MINISTRY OF HUMAN RESOURCES
DEPARTMENT OF OCCUPATIONAL SAFETY AND HEALTH

GUIDELINES ON OCCUPATIONAL SAFETY AND HEALTH FOR STANDING AT WORK 2024

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Preface

These guidelines may be cited as the Guidelines on Occupational Safety and Health for Standing at Work 2024. These guidelines replace the previous and first version of Guidelines on Occupational Safety and Health for Standing at Work 2002. The purpose of these guidelines is to provide a systematic plan and an objective approach in identifying ergonomics risk factor and controlling risk.

General health and welfare of employee involved in standing at work are usually effected to a certain extent in terms of persistent discomfort, pain and may lead to long-term chronic injury if there is no control. Therefore, it is the collective responsibility of the employers, safety and health practitioners, designers, manufacturers and employees, to ensure workplaces are better suited for standing at work with minimum risk to employee safety and health.

In summary, both employers and employees are expected to benefit from these guidelines, since it entails a detailed explanation on the ergonomics risk factors related to standing at work, health effect as well as practical guidance on how to minimize these risks.. It is hoped that the implementation of these guidelines in the workplace will help to mitigate risks associated with standing at work and prevent acute and chronic injuries and illnesses. At the same time, employers and employees are likely to benefit from increase in productivity and safety and health in the workplace.

The Department would like to thank all committee members for their effort and contributions in the preparation of these guidelines.

Ir. Hj. Mohd Hatta bin Zakaria

Director General
Department of Occupational Safety
and Health Malaysia
2024

Acknowledgement

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Abbreviation

BMI	Body Mass Index
CTS	Carpal Tunnel Syndrome
DOSH	Department of Occupational Safety and Health
ERA	Ergonomics Risk Assessment
ERF	Ergonomics Risk Factor
ISO	International Organization for Standardization
OMSD	Occupational Musculoskeletal Disorders
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
RSI	Repetitive Strain Injury
SBS	Sick Building Syndrome
TNS	Tension Neck Syndrome

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1 Introduction

Manual tasks in different industries are performed in a variety of ways where employees have to maintain basic body postures such as sitting, standing, walking, crouching or combinations of various postures. A proper standing posture and well designed workstation can contribute significantly to maintaining the safety and health of employees, reducing the risk of developing Occupational Musculoskeletal Disorders (OMSD).

This is particularly important considering the data from the National Occupational Accident and Disease Statistics 2022, which reported a total of 7,143 confirmed cases of occupational disease. Among these, OMSD accounted for the second-highest number of cases, with 678 instances, only surpassed by Occupational Noise Related Hearing Disorders. These statistics underscore the need for effective ergonomic interventions in the workplace to prevent such conditions.

1.1 Purpose

The aim of these guidelines is to provide the guidance and information with a systematic approach in the identifying of ergonomics risk factors (ERF) and controlling the risks related to standing at work in the compliance of Occupational Safety and Health Act 1994 (OSHA 1994) which is to ensure that employers provide a safe workplace to their employees and related persons. These guidelines give comprehensive ergonomics related guidance on standing at work covering work environment where employees are required to mostly stand to complete their task.

A workplace that requires the employee to primarily stand while doing their jobs may utilize these guidelines to minimize ergonomic risks associated with standing work. Standing work can be categorized based on leg movements as;

i. dynamic activity (continuous or intermittent leg movements);

ii. static activity (minimum or infrequent leg movements) and

iii. combination of dynamic and static actions.

Employees are required to stand while working because of one or more situations listed below;

i. The workstation provides no or limited knee or foot clearance and the task cannot be performed in a seated position as shown in **Figure 1.1**;

ii. Extended reaches are beyond an arm length (above, forward or below) where the upper part of the body has to bend forward to reach;

iii. Frequent distance movements and if the employee is sitting, he / she may require to stand up; and

vi. Reduced visibility.

If task demands prohibit employees from changing their standing posture positions, the task will be automatically considered as standing at work.

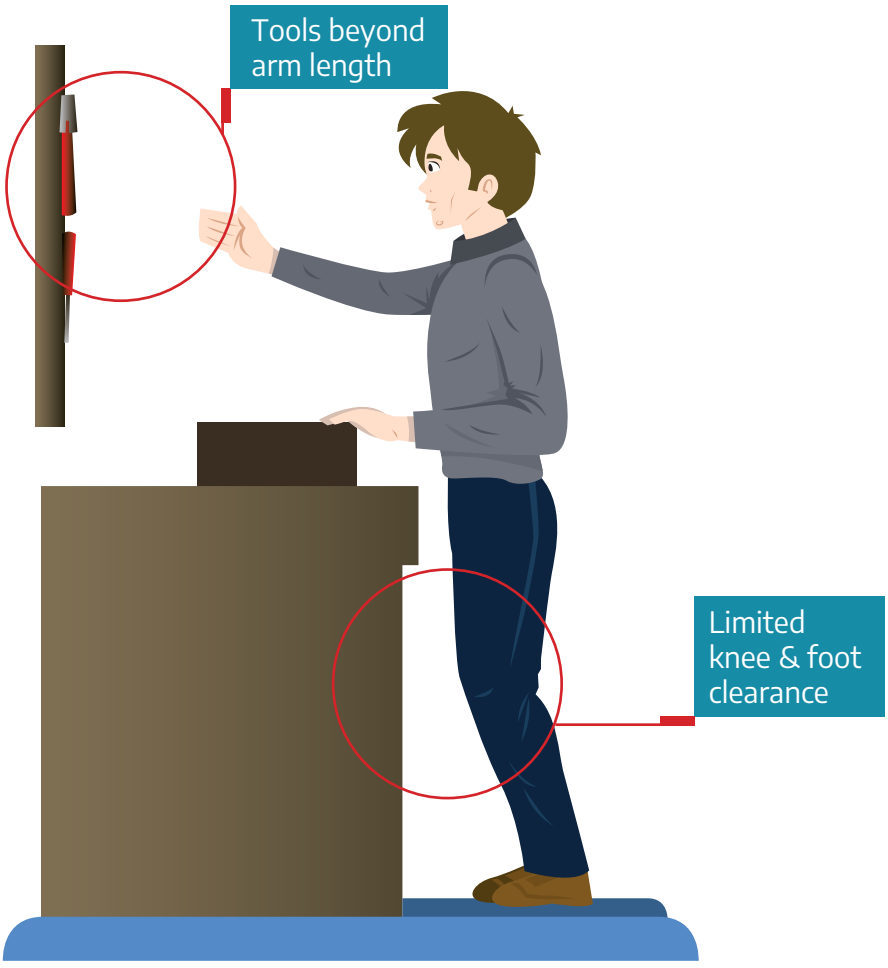

Figure 1.1: Limited knee / foot clearance and tools / equipment beyond arm's length.

1.2 Objectives

The objectives of these guidelines are to:

(a) Explain the ergonomics risk factors and health effects associated with standing at work; and

(b) Describe the appropriate control measures to alleviate the risks of standing at work.

1.3 Scope and Application

The scope of these guidelines covers the issues related to standing at work which are part of the physical ergonomics domain in the workplace. These guidelines are applicable to the workplaces as provided by OSHA 1994.

These guidelines cover issues related to standing work which involve standing with stationary position and very minimal leg movements more than two hours continuously.

2

Legal Requirement

The OSHA 1994 aims to secure the safety, health and welfare of persons at work for protecting others against risks to safety or health in connection with the activities of persons at work. Under the Act, employers, employees and self-employed person are required to meet certain standards on safety, health and welfare. The general provision related with standing at work are as follows:

a) Section 15 of the Act describes the duty of every employer to ensure; so far as is practicable, the safety, health and welfare at work of all his employees.

b) Section 17 of the Act describes the general duties of employers and self- employed persons to conduct his undertaking in such a manner as to ensure; so far as is practicable that he and other persons not being his employees, who may be affected thereby are not thereby exposed to risk to their safety and health.

d) Section 20 of the Act describes the duties of a person who designs, manufactures, imports, or supplies any article for use at work.

e) Section 24 of the Act describes the duty of every employee while at work.

Terms and Definition

The following terms and definition are applicable for these guidelines;

Ergonomics Risk Factor	An ergonomics risk factor is any attribute, characteristic or exposure that may cause or contribute to a musculoskeletal injury; the mere presence of a risk factor may not in itself result in an injury. In general, two or more risk factor may be present at one time, thereby increasing the risk of injury.
Occupational Health Doctor	A medical practitioner who is registered with the Director General to conduct medical surveillance programmes of employees.
Physical Ergonomics	Physical ergonomics is a domain of ergonomics dealing with the anatomy, anthropometry, physiology and biomechanics characteristics associate with physical activity. Some application includes work postures, materials handling, repetitive movements, occupational musculoskeletal disorders, workplace layout, workstation design and safety and health.

3

Ergonomics Risk Factors Related to Standing at Work

Standing is a natural human posture and by itself poses no particular health hazard. However, prolonged standing at work can lead to various ERF that affect employee health and productivity. These ERF arise from the physical strain and discomfort associated with standing for extended periods, which can contribute to occupational musculoskeletal disorders and other health issues. Understanding these ERF is essential for developing effective workplace interventions and promoting employee well-being.

3.1 Awkward Postures

Employees who are standing at work are usually exposed to awkward postures of the upper limb when trying to perform tasks or to reach items beyond their working envelope. Posture refers to the position of different segments of our body. When these different segments and joints are in their 'resting' position (simply means the position in which there is the least tension or pressure on nerves, tendons, muscles and joints) this position is called neutral postures.

Awkward postures, therefore is refers to position of the body when performing work activities that deviate significantly from neutral position. Over reaching items or tools are quite common place while standing or sitting due to the design and arrangement of tools or items. A good rule of thumb is that the working envelope need to be less than the arm length of the particular employee as shown in **Figure 3.1**.

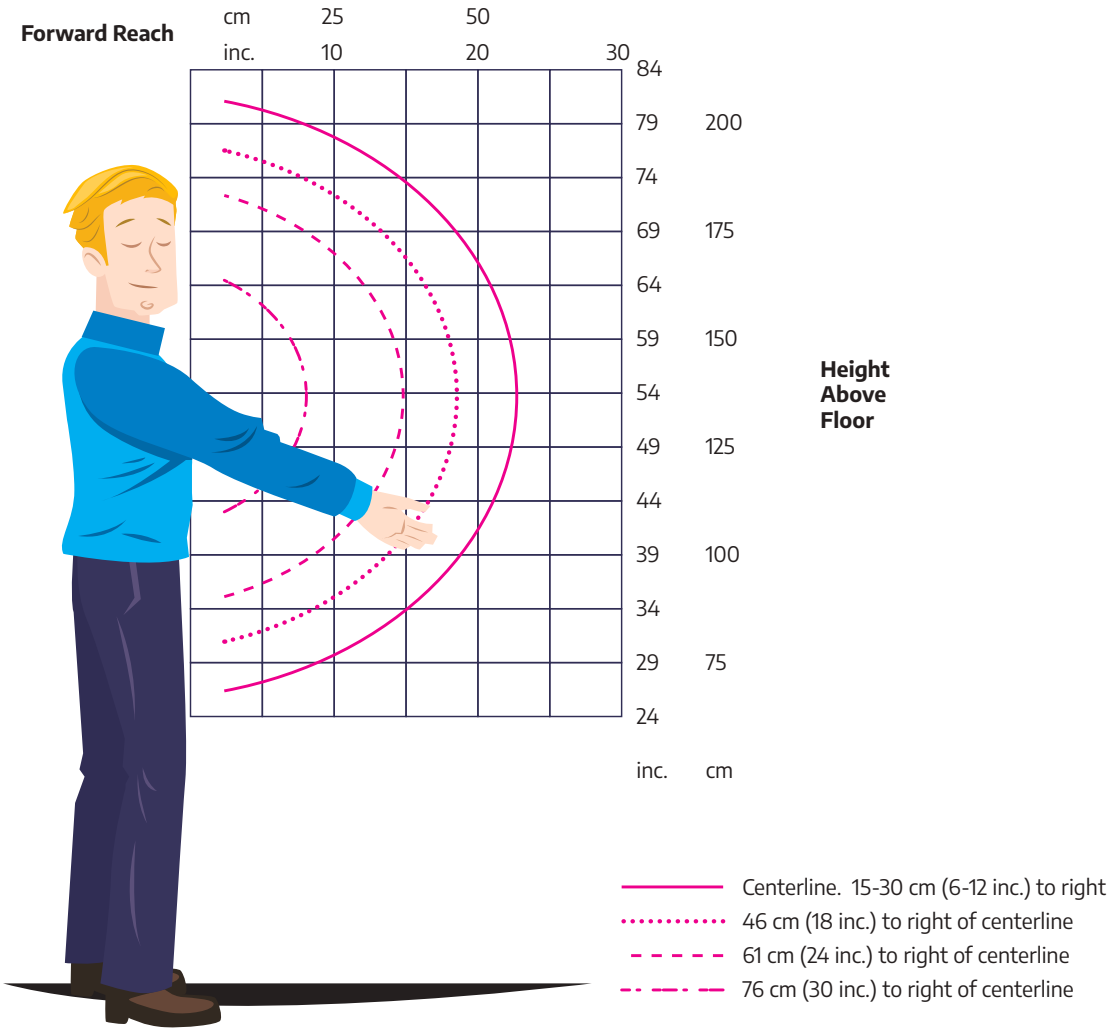

Figure 3.1: Working envelope for standing at work

3.2 Static and Sustained Postures

Working conditions which require holding loads in a static standing posture for several hours may result in discomfort. Examples of industrial tasks that involve prolonged standing include welding plates with a shielded metal arc machine, assembling vehicle tires in the overhead posture and holding a jig or clamp to drill holes with a drill machine. No movement during these tasks imposes very high static loads on the body and impedes the blood flow, thus resulting in rapid fatigue and slower recovery of tissues.

3.3 Vibration

Vibration at work is a common ERF for ergonomic injuries. Standing too close to vibrating machines or handling power tools can transmit vibration to the employee's body including the legs. This can worsen the muscle fatigue experienced by the employee. Excessive exposure to vibration can result in localized fatigue and pain in the lower back, neck, shoulders and knees. Limiting employees' exposure to vibration minimizes the risk of injury.

3.4 Contact Stress

Contact stress refers to the physical pressure or force exerted on a body part or surface when it comes into direct contact with another object or surface. It plays a significant role in understanding the mechanics of human movement and injury prevention. For example, when a person stands, their feet experience contact stress as they interact with the ground. Prolonged or excessive contact stress on the feet can lead to discomfort, pain and various foot conditions like calluses, corns or plantar fasciitis.

An example of standing contact stress is a cashier in a retail store who stands for long shifts on a hard concrete floor without any anti-fatigue mats. Prolonged exposure, the cashier might experience pain in their feet, legs and lower back due to the continuous pressure and lack of cushioning. This discomfort can lead to chronic musculoskeletal problems if not addressed.

3.5 Environmental Risk Factor

A good physical working environment is important, not only for health and well-being but also because an inadequate environment can have a negative impact on concentration and communication therefore impairing work performance or productivity. Extreme temperatures, inadequate air ventilation, inadequate lighting and excessive noise are examples of environmental risk factor which leading to adverse impact on employees while standing at work.

Hot temperature generally causes discomfort which compromises focus, efficiency, accuracy and overall productivity. In prolonged exposure, heat can lead to dehydration and muscle fatigue as the body attempt to regulate temperature to maintain homeostasis by increasing perspiration. The general discomfort potentially causes dissatisfaction leading to stress which may contributes to development of or aggravate existing OMSD. On the other hand, cold temperature leads to reduced sensory feedback, tensed up muscle causing less dexterity and flexibility resulting in muscle strains and pulls as the body homeostasis regulation kick in, constricting blood vessels to prevent heat loss.

Poor lighting setup at workplace can be divided in two extremes: which are being dim, dark, gloomy environment or too bright glare (direct or indirect) to the users. For standing work, poor lighting setup potentially cause employees to adopt awkward posture particularly for the trunk and / or neck as they adjust their position to see better. Such prolonged adoption of awkward posture could lead not only to job dissatisfaction but ultimately OMSD.

Continuous exposure to excessive noise or poor ventilation are risk factors which could cause discomfort leading to stress which in turn trigger the development or aggravate existing OMSD. This is particularly irritating for employees standing at work as they are unable to follow their biological instinct to move themselves away from the exposure to the environmental stressors.

3.6 Other Risk Factor

Psychosocial risks factors such as excessive workloads, conflicting demands, lack of influence over the way the job is done, job insecurity and lack of management support or colleagues can further aggravate the existing stress and strain which results in fatigue leading to OMSD.

Many of these risk factors are encountered in office work, with or without the use of computers such as in call center where operators may receive verbal abuse, working in isolation, bullying, etc. In some cases, the impact of computing technologies on how jobs are structured can play a major role such as in using software with glitches, slow system, unfamiliar or relatively new software.

The potential impact of these factors is two-folds. Firstly, they can have a direct impact on the mental and physical health of employees. Secondly, there is a growing body of evidence that they can contribute to (and exacerbate) the risk of musculoskeletal problems. It is important that these risk factors are taken into consideration during risk assessment.

Individual risk factors such as age, body mass index (BMI), physical activity, unhealthy diet etc. can further contributes to OMSD. As opposed to older individual whose physiological system has worn after years exposures to various ERF, a younger adult has a higher tolerance and flexibility against external stressors. Besides that, being engaged in certain hobbies such as gardening, fishing, knitting, etc. as well as intensive sports activities can further increase strain on the body musculoskeletal system which results in fatigue leading to OMSD and further aggravated by work.

3.7 Ergonomics Risk Assessment (ERA)

Ergonomics Risk Assessment (ERA) is a systematic and objective approach to identify ERF, assess and control ergonomics risk associated with the work tasks activities in the workplace. Method for implementation of ERA at the workplace are described in the relevant guidelines on ergonomics risk assessment published by DOSH.

4

Health Effects Related to Standing at Work

Prolonged standing at work has been shown to be associated with a number of potentially serious health outcomes, such as lower back and leg pain, cardiovascular problems, fatigue, discomfort and pregnancy related health outcomes.

4.1 Basic Human Anatomy for Standing at Work

The S-shaped curve of the back is a natural adaptation of the erect posture as shown in **Figure 4.1**, which helps minimize the energy requirements of holding the upper body erect for long periods.

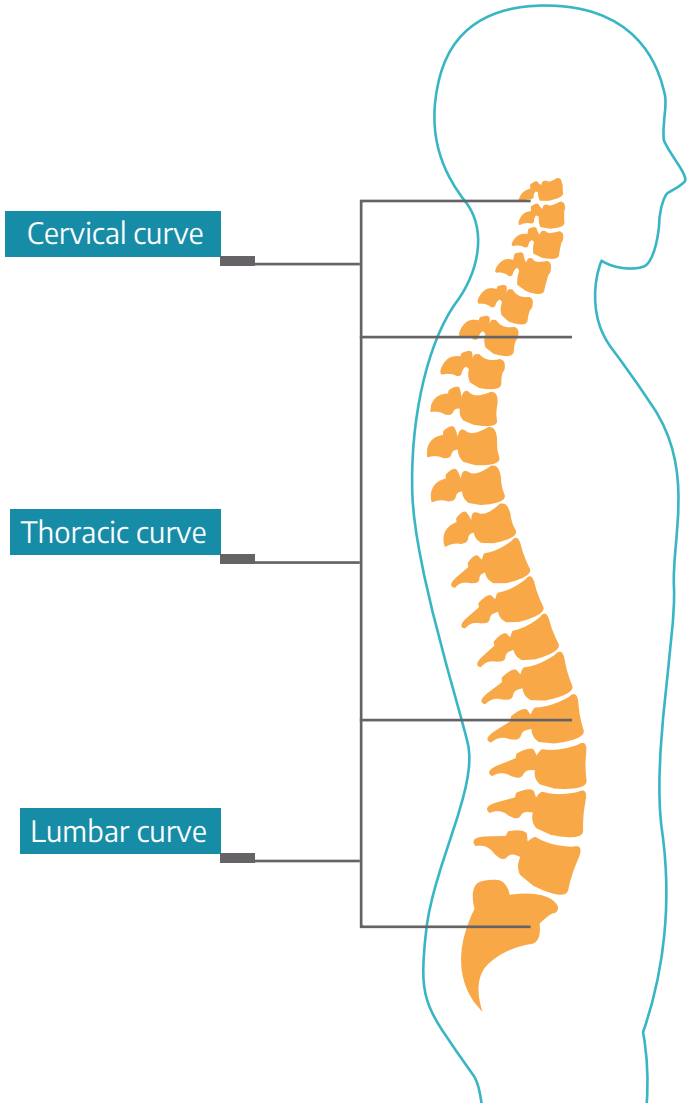

Figure 4.1: Natural lumbar S-curve of the human body

For humans, standing is actually an energy-efficient posture to adopt, that requires little in metabolic cost (energy) and normal standing on both legs is almost effortless.

As such, working in standing condition can be advantageous, provided that appropriate measures are taken to protect employee's body. 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 should to be designed or redesigned to allow for more postural movement and to avoid static postures. Occasions that put back / spine in an extreme posture 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 employees, which will have an effect on quality of work, productivity and safety and health of the employees.

4.2 Adverse Health Effects Related to Standing at Work

The adverse health effects related to standing at work can be as a result from many risk factors, both coming from occupational and non-occupational in origin hence the causes of these health effects are multifactorial in nature.

Standing at work may be an aggravating factor to the health effects mentioned below.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 can be one of the many causes that leads to 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. **Figure 4.2** illustrates the common health effects resulting from standing at work for a significant amount of time.

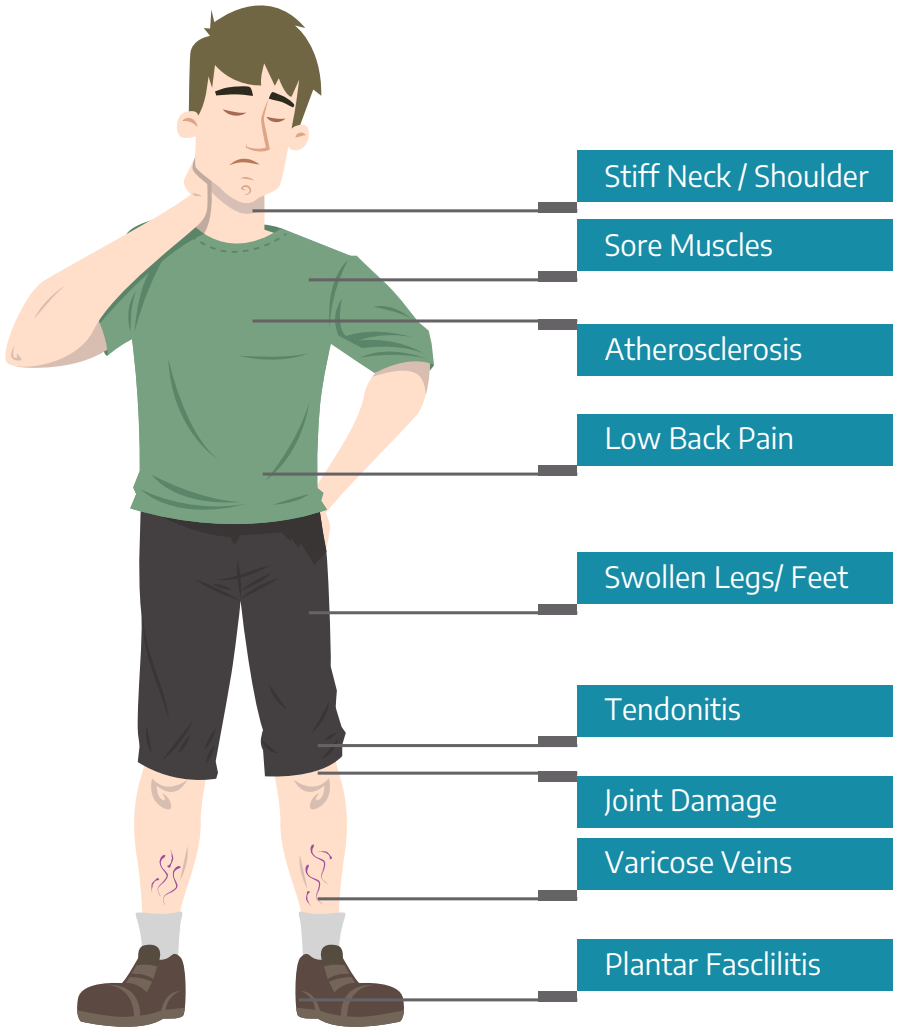

Figure 4.2: Health effects of standing at work

Minor effects may include stiff neck or shoulders, sore muscles and swollen legs or feet. The more harmful effects are atherosclerosis, low back pain, tendonitis, joint damage, varicose veins and plantar fasciitis.

Physiological strain occurs when good blood circulation is impaired, resulting in a limited supply of oxygen and nutrients to muscles and tissues through arteries. In addition, the waste byproducts such as lactic acid and carbon dioxide will also accumulate in the muscular system and not taken out through the veins.

This inefficient circulation process will result in the feeling of discomfort, fatigue and strain. Frequent and cumulative long-term exposure to physiological strain is likely to damage muscle at a cellular level, leading to potential musculoskeletal disorders or injury.

In addition, all the health conditions stated in these guidelines must be assessed by an occupational health doctor (OHD). The complaints from the employees who are subjected to standing at work needs to be assessed on an individual basis, since there can be many other confounding factors e.g. lifestyle, congenital diseases and environmental factors that can cause or aggravate the health conditions experienced by the employees.

4.2.1 Low Back Pain

Standing at work has also been associated with the occurrence of low back pain. Low back fatigue and subjective discomfort seems to be the most measured outcome for standing at work. The longer the duration of standing at work, the higher the employee's levels of discomfort and fatigue. The onset of discomfort and fatigue can start anywhere between 30 mins and 1 hour of standing at work.

4.2.2 Preterm Birth and Spontaneous Abortion

Pregnant women are usually discouraged from performing standing at work due to the fact that preterm birth and spontaneous abortion can occur due to prolonged standing. Apart from standing at work, heavy physical labor is also known to cause preterm birth and abortion among pregnant women. Therefore, safety and health practitioners need to exercise caution when dealing with pregnant employees in the workplace involving standing at work.

4.2.3 Atherosclerosis

Standing at work for long periods has also been associated with occurrence of atherosclerosis. Atherosclerosis is commonly described as the narrowing of the heart arteries caused by a buildup of fatty substances in the artery walls.

Prolonged standing at work has been shown to increase the stiffening of the lower limb arteries, which does not decrease with walking breaks. The stiffening of the lower limb arteries is a prognostic indicator of atherosclerosis and therefore is a good indicator for cardiovascular health. Employees who are subjected to standing at work should monitor their cardiovascular health regularly.

4.2.4 Varicose Veins

Prolonged standing can cause blood pooling in the leg veins, resulting in the one way valves having to work extra hard to prevent backflow of blood. When this happens frequently, the one-way valves become weaker from extra work and may not work properly as intended. This condition inevitably leads to varicose veins as shown in **Figure 4.3.**

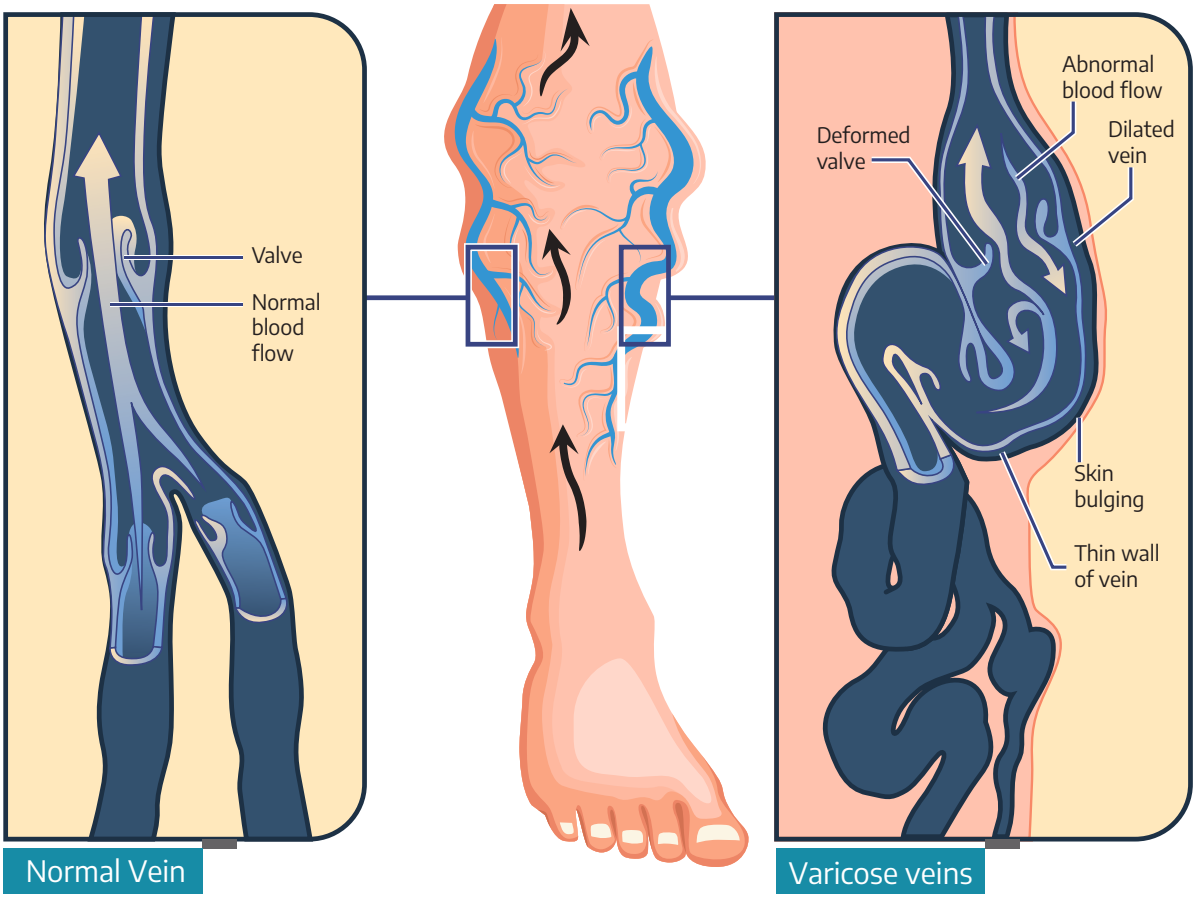

Figure 4.3: Varicose Veins

Varicose veins occur when veins aren't functioning properly. Veins have one-way valves that prevent blood from flowing backward. When these valves fail, blood begins to collect in the veins rather than continuing toward your heart. The veins then enlarge. Varicose veins often affect the legs. The veins there are the farthest from your heart and gravity makes it harder for the blood to flow upward.

Some potential factors for varicose veins include:

- Pregnancy
- Menopause
- Age over 50
- Standing for long periods of time
- Obesity
- Family history of varicose veins

Biomechanical strain can be developed on the lower limb joints such as knees and ankles. When standing, the body weight is primarily supported by the lower limbs. Prolonged standing results in biomechanical stresses and pressures on muscles and joints, which can lead to musculoskeletal wears and tears over period of time. Muscle swelling and inflammation on specific body parts are some of the common physical outcomes of prolonged standing.

The onset of physical muscular discomfort and pain due to cumulative exposure of prolonged standing can distract employee from performing their task optimally. This indirectly contributes to the increase of mental pressure. Psychological stress can impact employee's overall state of mind, decision making processes, motivation, work performance and productivity as it hampers the ability to work efficiently.

4.2.5 Plantar Fasciitis

Plantar fasciitis is usually described as heel pain that involves inflammation of the thick ligament that runs beneath the foot bone all the way to the toes as shown in **Figure 4.4**. Plantar fasciitis acts as a shock absorber for the foot; it absorbs the impact caused by daily activities such as walking, running and jumping. Repetitive impact to the plantar fascia can cause inflammation resulting in heel pain. Typical complaints from plantar fasciitis patients are pain at the heel during the initial steps after waking up in the morning or after having to stand for a prolonged period or having to stand up after sitting for a while.

The development of Plantar Fasciitis depends on several factors such as:

- Age (40 years and above)
- Gender (females are more at risk)
- High stress activities on heel (e.g., ballet, marathon runners)
- Abnormal body mass index (BMI)
- Abnormal foot characteristics (e.g., flat feet, high arch)
- Prolonged standing at work
- Improper shoes selection

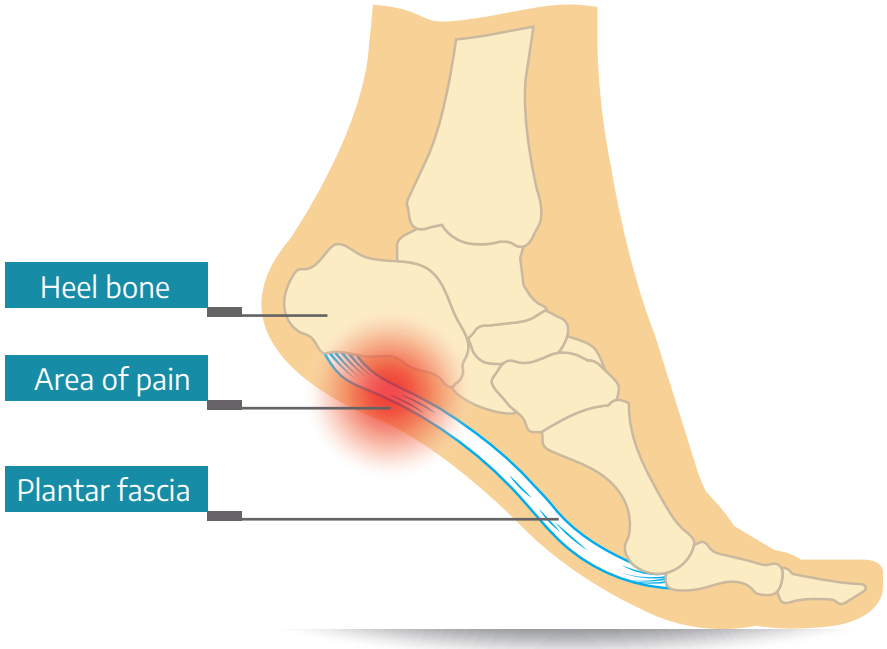

Figure 4.4: Plantar Fasciitis

4.2.6 Knee Osteoarthritis

Knee Osteoarthritis, commonly known as joint pains typically involving the knees, where the cartilage is gradually worn down by gradual, excessive forces applied on it, resulting in knee bones rubbing into each other. Prolonged standing at work is also known to cause knee osteoarthritis.

5

Principles of Ergonomics For Standing at Work

The design of the workstation, should be based on a careful assessment of all aspects of the job and any special needs of the individual employee. The aim should be to ensure that each task can be carried out safely, comfortably and as efficiently as possible. Such an approach helps in the selection of appropriate layout of workstation, the method of working and the order in which tasks are carried out are properly matched.

5.1 Work in Neutral Postures

Neutral posture is the optimal position of each joint that provides the most strength, the most control over movements and the least physical stress on the joint and surrounding tissue. In general, this position is near the midpoint of the full range of motions; that is, the position where the muscles surrounding a joint are equally balanced and relaxed. There are important exceptions to this rule of mid points. Examples are the posture of the arm, which is affected by gravity and the knee, which functions well near its extreme extended position. Key work postures of practical relevance in the workplace are:

5.1.1 Maintain the S-curve of The Spine

The spinal column is curved roughly in the shape of an “S”. It is important to maintain this natural S-curve to prevent chronic back injuries and to optimize the working posture. Using a footrest promotes working in this posture.

5.1.2 Keep the neck in its proper alignment

The neutral posture of the neck should not be bent or twisted.

5.1.3 Keep elbows in and shoulders relaxed

The elbows should be held comfortably at the side of the body; the shoulders should be relaxed and not hunched. Working with the elbows winged out can add strain to the shoulders and cause fatigue and discomfort.

5.1.4 Keep wrists in neutral

The hands should be in the same plane as the forearm and angled somewhat in, more or less. One can also directly check the neutral posture by dangling the arms at one's sides and observing the position of the wrists.

5.2 Keep Everything in Easy Reach

An essential aspect of task design is keeping frequently needed products, parts and tools within easy reach. Focusing on reaches provides value in several ways:

i. Long reaches are often the underlying reason why people are found working in awkward postures.

ii. Long reach combined with lifting a load can increase exertion and multiply the load on the shoulders and lower back.

iii. Long reaches can be a source of wasted time; thus, they need to be addressed from an efficiency standpoint.

iv. Addressing reaches can lead to better use of valuable floor space and can reduce congestion.

v. Finally, in some circumstances the ability to reach at all is the issue. For example, a pilot in a cockpit does not have the luxury of standing up, using a stepstool or employing any of the other normal accommodations that people do when an item is beyond reach. The location of controls must simply be within everyone's grasp.

It should be noted that in many ways, this principle is redundant with that of posture. If the postures are in neutral, then the reaches will normally also be satisfactory. However, in the case of reaches, one evaluates the equipment and workstations themselves, whereas with posture, all the signs of problems come directly from observing individuals.

Thus, evaluating both reaches and postures serves as a valuable way to double-check observations by viewing the task from different perspectives. Moreover, the techniques for evaluating reaches permit evaluation of workstations where there are no employees at hand to observe directly. Thus, considering reaches can be helpful when planning a new workplace and design decisions are based on drawings.

5.2.1 Maintain the Reach Envelope

The basic rule is to always keep in mind the reach envelope which are:

i. Frequently used materials should be kept within the reach envelope of the full arm.

ii. Things that are almost constantly in use should be within the reach envelopes of the forearms.

A useful rule of thumb is that reach should be established to accommodate smaller- statured people. The idea is that if shorter people can comfortably reach, it will be reachable by everyone.

There is an obvious interrelationship between heights and reaches. Thus, one way to reduce reaches is to optimize heights.

5.2.2 Reaching for Parts

A common problem in workplaces is reaching for and replacing completed parts. Such long reaches can be improved in a number of ways.

i. Tilt
   When working out of boxes it is possible to use tilt tables or stands or even just prop up the box on one end. Tilted box stands can easily be fitted with hinges, cylinders and even rollers to enable easy transfer to carts and conveyors.

ii. Use drop down containers
   Many styles of containers incorporate sides that can drop down or be removed. These designs permit ready access to materials while cutting down on the reach.

iii. Use chutes
   Parts can be fed directly to people by using chutes and hoppers. This approach is particularly helpful when there are multiple parts that cannot all be kept in boxes on the same work surface.

iv. Use slider tracks
   When parts are handed off from one person to the next, as is becoming more common, it is possible to use slider tracks to facilitate the transfer. This technique is useful when the workstations are further apart than an easy reach. Furthermore, a track mounted on a hinge can be used to slide parts across an aisle in a work cell (the hinge permits easy movement to allow passage).

v. Smaller lot sizes
   Large containers typically cause long reaches. Depending upon size of parts and volume used, it may be possible to use smaller lot sizes (as with Just- In-Time inventory control) which typically involves using smaller containers, thus shorter reaches.

5.3 Work at Proper Heights

A common workplace problem is a mismatch in heights between employees and the work that they are doing. This leads to poor postures and related fatigue, discomfort and potential damage to soft tissue. Moreover, awkward heights quite often create unnecessarily harder work and decrease the ability to perform the task correctly.

5.3.1 General Rule

The movements employees perform with their hands and the size of the objects they work with often determine the height of the work surface. When setting the heights, follow these general rules

i. Avoid extremes
   Many times, when it is not practical to design every height to be optimal, it may be feasible at least to avoid the extremes; that is, avoid working below knee level or above the shoulders.

ii. Design for elbow height
   Generally, work is best done at about elbow height.

iii. Consider the exceptions
   The nature of the work also affects the proper height. Heavier work, requiring upper body strength, should be lower than elbow height. Lighter work, such as precision work or inspection tasks should be higher.

5.3.2 Adjustable heights

A good workstation design usually provide ways for height adjustment to accommodate height differences among employees. For examples;

i. Adjust the work surface's height.

ii. Stand on platforms

iii. Set a work area for tall people, for short people provide a bench.

iv. Tilt the work surface

v. Use tool extenders

5.4 Minimise Fatigue and Static Load

Overloading physical and mental capabilities can contribute to accidents, poor quality, lost productivity and wear and tear-type injuries. Fatigued muscles are more prone than otherwise to injury, whether acute or cumulative.

Efficiency experts during the early part of the twentieth century placed considerable emphasis on techniques to prevent fatigue, but the topic has been neglected in recent decades. Now with the growing interest in ergonomics, fatigue has regained attention.

There are four major causes of fatigue:

i. Mental overload
   Which has been well studied in cognitive ergonomics. Did not cover in this guidelines.

ii. Work organisation
   Related issues like overtime and shift work. Did not cover in this guidelines.

iii. Metabolic load
   Concern for which is heavy and exhausting work. Mechanisation has overcome most of this problem.

iv. Static load
   Which is continuous tensing of a muscle group is the focus of this intervention.

5.4.1. Continuous Standing

The fatigue related to continuous standing is created by static load on leg muscles. To avoid fatigue in leg muscle due to static load.

i. Provide Mobility
   It is difficult to stand rigid for even a few minutes because of the overuse of the same muscles. In contrast, it is possible to walk for hours, even through one's overall posture is still standing upright. The difference is that while walking, there is constant shifting in the use of the various muscles in the legs, giving them rest, even if only for split seconds.

ii. Use Footrests

For standing jobs, having a footrest available provides a chance to alternate postures from time to time.

iii. Use Lean Stands

Lean stands provide the advantages of relieving the static load on leg muscles from time to time. Unlike chairs, however, it is possible to revert instantaneously to a standing position for immediate attention to a machine or other work process. Furthermore, unlike chairs or stools, which can take some effort to get into and out of, lean stands are easy to use. Note that the intent is not to remain on a lean stand for long periods; it is simply to obtain some occasional relief from constant standing.

5.5 Minimise Pressure Points

Direct pressure or "contact stress" is common issue in many workstations. Besides causing discomfort and hindering work efficiency, it can inhibit nerve function and blood flow, potentially leading to permanent injury. For instance, the hand is particularly sensitive due to the presence of large number of nerve throughout the hand and which are typical points of contact and blood vessels in the fleshy part of the palm where hand tools typically apply pressure.

5.5.1 General Rules

Avoid contact between the body and the tools or equipment wherever possible.

i. Shape the item to fit the body's contours at the point of contact.

ii. Provide padding to reduce pressure.

iii. Distributes the pressure over a larger surface area of the body.

5.5.2 Provide Floor Cushion

Standing for long periods on hard surfaces like concrete floors can damage heel tissue, contribute to leg disorders and increase fatigue.

i. Anti Fatigue Mats

In workplaces where employees stand at workstations, different types of mats are used to match various conditions such as oily machine shops or clean rooms in pharmaceutical labs.

ii. Fiberglass Grating

These gratings are suitable for chemical, food processing and meat and poultry plants where mats are impractical. They're typically installed on rubber risers but can also be mounted on metal frames. It's crucial not to over-support the frames to ensure they offer some flexibility.

iii. Viscoelastic Material

These materials are poured into floor insets to offer cushioning in messy environments like oily areas. They can be easily mopped up and, being level with the floor, avoid tripping hazards, congestion or cleaning difficulties associated with mats.

iv. Cushioned Insoles or Heel Cips

Cushioned insoles or heel cups are ideal for mobile employee like maintenance, engineers and supervisors in situations where mats aren't practical. Viscoelastic materials, known for their shock-absorbing properties, are often the most effective choice.

v. Wood Flooring

Wood flooring is more forgiving than concrete, it often needs extra cushioning like mats or insoles. Padded carpeting is typically adequate for offices and similar environments.

5.5.3 Use Flat Footrests

Foot rings and rails are often found on stools and workstations, providing some support. However, their narrow design can create pressure points on the feet. Whenever possible, using a flat surface is preferable.

5.5.4 Cushion Equipment Edges

Employees often find themselves leaning against hard equipment edges like conveyors or workbenches.. The initial approach should be to explore redesigning the area or task to eliminate the need to lean entirely. If redesign isn't feasible, using padding can provide relief.

6 Control Measures

Control measures encompass practices, procedures or devices designed to mitigate or eliminate ERF. These interventions safeguard employees by preventing injuries and illnesses, thereby promoting a safer and healthier work environment. Controlling the risks for standing at work can be achieved through the application of principle of ergonomics.

6.1 Workplace Design

Design to allow adequate clearances for employee to adopt posture variations at work as shown in **Figure 6.1**. Ensure there are enough spaces at the feet to allow for movements.

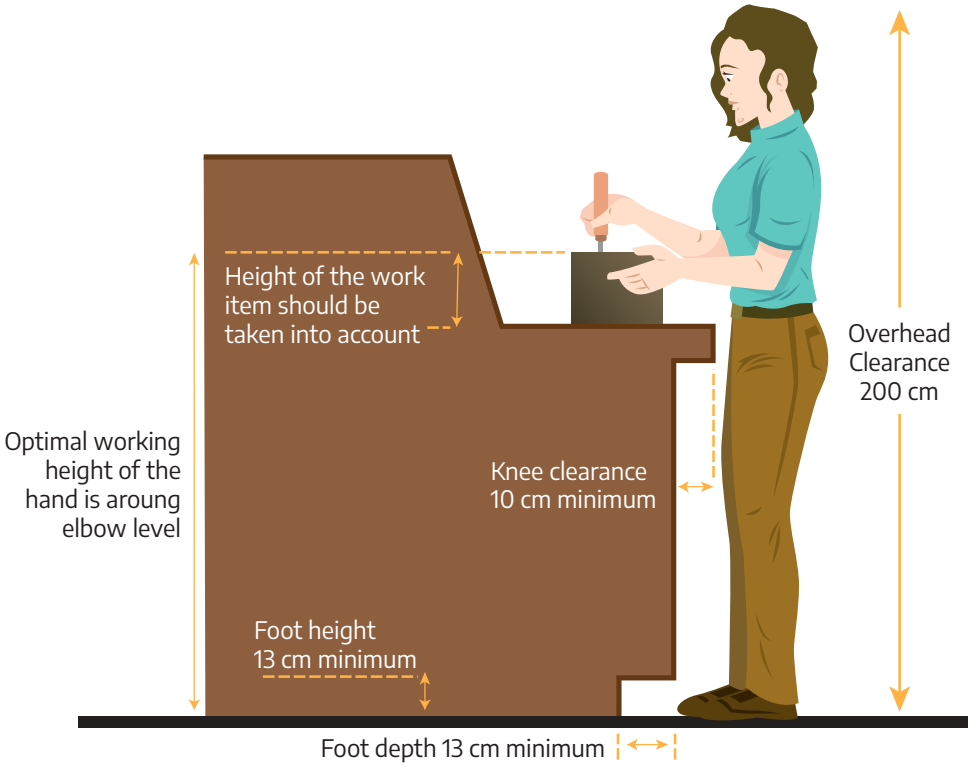

Figure 6.1: Foot and knee clearance values for standing at work

For tasks that requires body rotation, allocate enough clearance so that the whole body (including feet) can be fully rotated, to minimize body twisting. In early design stage, it is recommended that design process incorporate 3D model to visualize and check for clearances prior to finalizing the design.

Design layout and arrangements of items so that they are within considerable height (e.g around elbow height level) and easy reach (e.g., within radius of forearm length – 50 cm). Items that are not at a considerable height and within reach would promote lower back bending and overreaching.

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 precision or close-up work.

6.2 Workstation Height

Determine the type of task being involved for standing at work. In addition, the types of tasks may determine whether an employee is suitable to perform it while standing or not. In general, these four types of tasks are:

i. Precision Work

Precision tasks are usually performed in sitting position due to the nature of job requiring accurate visual and eye focus. The parts of the body commonly involved are eyes, hands and fingers. 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 for visual and body stability.

ii. Light Work

Light duty tasks sometimes may be performed in the seated or standing postures, depending on the task requirements. The movement and forces required for light work are considerably higher than precision task. Usually, light effort from the muscles of the lower and upper arm is required and no significant exertion should be required for light tasks. The tendency is to carry out in sitting position, but with occasional standing requirements. The table height for light work is recommended to be near the standing elbow height as shown in **Figure 6.2**.

iii. Heavy Work

The 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. Table height below the waistline is suggested for heavy work as shown in **Figure 6.2**. Standing posture allows greater flexibility to exert such force.

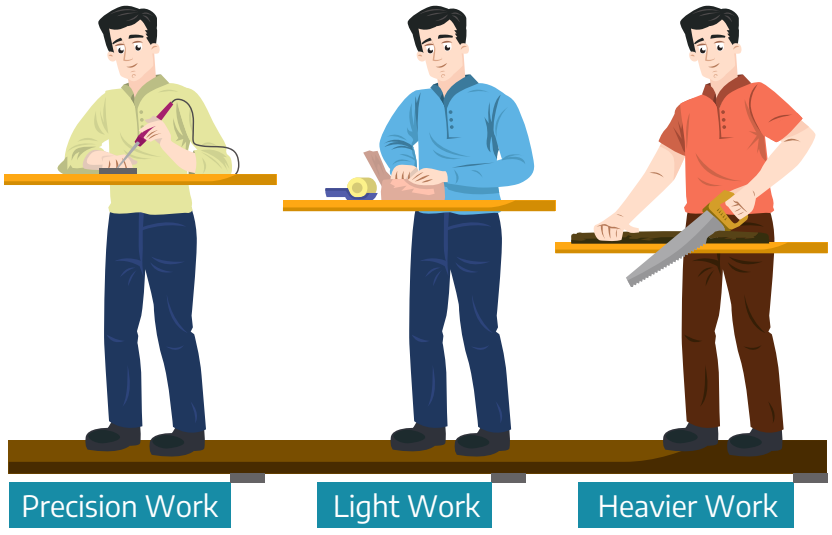

Figure 6.2: Precision, light and heavy work table heights

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).

6.3 Anti-Fatigue Mats

Anti-fatigue mats are widely used to reduce fatigue and discomfort associated with standing occupations. These flooring solutions, often made of polyurethane foam or synthetic rubber are designed to induce subtle instabilities that encourage low levels of leg muscle activity and slight postural changes. Previous studies have found that ergonomic interventions, such as the use of anti-fatigue mats , shoe insoles, sloping surface and footrests, have the potential to lessen the discomfort and pain, especially in the lower limbs.

The advantage of anti-fatigue mats is they may encourage the body to move in a subtle way, such as natural swaying of the body, hence prompting the movement of the calves and leg muscles. Slight movements of the body and legs will assist in the blood circulation in the lower limbs, resulting in less build-up of lactic acid around the muscles that lead to fatigue in the calf and leg muscles. In addition, employees will also prefer to stand on anti-fatigue mats as compared to hard flooring since anti fatigue mats offer some relief to localized pressure on the employee's feet. Certain industries or workplaces such as semiconductor factories have been successful in the implementation of anti-fatigue mats , for example at the inspection and monitoring station where employees perform the task while standing on anti-fatigue mats as shown in **Figure 6.3**.

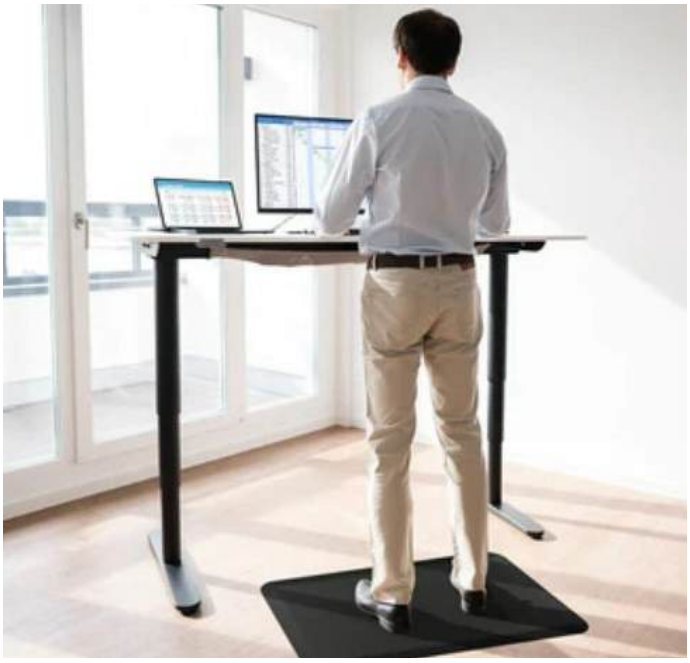

Figure 6.3: Anti-fatigue mats standing workstation

The selection criteria of anti-fatigue mats may consider the material properties, thickness and the material type and composition. Typically, a thickness of 3/8 to 1- inch mats are widely available anti-fatigue mats in the market, anti-fatigue mats with 11-11.5 mm thickness with medium to high stiffness provided a significant reduction muscle activity for the lower legs.

However, the usage of anti-fatigue mats does have drawbacks in terms of its application. It has to be noted that not all workplaces are suited for the application of anti-fatigue mats, since the applicability also depends on factors such as the affordability, robustness, willingness of employees to use the anti-fatigue mats , nature of work at the workstation.

Affordability and robustness of the anti-fatigue mats are a concern to many workplaces since anti-fatigue mats tend to wear out over time and the replacement costs can be significant. Willingness of the employees in using the anti-fatigue mats is also crucial for the successful use of the anti-fatigue mats. Employees also have to be taught on the importance of anti-fatigue mats and reminded to utilize them in the workplace. In terms of the nature of work itself, anti-fatigue mats may only be suitable in workplaces where frequent movement of employees are minimal, since anti-fatigue mats have a tendency to cause tripping hazards.

6.4 Footrest

The use of a footrest as shown in **Figure 6.4** reduces intravertebral disc stress by preventing excessive lordosis, subjects have significantly preferred to using the footrest compared to standing without footrest. Heel comfort was significantly higher when using the footrest option.

Figure 6.4: Footrest at workstation

Footrest heights between 10 cm and 30 cm can positively influence muscle activity and posture, however, caution should be exercised if standing position goes above 10 minutes. The body height can be used as a guide for determining the footrest height for standing at work. The utilization of footrest can significantly influence posture, muscle activation and balance during standing at work.

6.5 Sit Stand Stool

Most tasks in the workplaces require employees to perform them in standing or sitting postures. For examples, operators working in electronics industry, automotive assembly and metal machining and fabrication (e.g. drilling, milling and welding processes) need to stand throughout working hours. If the employees exposed to prolonged or excessive standing, they may feel discomfort and fatigue particularly in the muscles of the lower extremities such lower back, thighs, calves and feet.

The sit stand stool is a commonly used option for alleviating fatigue resulting from prolonged standing in the workplace. It offers the user to rest some of their body weight onto the stool while mimicking the standing posture. Employees can continue working while using the sit stand stool as opposed to having to take a break by sitting in a proper chair. Sit stand stools offer better protection against lower limb discomfort and better circulation for the lower limb muscles.

6.6 Administrative Controls

Administrative controls for standing at work involve implementing policies, procedures and practices to manage and reduce the risks associated with prolonged standing. These controls focus on organizing work schedules, providing training and education and promoting healthy work habits to minimize the negative effects of standing for extended periods. Here are some examples of administrative controls for standing work:

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.

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

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

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

v. Brief exercise at workplace / workstation - Any form of exercise that involves moving around the workplace as shown in **Figure 6.5** can help to alleviate the symptoms related to standing work.

Figure 6.5: Light Exercises and Stretching At Workplace

Light activities such as walking and stretching can improve blood circulation and release any muscle tension resulting from standing work. Light exercise can be done at the workstation subject to the mutual understanding and agreement from the employee and employers.

vi. Active Standing at Work / Dynamic Standing

Apart from light exercise and stretching, active standing or dynamic standing can also be promoted to the employees at their workstation. Dynamic standing involves minimal movements from the employee, which can consist of a couple of small steps in any direction at their workstation, stretching their feet forwards and backwards, standing on their toes occasionally, or wriggling their toes and feet from time to time. Any actions promoting movements of their feet and body at the workstation should be encouraged by the employers as part of the work routine for the employees. **Figure 6.6** shows an example of standing exercises, leg stretching and resting.

Figure 6.6: Standing exercises, leg stretching and resting

6.7 Personal Protective Equipment (PPE)

PPE requirements can vary greatly depending on the specific work environment and the hazards present. Standing at work might require different types of PPE depending on the nature of the job. Here are some common types of PPE that might be necessary for standing work;

i. Footwear

a) Comfortable and supportive footwear is crucial for standing work to prevent foot fatigue and reduce the risk of musculoskeletal injuries. Safety shoes or boots with slip-resistant soles can provide added protection against slips and falls. shoes must be a correct fit as shown in **Figure 6.7**.

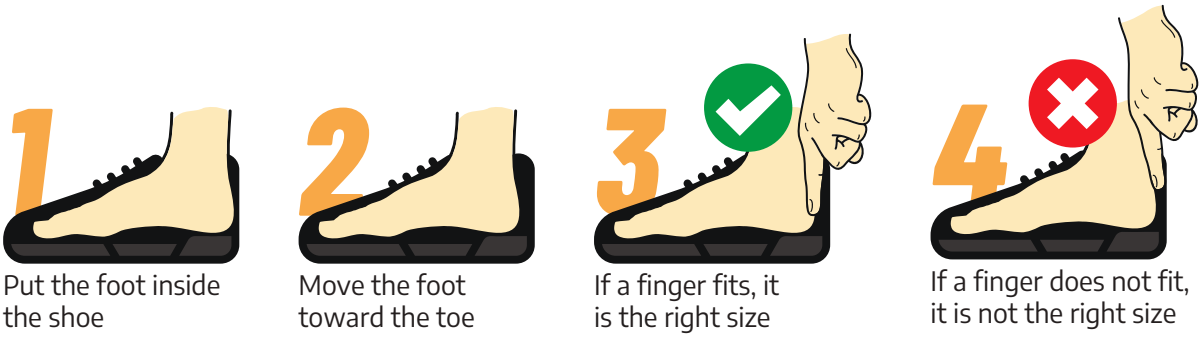

Figure 6.7: Method for correct fitting of shoes

b) Proper insoles with arch support

Good comfort is heavily determined by the types of insoles. Insoles with arch support are essential for proper support at the feet arch where dynamic loading takes place as shown in **Figure 6.8.**

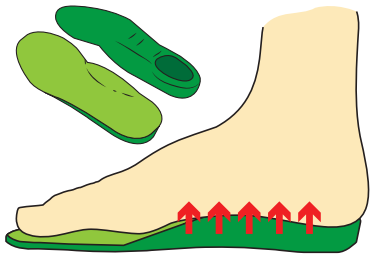

Figure 6.8: Shoe outsole / soles having most ground contact

c) Proper shoe sizing and fitting

Shoes must have a spacious upper for foot splay and must not squeeze the upper part of the feet causing discomfort for the employees. Referring to **Figure 6.9**, the shoe must not constrain the feet in any way whatsoever. Employees must test for proper fit before selecting and purchasing the shoes for standing at work

Figure 6.9: Determining proper shoe fitting

ii. Compression Socks

For employees who experience swelling or discomfort in the legs and feet due to prolonged standing, compression socks can improve circulation and reduce fatigue.

7

Training and Information

Employees who are exposed to ERF should be provided with training and information, so that they understand their roles and responsibility in the control, prevention and mitigation of OMSD. Training and information programmes should be updated to be consistent with changes in ergonomics control measures and work processes.

The employer should provide training and information to maintain safety and health at the workplace. The duty includes planning, organizing and implementing the training programme to ensure that all employees receive the necessary information to maintain safety and health at workplace.

Training and information should be conducted for the employees at all level. The contents and scope of training should be as follows:

- Specific ERF related to standing at work;
- Sign and symptoms of ergonomics-related injuries and OMSD;
- Control measures to mitigate risks related to standing at work; and
- Skill and knowledge to perform work that meet ergonomics requirement.

8 Action Based Checklist for Standing at Work

Action Based Checklist provides a rapid or quick assessment using a comprehensive list of pre-determined set of benchmarks or standards for a known situation or items. In this regards, Appendix 1 in this Guidelines provides checklists adapted for different standing work activities at work. The checklists address the elements and consideration as the best practices in the workstation design primarily on the standing work characteristics.

Unfortunately, the usage of checklist does not provide an indication of risk. Rather, they stipulate specific consideration of potential areas of improvement for each item within the checklist which can be undertaken to address the ergonomics issues related to the existing standing work. This action-based checklist can be used as a guide to implement control measures for standing workstation.

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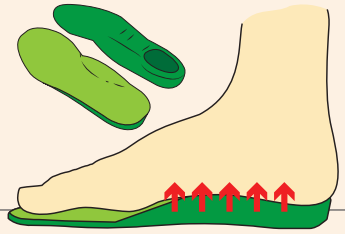
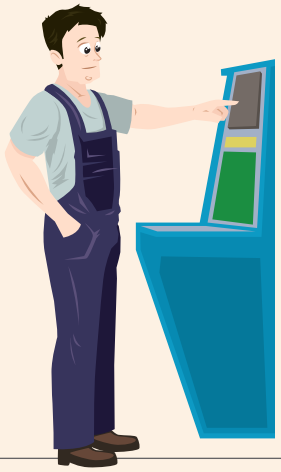
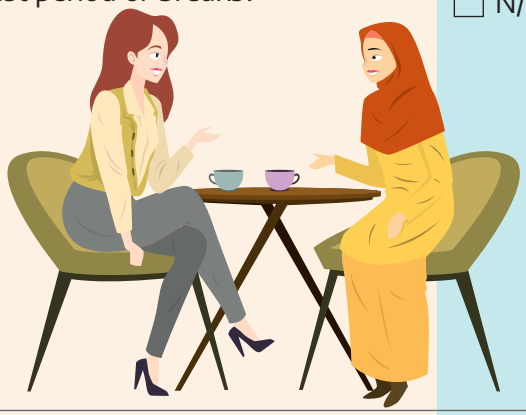
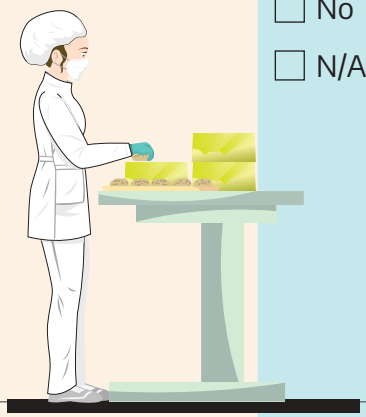
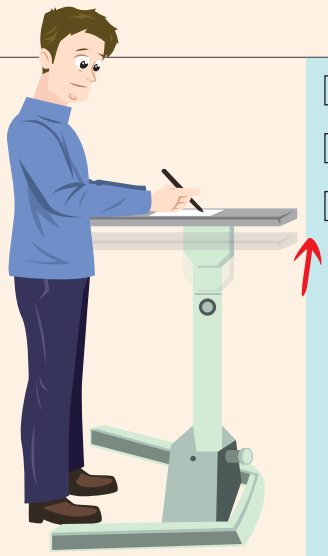
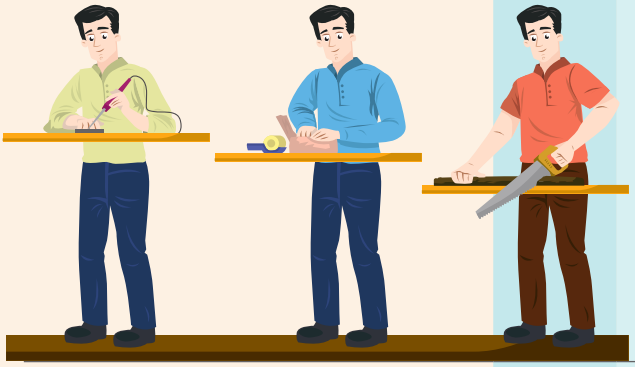
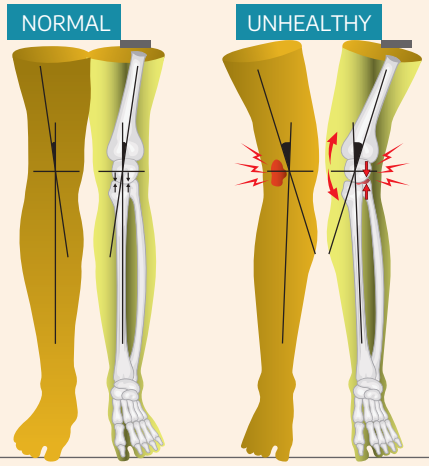
Appendix 1

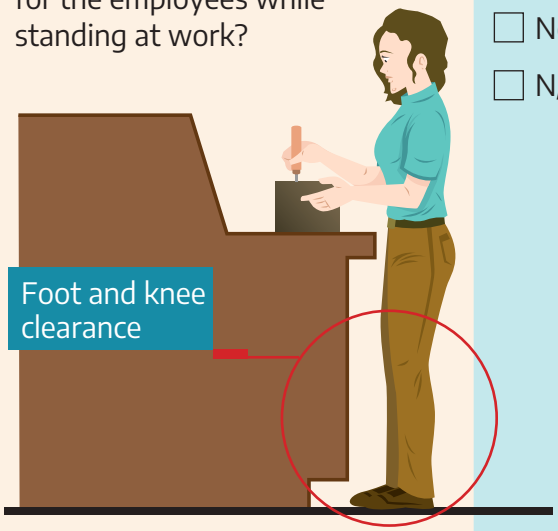
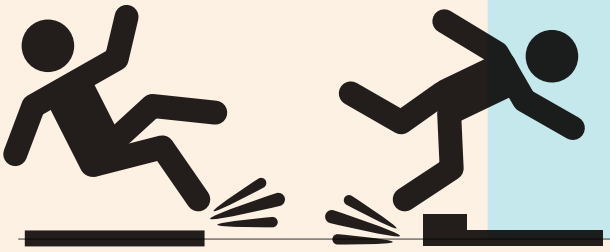
Action Based Checklist for Standing at Work

Company Name		
Company Address		
DOSH Registration No.		
Date od Assessment		
Location Name		
Number of Employee	Male:	Female:
Prepared by		

Action Items	Answer	If Further Action Required	Recommended Action
Is the employee standing on a proper floor mat when performing standing work? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	
Are shoes provided with proper soles to support the body weight? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	

Is the arrangement of the items / tools / controls required for the job, within easy reach? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	
During the work cycle, does the employee perform a particular work continuously with proper rest period or breaks? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	
Does the employee maintain a neutral posture of the upper body when standing at work? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	
Is the duration of STATIC standing position at work less than 10 minutes with possible leg movement or rest? **Static Standing < 10 mins**	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	

Is the workbench adjustable? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A
Is the workbench at the appropriate height? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A
Does the employee have a normal BMI? **Normal 18.5 - 25**	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A
Is the employee free from any injuries around the lower limb region? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A

Is the employee wearing correct-sized footwear size and type? (Too tight or too loose) 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A
Foot clearance is adequate for the employees while standing at work? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A
Is the floor surface even and stable? 	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A

Note:

1. Tick “Yes” answer, if items have been considered. Therefore, no further action is required.
2. Tick “No” answer, if items have not been considered. Therefore, further action is required by the employer.
3. Tick “N/A” answer, if items is not applicable.

MINISTRY OF HUMAN RESOURCES
DEPARTMENT OF OCCUPATIONAL SAFETY AND HEALTH

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