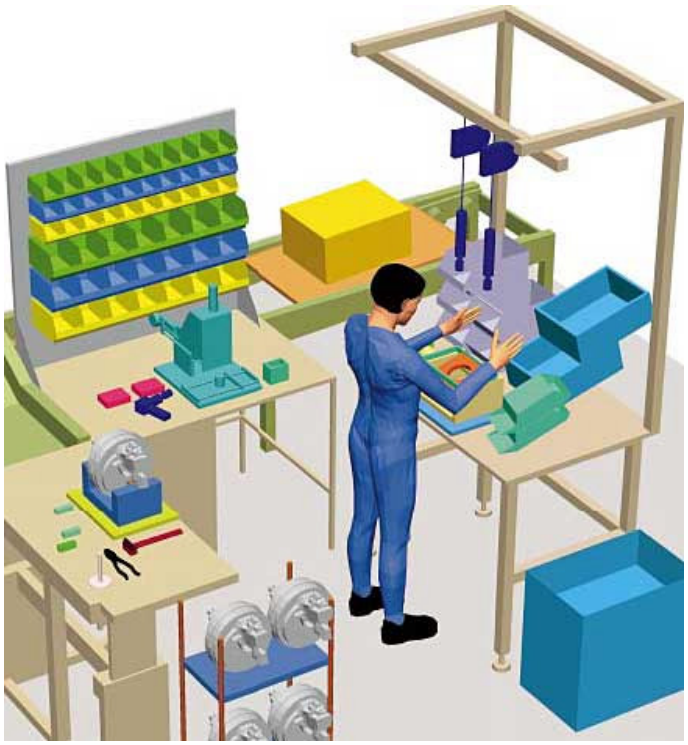
GUIDELINES ON OCCUPATIONAL SAFETY AND HEALTH

FOR STANDING AT WORK



DEPARTMENT OF OCCUPATIONAL SAFETY AND HEALTH
MINISTRY OF HUMAN RESOURCES
MALAYSIA
2002

JKKP : GP (I) 02/2002
ISBN 983-2014-21-2

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ACKNOWLEDGEMENTS

These guidelines are the result of a joint effort of the Department of Occupational Safety and Health (DOSH), the National Institute of Occupational Safety and Health (NIOSH) and a group of individuals.

The Department of Occupational Safety and Health wishes to thank and acknowledge the following individuals and their respective organisations for their contributions toward the preparation of these guidelines:

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Last but not least, thanks to staff of DOSH and NIOSH who are involved in preparation and publication of these guidelines.

Director General
Department of Occupational Safety and Health
Malaysia
September 2002

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FOREWORD

These guidelines may be cited as the Guidelines on Occupational Safety and Health for Standing at Work.

The purpose of these guidelines is to provide guidance on risk identification and assessment related to standing at work. It explains how a suitably designed standing workstation contributes to the safety and health of people at work. It gives advice on proper management of standing work.

These guidelines will be of interest to employers and safety and health officers and to manufacturers, designers and suppliers of industrial equipment. Standing in an unnatural posture for a long time can result in tiredness and discomfort. This may affect employees' general welfare which could have adverse consequences for their safety and health. Employers who provide suitable standing workstations are not only fulfilling their legal responsibilities but also contributing to the efficiency of their workforce.

These guidelines will be reviewed from time to time and readers are encouraged to give their comments in writing to the Department of Occupational Safety and Health, so that the guidelines will be continually updated and be improved.

Director General
Department of Occupational Safety and Health
Malaysia
September 2002

Chapter 1:

INTRODUCTION

Manual tasks in different industries are performed in a variety of ways where employees have to maintain basic body posture(s) such as sitting, standing, walking, crouching, etc. or combinations of various postures. Depending on the type of the task performed, the correct basic body posture is important because it can affect productivity, product quality, and safety and health of the employees.

These guidelines propose a method to systematically identify, assess and control the risks related to the standing task and workstation. A proper standing posture and workstation can contribute toward maintaining the safety and health of people at work. It starts with the identification of the risk factors using a simple checklist, then the degree of risk is assessed through a simple assessment process and finally action to be taken to control the risk is determined. If necessary these guidelines give suggestions on the control measures to be taken based on the seriousness of the problems in standing work. Some simple suggestions based on the design principles for the standing work area are demonstrated in the last chapter of these guidelines.

These guidelines are intended for use by the management and the supervisory levels.

1.1. Scope and Application

These guidelines apply to any workplace where there is a standing workstation. Definition of standing workstation can be referred in sub-chapter *1.3. Standing workstation*.

1.2. Working Posture

The working posture and task should be designed to avoid strain and damage to any part of the body such as the tendons, muscles, ligaments, and especially the back. During work, employees subconsciously tend to accept and adapt to unsatisfactory standing working conditions. They may not realise that their body is under strain until they feel actual pain and even then they may not understand the causes.

Ideally all work activity should permit employees to adopt several different, equally healthy and safe postures without reducing the capability to do the work. The employees should be able to maintain an upright and forward facing posture.

The work should be arranged so that it may be done either in the seated or standing position. However, if the standing posture is the choice for a task and if there is insufficient rest to the legs, or if they have to maintain in an awkward posture for long duration, then it can lead to fatigue, pain and discomfort. Prolonged daily standing in the awkward posture of the upper body is known to be associated with low back pain.

1.3. Standing Workstation

Standing work can be categorised based on leg movements such as dynamic activity (with leg movements), static activity (with less or no leg movements), and a combination of dynamic and static actions.

For the purpose of these guidelines, *a standing workstation* is defined as a workstation where a task is performed with the employee standing in a relatively stationary position and without much leg movement. In the standing position the body is held upright by the big muscles of the trunk and lower limbs. The employee stands throughout the length of the work shift and he or she does not move from one workstation to another.

The type of work done in the standing workstation can be categorised as light, medium to heavy work depending on whether the employee is required to exert downward forces and manipulate heavy objects.

A standing workstation may involve tasks where the employee's upper limbs are used to move loads within the standing workstation and the lower leg and trunk movements are used to provide the momentum to move the loads. The employee may also adopt a certain amount of postural movements on the whole body to perform his task such as trunk bending, twisting and turning and with the arms reaching upwards and outwards within the workstation but the legs are in a relatively stationary position.

Examples of standing workstations are:

i. Assembly tasks such as medium or heavy work.
ii. Packing tasks such as grocery, warehouse work.
iii. Molding tasks such as feeding or receiving materials.
iv. Photocopy work.
v. Kitchen tasks such as washing utensils, meal preparation and cooking.

In above cases, the employees have to perform standing work in relatively stationary position without much leg movement and they have to stand throughout the length of the work shift.

Some types of standing work are not considered as standing workstations because the employees do not have a fixed workstation and their activities involve dynamic legwork and they move around in the workplace.

Examples of work that are not considered as standing workstations are:

i. Construction work such as wall painting, brick laying, erecting scaffolds.
ii. Policeman controlling traffic at a road junction.
iii. Oil rig work.
iv. Baggage handlers at the airports.

Chapter 2:

STANDING WORK POSTURES

A workstation can either be designed for tasks to be performed while standing, sit-stand or sitting. Employee is required to stand while working due to one or more situations listed below:

- The workstation provides no or limited knee or foot clearance and therefore the task cannot be performed in a seated position.
- Extended reaches are beyond an arm length (above, forward or below) where the upper part of the body has to bend forward to reach.
- Frequent distance movements and if the operator is sitting, he/she may require to stand up.
- Downward force to be exerted by the hand is more than 4.0 kg or the object weight handle is more than 4.0 kg.
- Reduce visibility.

In addition to the above situations, the type of tasks may determine whether a particular workstation is for standing or not. There are four types of task, namely:

1. Precision
2. Light
3. Medium, and
4. Heavy

The medium and heavy task should be done in standing position because a significant amount of force is required to be exerted by the body. In most occasions, only a small amount of force may be exerted while in sitting position. To exert greater forces, the body must use the bigger muscles of the body that are located on the shoulders, back and thighs. A standing posture allows greater flexibility to exert such force.

Precision tasks are usually performed in sitting position because the amount of forces for the body to exert is small. The parts of the body commonly involved are the forearm and hand. Precision work may be

performed in standing position but for shorter period, preferably less than 10 minutes. For longer periods, precision and light duty tasks should be done in sitting position to avoid fatigue to develop.

Light duty tasks sometimes may be performed in the seated or standing postures. The tendency is to carry out in sitting position, but with occasional standing requirements.

For tasks where continuous foot control is required, the work should be performed in the seated postures (e.g. driving a car). Intermittent foot control is allowed in the standing work position (e.g. handling impact equipment).

2.1. The Importance of Proper Standing Workstation

In humans, the S-shaped curve of the back is a natural adaptation of the erect posture, which helps minimize the energy requirements of holding the upper body erect for long periods. In fact for humans, standing is an energy-efficient posture to adopt, that requires little in metabolic cost (energy) and normal standing on both legs is almost effortless.

Most of the bones of the body are designed to aid body movement of the body parts where they are connected to each other at joints and are held together by ligaments and muscles. The main role of the ligaments is to hold the joints tightly and to resist any sideways movement that may damage them. In doing so, they tend to limit movement when a muscle is fully stretched.

The joints of the spine allow for a wide range of movements of the body such as bending forward and backward and rotational movements. The individual small bones of the spine are joined together by a series of elastic ligaments that help to maintain the normal curvature of the spine.

The human skeleton consists of two (2) lever systems, the arms and legs, joined together by an articulated column, the spine. The spine is important to maintain posture but an aching back may

occur if undue strain is put on the mechanism. More severe strain can cause damage to the muscles and to the elastic ligaments. If the strain is sudden or prolonged to the intervertebral discs, the result will be a painful back condition called the 'slipped disc'.

Standing in one particular position or in any unnatural posture for long duration could lead to discomfort, tiredness and fatigue. To maintain a standing posture for a long duration, the muscles and ligaments would experience static loading; soft tissues in the joints would experience compression, and venous pooling in the leg areas are more likely to occur. These conditions are the root causes of fatigue. If there is not enough recovery time for the muscles and the soft tissues in the joint, then fatigue would develop and cause pain.

Depending on the degree of the fatigue experienced, it may cause discomfort, distraction and possibly reduced job satisfaction and performance. Excessive fatigue may become severe with time and affect the job performance in terms of the quality of the job and the productivity. This situation may cause injury, which may lead to long term ill effects and affects the employee's general welfare.

There are jobs or tasks that are better performed in the standing posture. Wherever possible, jobs or tasks that require the person to stand still for long duration without support need redesign to allow for more postural movement and to avoid static postures. Occasions that put back/spine in an extreme postures should be avoided. Muscle fatigue may be avoided if the manner in which it arises is understood and factors that induce it are avoided.

The improper design of a standing workstation would make the task more difficult, strenuous, fatiguing, boring, unacceptable and uncomfortable for the operators, which will have an effect on quality of work, productivity and safety and health of the employees.

2.2. Adverse Health Effect due to Ergonomic Risk from Standing Work

Improper design of standing workstation may create risks to the employee's body system due to:

a. Localised fatigue that can cause pain and discomfort to the muscles of the back, neck and shoulders; and the joints of the knees, ankles, hips, shoulders, and elbows.
b. General fatigue that results in reduced physical ability to perform a task. It also can reduce the concentration level of employees.
c. Overexertion to the musculoskeletal system.
d. Injuries to the employee such as slipped disc, tendonitis, sprained back, and others.

Chapter 3:

LEGAL REQUIREMENT: SECTION 15, OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) 1994

The Occupational Safety and Health Act 1994 aims to secure the safety, health and welfare of person at work, to protect others against risks to safety or health in connection with the activities of persons at work, and to promote an occupational environment for persons at work which is adapted to their physiological and psychological needs.

The Act places certain duties on employers, employees, self-employed persons, manufacturers, designers, importers and suppliers. Under section 15 of the Act, duties and responsibilities of employers and the self-employed persons are clearly stated. The responsibilities include:

- Provision and maintenance of plant and system of work to ensure safety and without risk to health.
- Make arrangement to ensure safety and absence of risks to health in connection with the use or operation, handling, storage and transport of plant and substance.
- Provision of necessary information, instruction and training to and supervision of employees to enable them to perform their work safely.
- Provision and maintenance of working environment that is safe and without risk to health and adequate welfare facilities.

Every employer and self-employed person who has employees working in standing position for significant periods of time, is obliged to make the necessary arrangements to ensure employee's safety and health while he or she is engaged in such work. These guidelines are thus intended to provide the employer with recommended safe work practices and procedures that he or she can adopt in order to protect his employees from the risks of work in the standing posture in pursuance to the above requirements of the OSHA 1994.

If standing at work is prominent in the workplace, then the workplace should include standing at work in their safety and health policy or they should have separate safety and health policy for standing at work.

Chapter 4:

RISK IDENTIFICATION, ASSESSMENT AND CONTROL MEASURES FOR STANDING WORK

The employer has to establish whether there is ergonomic risk due to standing workstation. This can be done through risk identification. The purposes of risk identification are to identify standing work that can pose an ergonomic risk to employees and to prioritize problems identified so that further assessment or control can be initiated.

4.1. Risk Identification

There are two (2) common techniques that can be used to identify the risk which are reactive and proactive techniques.

4.1.1. Reactive Technique:

Steps for the reactive technique are specified below:

Step 1: Review Medical Records

Review medical records of employees in those areas where employees carry out tasks in standing positions. Relevant information are but not limited to:

a. Complaints of pain in the soles of feet.
b. Complaints of pain in the joint areas such as knees, hips, back, shoulders, neck, elbows and hands.
c. Reports of feeling cramp, fatigue, pain in the muscles especially the legs, back, shoulders and hands.
d. Prescriptions given by doctors such as pain killers, to reduce pain in body parts suspected to be due to standing work.
e. Medical leave for illness suspected due to standing at work.

Step 2: Review Accident Records

a. Cases of collapse while performing standing work.
b. Other related accidents while performing standing works that may be due to fatigue (e.g. accidents that involve resting hand on a rotating machine).

Step 3: Record Complaints

a. From the group of employees
b. From the supervisors

Step 4: Check Quality and Performance Status

Employees who are constantly in fatigue, pain, or injured due to improper standing work are likely to have problems related to quality of work and performance due to physical inability to perform the task assigned to them properly. It may be necessary and possible to check whether they can meet the production target, number of rejects, scraps and reworks. Check whether the employees can maintain their trend of production rate and quality.

4.1.2. Proactive Techniques:

The most effective technique to identify ergonomic risk due to standing work is by utilising proactive techniques. Steps for proactive technique are specified below:

Step 1: Direct Observation

Basically, a direct observation is performed by "walk through" inspection at the standing workstation areas. Observation should focus and emphasis on the problematic areas. The use of a checklist is recommended. A sample checklist is given in *Appendix 1*.

It is highly recommended that the person assigned to carry out the direct observation should have some knowledge in ergonomic risk factors related to standing work.

The purpose of direct observation is to identify ergonomic risk factors due to improper design of standing workstation such as but not limited to:

a. Static loading.
b. Hard surface for the feet.
c. Improper footwear.
d. Awkward posture of the upper body such as the workstation being too low or too high.
e. Standing without movement for more than 10 minutes.
f. Lack of movement of the bigger muscles while performing work.
g. Over reaching.
h. High repetition of awkward posture and over reaching.
i. Long duration of awkward posture and over reaching.

Step 2: Body Part Symptoms Survey

Body part symptoms survey should be carried out for all employees who work at standing workstation. The purpose of the symptoms survey is to document whether there are trends in pain, discomfort and injuries among standing workstation employees due to standing work. Obviously, if worsening trend in lower limbs were detected, this would indicate a risk. A sample of body part symptoms survey is attached in *Appendix 2*.

There may be cases where some employees may still complain of pain and discomfort or uneasiness due to standing work even though there is no indication of serious problems or risks from the standing workstation or tasks during the risk identification process. In this case, a thorough look at the non-occupational risk factors and psychosocial factors are warranted.

4.2. Other Risk Factors

4.2.1. Non-Occupational Risk Factors

Not all risks of standing work are directly related to the job, tasks or workplace design. Employees can also feel pain and discomfort due to other factors. In other words, *sometimes there is nothing wrong with the standing workstation*. The non-occupational risk factors are unique to each individual employee and can only be verified by medical personnel. These employees have to undergo medical examination to certify whether they are fit to do standing work.

Examples of the non-occupational risk factors are:

a. Overweight or obesity.
b. Pregnancy.
c. Back injury from previous job.
d. Past accident that may have impaired certain body parts.
e. Reduced ability to work due to activities such as golfing, gardening and fatigue because of other jobs.
f. Diseases such as joint rheumatism and arthritis, degenerative bone diseases (lumbar, trunk and lower back spondylosis), peripheral circulatory disorder.
g. Physical disability.

Employees with non-occupational risk factors must be monitored if they are employed in a standing workstation. If problems develop, these employees may not be fit to work. The standing work may exacerbate the symptoms of pains and discomfort. *Consult medical personnel for advice.*

4.2.2. Psychosocial Factors

Ergonomic risk factors at work do not only involve physical factors but psychosocial factors as well. Pain and discomfort experienced by employees may not be directly related to physical characteristics of the workstation alone but at the same time may be related to characteristics of the work environment. Psychosocial work factors are "perceived" characteristics of the work

environment, job content and organisational conditions that have an emotional value for employees and managers, and that can result in stress and strain. Examples of psychosocial work factors include overload, lack of job control, social support and job future uncertainties. These factors can influence the employee's health, work performance and job satisfaction.

There is increasing evidence that psychosocial factors related to the job and work environment play a role in the development of work related musculoskeletal disorders. Findings suggest perceptions of intensified workload, monotonous work, limited job control, low social support are associated with various work related musculoskeletal disorders. Psychosocial factors should be taken into consideration when performing risk assessment at a workplace.

4.3. Risk Assessment

4.3.1. Severity of the Problem

Severity of the problem should be based on:

a. the most number of risk factors
b. the most number of complaints from employees
c. the most number of cases of injuries from the medical reports
d. deterioration of quality of products
e. high percentage of symptoms of pains and discomfort on the body parts

4.3.2. Classification of Risk

Once all information during risk identification has been compiled, the next step is to determine level of the risk. The risk can be classified into three levels (1, 2 and 3) as specified below:

1. Level-1 Risk

The risk is classified as Level 1 risk when one or more of the statements below are identified:

a. There are general complaints from employees such as fatigue, discomfort and pain in body parts, especially the lower parts of the body such as the lower back, thighs, knees, and feet.
b. When employees lean toward a table, equipment or machine to release stress in the legs due to fatigue or frequently walk away from the workstation.
c. When a survey of body part symptoms shows trend of pain and discomfort.
d. Quality and productivity may not be seriously affected.

2. Level-2 Risk

The risk is classified as Level 2 risk when one or more statements below are identified:

a. More serious complaints are documented from the employees who perform the standing work.
b. The body part symptoms survey indicates persistent pains and discomfort on certain body parts such as the muscles and joints especially in the feet, calves, knees, thighs, back, and shoulders that continue after work.
c. Medical reports confirm that employees have complained of localised pains and discomfort. Medications to treat symptoms are given by the nurses and doctors.
d. Employees who are currently working in a standing workstation show high rates of absenteeism and medical leave.
e. The safety records show incidents such as employees collapsing during standing work.
f. The quality and productivity of work have been affected, such as in terms of inconsistent volume of production and increase in the number of scraps and rework.

3. Level-3 Risk

The risk is classified as Level 3 risk when one or more statements below are identified:

a. Employee suffers chronic injury due to standing work. The injury can be serious enough that the employee would not be able to perform the standing work voluntarily or with the advice of a doctor (preferably the occupational health doctor).
b. Disability as a result of injury sustained during standing work.

4.4. Risk Control Measures

Control measures to be implemented are based on the level of risk found during risk assessment.

4.4.1 Level-1 Risk Control Measures

The suggested control measure for level-1 risk is to conduct training programme for the employees and supervisors that will help them to understand standing work.

The training should highlight the following issues:

a. The importance of proper standing procedures while working and how it affects the productivity, quality and long-term safety and health of the employee.
b. Competency to understand risks associated with standing works.
c. Practical measures to reduce risk from standing work can be taken such as stretching, adjusting the height of the workbench and rearranging the workstations.
(as in Chapter 5)
d. Reporting symptoms of fatigue and injuries. Employer has to establish a reporting system and investigate immediately all the reports received.

Besides conducting the training, a body part symptoms survey should be carried out once every six months. Result of the body part symptoms survey should be analysed to detect problem.

4.4.2. Level-2 Risk Control Measures

The suggested control measures for level-2 are divided into three steps:

Step 1:

Employer to establish an ergonomic management team consisting of engineers, representatives from OSH committees, Safety and Health officer, doctor, nurse, managers, senior executive or others. The ergonomic management team is responsible for minimising risks due to standing work. The team can initiate

a. Work or Task Analysis and Job Safety Analysis (JSA)
b. Formulation of safe standing work procedures
c. Workstation redesign or Work redesign
d. Other ways and methods to minimise risk due to standing work

Step 2:

Employer to educate the persons who are responsible for the design of standing workstation with regard to the requirement for proper workstation design (e.g. ergonomic factors and consideration).

It is highly essential for the person who designs any workstation to understand that risks developed from standing work are most likely due to poor design of workstation and not the employees.

Some of the suggested topics need to include:

a. Human sizes and body dimensions (anthropometrics).
b. Human strength and movement (biomechanics).
c. Ergonomics and workplace design.
d. Work physiology.

References on the subjected topics can be found in the *Appendix 3*.

Step 3:

All level-1 risk control measures are applied.

4.4.3 Level-3 Risk Control Measures

The appropriate control measures for level-3 are divided into two steps:

Step 1:

All level-2 risk control measures are applied.

Step 2:

Employer to develop Medical Management Programme with the assistant of ergonomic management team. The Medical Management Programme will consist of policy and procedures with regard to those whose are already injured and disabled due to standing work. Some suggestions for the medical management programme actions are:

a. Correct definition of light duties for the injured employees just in case the employee may no longer be able to work at the standing workstation (example: duties that will not aggravate the injured body parts).
b. Proper advice to employers and employees about the risks of standing work from the medical point of view, root causes and how the health problems come into existence.
c. Advice the appropriate back-to-work or rehabilitation programme.
d. Appropriate medical treatment for the employees suffering from chronic injuries.

Summary of Risk Identification, Risk Assessment and Control Measures are shown in *Appendix 4*.

Chapter 5:

STANDING WORKSTATION DESIGN PRINCIPLES

The best design of any workstation must demonstrate minimal physical stresses to the employees that may lead to localised fatigue, pain and discomforts to the employees.

To minimise the physical stresses, several design principles can be adopted such as:

i. Re-design or rearrange task to allow employee to sit or to stand whenever necessary for him or her to do so.
   - Avoid tasks which require standing in static posture.
   - Provide a chair or a stool for sitting on or standing against.

Sit/Stand Stool

ii. Provide workstation accessories such as but not limited to:
   - A cushioned surface to stand on (anti-fatigue floor mat).
   - Better soles for shoes.
   - Adjustable working surface to accommodate differences in employees' height.
   - Small foot bench. (e.g. grating for foot to rest)

Grating

Anti-Fatigue Mat

iii. Arrange for task variation so that an employee can perform different tasks that will allow the legs to move and reduce static loading.

iv. Job or employee rotation –
Introduce variability of the task/job so that localised fatigue on certain parts of body is reduced. Monotonous work may induce fatigue to specific parts of the body.

v. Introduce frequent short breaks to recover from fatigue during the work cycle.

vi. Provide proper and sufficient lighting to an employee that performs work in standing position. The amount of required lighting varies between general work and close-up work. Postures may be affected if sufficient light intensity is not available for close-up work.

It is recommended that a person who has adequate knowledge on ergonomic principles should do or oversee standing workstation design.

Appendix 1: Simple Checklist for Standing Work

("Yes" to these questions indicates a potential risk)

1. Does the employee stand on a hard surface without any proper floor mat when performing standing work?

2. Are shoes provided with improper soles to support the body weight?

3. Is the employee wearing heavy clothes?

4. Is the arrangement of the job not within easy reach?

Task, which is not easily reached

5. During the work cycle, does the employee perform a particular work continuously without releasing the physical stress of the body such as in the calf muscles either through rest breaks or leg movement or task variability?

6. Does the employee have to maintain an awkward posture of the upper body, for example back, elbows?

Bending for long period

7. Is the duration of standing position at work exceeding 10 minutes without possible leg movement or rest?

One way of releasing physical stresses of the body

8. Is the workbench fixed (not adjustable)?

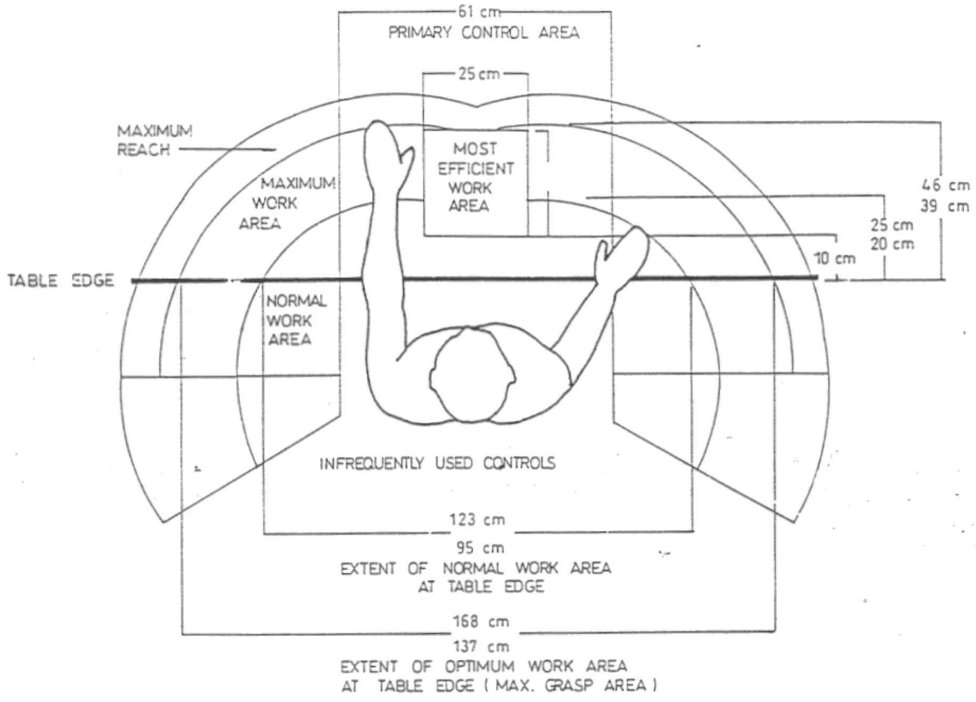
9. If yes, is it too low or too high?

Workbench too high

Workbench too low

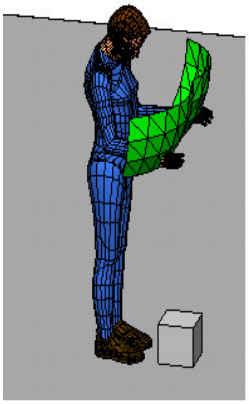
10. Are the items arranged in the standing workstation not within reach?

Appendix 1



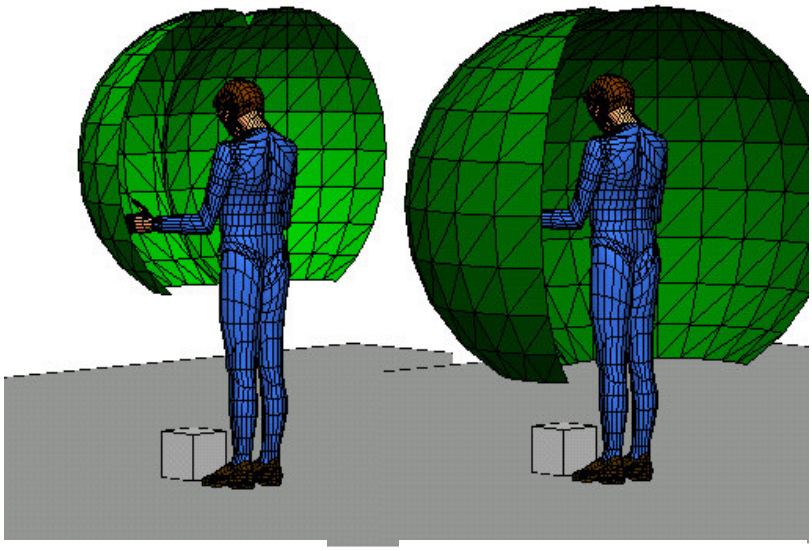
Workspace Envelope: The Ideal Measurements of a Workspace Envelope

Appendix 1



Standing work:
i. Ideal reaching envelope

Example of within-reach workstation
(for standing work)



Standing work:
ii. 100% reaching envelope

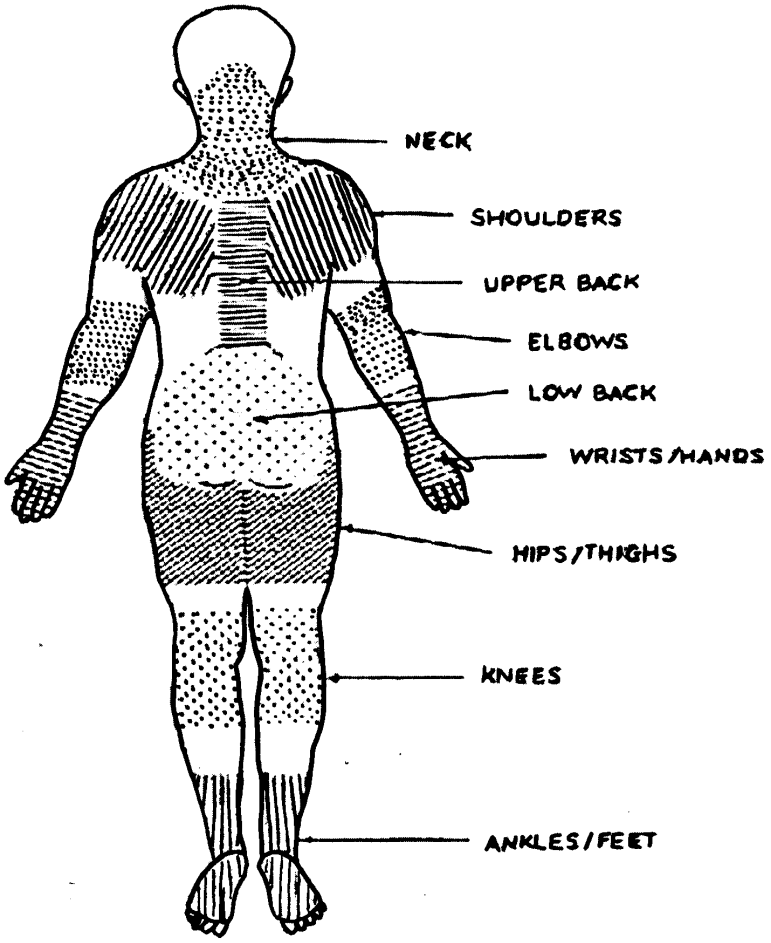
Standing work:
iii. Reaching envelope with body assistant

The items arranged in the standing workstation should follow the reaching envelope principles. The reaching envelope varies from one individual to another.

Appendix 2: Body Part Symptoms Survey

Localised Symptoms

This picture shows the approximate positions of the parts of the body that are referred to in the questionnaire. Limits are not sharply defined, and certain parts overlap. You should decide for yourself which part you have or have had trouble (if any).



Trouble with the locomotive organs			
Have you at any time during the last 12 months had trouble (ache, pain discomfort) in :	To be answered only by those who have had trouble		
	Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?	Have you had trouble at any time during the last 7 days?	Do you think that the trouble is attributable to your work?
Neck 1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
Shoulders 1☐No 2☐Yes, the right one 3☐Yes, the left one 4☐Yes, both.	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
Elbows 1☐No 2☐Yes, the right one 3☐Yes, the left one 4☐Yes, both.	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
Wrists/hands 1☐No 2☐Yes, the right one 3☐Yes, the left one 4☐Yes, both.	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
Upper back 1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
Low back 1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
One or both hips/thighs 1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
One or both knees 1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
One or both ankles/feet 1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes	1☐No 2☐Yes 3☐Not sure
What do you think can be done at your workplace to improve its safety and health aspect : _____ _____			

Appendix 3: List of Reference Materials for Further Study

1. Van Nostrand Reinhold, Ergonomic Design for People at Work Eastman Kodak Company, 1983.

2. Tichauer, E. R. The Biomechanical Basis of Ergonomics, Wiley-Interscience, New York, 1978.

3. Frankel, V.H., and M. Nordin, Basic Biomechanics of the Skeletal System, Lea & Febinger, Philadelphia, 1981.

4. E. Grandjean, Fitting The Task To The Man: An Ergonomics Approach, Taylor & Francis, London, 1986.

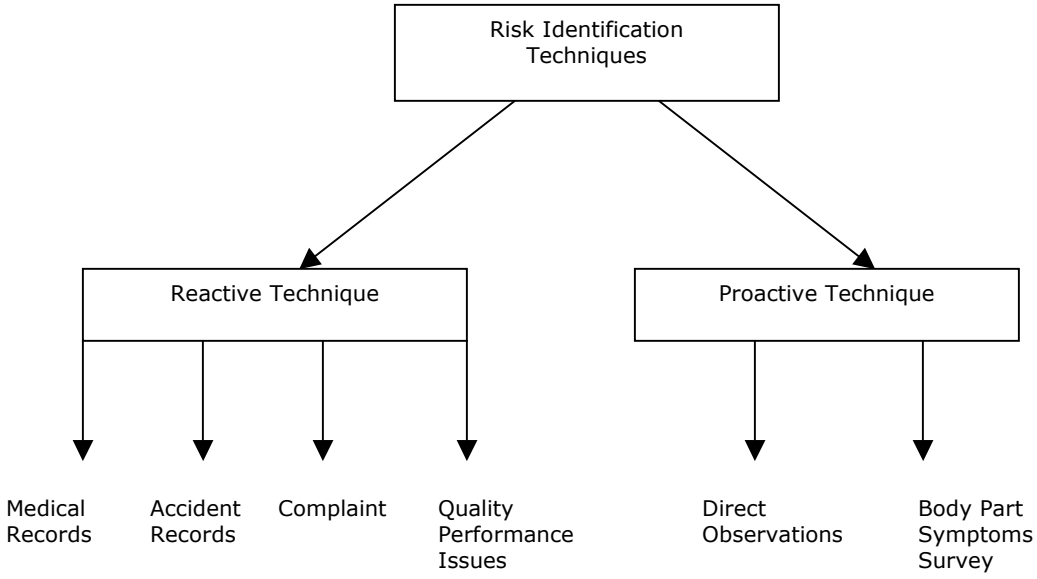
5. Coermann, R., The Mechanical Impedance of the Human Body in Sitting and Standing Position at Low Frequencies In Human Vibration Research, Pergamon Press, New York, 1971.

6. Dan MacLeod, The Rules of Work: A Practical Engineering Guide to Ergonomics, Taylor & Francis, New York, 2000.

7. John R. Wilson and E. Nigel Corlett, Evaluation of Human Work: A Practical Ergonomics Methodology, Taylor & Francis.

Appendix 4: Summary of Risk Identification, Risk Assessment and Control Measures

1. Risk Identification



2. Risk Assessment

Level 1 Risk Assessment	**Level 2 Risk Assessment**	**Level 3 Risk Assessment**
Fatigue complaints, discomfort, pains of lower back, limbs.	More serious complaints.	Chronic injury - not able to do standing work.
Leaning on work surface for support, walk away from workstation.	Body parts survey shows persistent pains/ discomfort of lower limbs.	Permanent disability from injury from standing work.
Body part symptoms survey shows pain & discomfort.	Medical reports of complaints, medical treatment.	
Work quality/ productivity not seriously affected.	High number of medical certificates (MC) and high rate absenteeism.	
	Incidence of collapse in standing workstation.	
	Inconsistent production volume, increase in number of scraps & reworks.	

3. Control Measures

Level 1 Risk Control Measures	**Level 2 Risk Control Measures**	**Level 3 Risk Control Measures**
Training Programme for employees & supervisors on importance of proper standing procedure, competency to understand risks, practical measures and reporting symptoms of fatigue/injuries.	Form Ergonomic Management Team by initiating work/task analysis, formulate safe standing procedure, workstation redesign.	All Level 2 Measures.
Carry out Body Part Symptoms Survey once for every six months.	Educate Industrial Designer/ or Engineer with ergonomic knowledge.	Develop Medical Management Programme.
Establish reporting system.	All Level 1 Measures	
Implementation of practical measures.		