



Ministry of Human Resources Malaysia
Department of Occupational Safety and Health

**GUIDELINES ON
OCCUPATIONAL SAFETY AND HEALTH
IN THE SERVICE SECTOR**

OCCUPATIONAL SAFETY AND HEALTH INSTITUTIONAL CAPACITY BUILDING

UNITED NATIONS DEVELOPMENT PROGRAMME
UNDP Project MAL/99/006/A/01/NEX



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Acknowledgements

Services sectors in the context of industry involved Hotel and restaurants, wholesale and retail, Public/Government sector, Finance and Professional Services. The sectors has been established in Malaysia since 1980's to help the economic growth as well as giving job opportunities to local people.

For the last five years, services sector has been the main contributors in the economic growth in Malaysia. This has been noted in the Economic Report 2002/2003, Ministry of Finance, and increment of 43% in the Gross Domestic Product (GDP) with total amount of RM 40,000 million from year 1998 to 2003.

Work related accidents and diseases have been identified in all sectors in Malaysia including Service sectors. The SOCSO Report year 2003 has notified 13,195 accident cases that hotels and restaurants and also wholesale and retail. It shows that this sector is not exempted from having such incidences.

The purpose of this guideline is to assist employers and employees understand general health and safety matters and risks associated with the work systems of the workplace at services sectors. The general duties of both parties have been enacted under the Occupational Safety and Health Act 1994. The commitment to ensure safe and conducive work environment are really important to maintain the quality of life while at work.

This guideline is guidance handbook and will be reviewed from time to time. Readers are welcome to give suggestion and Inputs to the Department for improvement in the guidelines. Should you have any questions about these Guidelines, please contact the Department of Occupational Safety and Health, Ministry of Human Resources, Malaysia.

Director General

Department of Occupational Safety and Health,
Malaysia

Foreword

The guidelines may be cited as Guidelines On Occupational Safety and Health in Service Sector that gives guidance on the common safety and health matters such as VDU and use of computer, cold store, ergonomics, sanitary facilities, personal protective at the Hotel and restaurants, wholesale and retail, Public/Government Sector, Finance and Professional Services.

This guidelines is prepared as a result of a collaborative effort between the Department of Occupational Safety and Health (DOSH), Ministry of Human Resource, Malaysia and United Nation Development Programme (UNDP) through a project entitled 'Occupational Safety and Health Institutional Capacity Building : MAL/99/006/A/01/NEX'.

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1. INTRODUCTION

1. This guidance is intended for owners and managers as well as the inspectors responsible for enforcing health and safety legislation. It will also be of value to employees and safety representatives. The principles set out here may also be applied to large service outlets, which have similar SERVICE FACILITIES and ACTIVITIES. The booklet briefly covers general health and safety matters and goes on to describe in detail the main risks associated with storage systems, manual and mechanical handling systems, equipment, substances and work practices which are found in most workplaces of service sector. Good working practices and ways of safeguarding workers in the industry are suggested.
2. This guidance is divided into 2 categories namely
 - Generic Guidance – which will explain more on problems that may occur on all sub-sectors.
 - Specific Guidance – which will focus more on specific problems arise on specific sub-sector.
3. The Department of Safety and Health (DOSH) is responsible for developing health and safety standard nationally.

INFORMING EMPLOYEES

1. An employer must either:
 - a. Display in a readable poster on “HEALTH AND SAFETY LAW -WHAT YOU SHOULD KNOW”; or
 - b. Give to each employee the approved leaflet.
2. The following information must be either clearly written on the poster, or given in writing to each employee:
 - a. The name and address of the DOSH local office; and
 - b. The address of the local Penal Clinic and Hospital
3. Under the Occupational Safety and Health 1994 (OSHA 94) employers have a general duty to ensure, so far as is reasonably practicable, the health, safety and welfare at work of their employees and the health and safety of other people affected by their undertaking. This duty includes providing a safe and healthy workplace, safe machinery and safe systems of work, together with adequate information, instruction, training and supervision. Employees also have a duty to take reasonable care of their own health and safety and that of others.

SAFETY POLICY

1. Businesses, which employ five or more people, should have a written statement of their policy for ensuring health and safety. This safety policy should help employers decide on priorities, detail health and safety objectives and outline the organization that exists for ensuring they are met. It should also set out how the policy is to be implemented. The policy statement should be brought to the attention of all employees.

SAFETY AND HEALTH COMMITTEE

2. Businesses, which employ forty or more peoples, should have a nominated and elected group of representative from employees and employer. Their main function is to :
 - a. Assist in development of rules and systems;
 - b. Assist in development and review of programs;
 - c. Perform analysis of incident trends and statistic;
 - d. Review and recommend amendments to safety and health policy;
 - e. Perform inspections and recommend preventive measures;
 - f. Perform immediate investigation of accidents and recommend corrective measure;
 - g. Investigate complains of unsafe practices and recommend corrective measure;
 - h. Assist in development of promotional and education programs;
 - i. Discuss reports and matters from safety officer, enforcement officers, etc;
 - j. Advise employer on safety and health matters.

RELEVANT LEGISLATION

Specific requirements on health, safety and welfare in the workplace are also laid down in the following Acts and Regulations:

- a. The Occupational Safety and Health 1994
 - i. Safety and Health Committee, Regulation 1996
 - ii. Classification, Packaging and Labeling of Hazardous Chemicals, Regulations 1997
 - iii. Safety and Health Officer, Regulation 1997
 - iv. Use and Standardization of Chemical Hazardous to Health, , Regulation 1998
 - v. Notification and reporting an accident, Regulation 2004
- b. The Factories and Machinery Act 1967;
 - i. 'Certificate of Competency-Examination', Regulation 1970
 - ii. 'Electric Passenger and Goods Lift', Regulation 1970
 - iii. 'Fencing of Machinery and safety', Regulation 1970
 - iv. 'Notification of fitness and inspections', Regulation 1970
 - v. 'Person- in- charge', Regulation 1970
 - vi. 'Safety, Health and welfare', Regulation 1970
 - vii. 'Steam Boiler and Unfired Pressure Vessel', Regulation 1970
 - viii. 'Administration ', Regulation
 - ix. 'Compounding of offences', Regulation 1978
 - x. 'Compoundable Offences', Regulation 1978
 - xi. 'Lead', Regulation 1984
 - xii. 'Asbestos Process', Regulation 1986
 - xiii. 'Building Operation and Works of Engineering Construction (Safety)', Regulation 1896
 - xiv. 'Noise Exposure', Regulation 1989
 - xv. 'Mineral Dust', Regulation 1989

c. Guidelines

Guidelines	Ref
On OSH for Seating at work	JKKP:GP(1)2/2003 ISBN : 983-2014-25-5
On OSH for working with Video Display Units (VDUs)	JKKP : GP (1) 6/2003 ISBN : 93-2014-27-1
On OSH for the preparation of Chemical Register	JKKP : GP (1) 4/200 ISBN : 983-2104-07-7
On First-Aid facilities in the workplace	JKKP : GP (1) 2/96 ISBN : 983-99156-1-4
Code of practice on prevention and management of HIV/AIDS at workplace	JKKP : COP (I/BM) 01/2001 ISBN : 983-2014-11-5
For Classification of Hazardous Chemical	JKKP : GP (I) 4/97 ISBN : 983-99156-6-5
On OSH for Standing at work	JKKP : GP (I) 02/2002 ISBN : 983-2014-21-2
On productive Health Policy & Programme at workplace	JKKP : GP (I) 3/2002 ISBN : 983-2014-22-0
FOR Safe Working in a Confined Space	JKKP : GP (I) 04/98 ISBN : 983-2014-03-4
On Monitoring of airborne contaminant for chemicals hazardous to health	JKKP : GP (I) 01/2002 ISBN : 983-2014-19-0
Information on the prohibition of substances from certain purpose	JKKP: GP (BM& BI) 1/2000
For the preparation of demonstration of safe operation document	JKKP : GP (I/M) 5/2001 ISBN : 983-2014-14-X
On Occupational Vibration	JKKP : GP (I) 1/2003 ISBN : 983-2014-24-7
Assessment of the health from the use of hazardous chemicals I the workplace	JKKP : GP (I) 6/2000 ISBN : 983-7014-09-3
For the registration of assessors, hygiene technician and Occupational Health Doctor	JKKP : GP (I) 3/2000 ISBN : 983-2014-06-09
For the preparation of demonstration of safe operation document (storage pf Liquefied Petroleum Gas in Cylinder)	JKKP : GP (I/M) 6/2001 ISBN : 983-2014-12-3

- 3 All this safety legislation may apply to the activity in Service Industry. In some premises other health and safety regulations may also apply.

2.1 STAFF TRAINING

GENERAL

1. Many accidents occur when employees, particularly young employees, use machines, equipment, substances or work in hazardous circumstances without proper training. No one should use dangerous equipment or substances unless they have been properly trained and are competent. Managers and supervisors will also need suitable training and should be competent.

Information and advice for training may be obtained from:

- a) Supplier of the material, substance or equipment;
- b) DOSH
- c) Accredited Training Provider
- d) Health Departments; professional bodies (for example the National Institute of Occupational Safety and Health -NIOSH)

TRAINING CHECK-LIST

2. The following check-list shows what needs to be considered when preparing a typical training program:

Organization

- Will training be 'on' or 'off' the job?
- Who will do the training? (Will they be competent?)
- Who will supervise the training? (Will they be competent?)
- How will the trainees' competence be assessed?
- What will the trainee be competent in at the end of the training?
- What records will be kept?
- Who will keep the records?

Selecting and assessing the trainee

- How is the trainee to be selected? Selection should take account of the physical and mental demands of the job.
- How much does the trainee know already about safe working practices?

Basic instruction

For each task prepare a list of all the points training should cover, for example:

- what equipment or substance to use;
- what the method of work is;
- how the equipment or substance works and what it does;
- what dangers are associated with its use, including accidental spillage;
- what safety precautions are needed and how they protect the user;
- how to clean equipment safely;
- what to do if equipment, seems faulty; and
- what personal protective equipment to wear.

Supervised working

- Make sure the supervisor is competent for the training task.
- Set the trainee to work under close supervision.
- Make sure the supervisor has the time and knowledge to supervise effectively.
- Make sure the supervisor watches closely to see that dangerous practices do not develop.

FITNESS FOR WORK

3. People's physical capacities vary. Some tasks place particular physical demands on workers, and individuals need to be specially selected and trained for these jobs. Other people may have health problems, which affect their ability to do more normal jobs. Many employees find their capacity for work temporarily reduced by illness or injury. Those returning to work after a period of sickness are likely to need help in readjusting to their jobs. Workers must be physically and mentally suited to their jobs. It is usually possible to anticipate and resolve problems by seeking specialist advice.

FINAL CHECK

4. Check that trainees know how to carry out the work properly and safely. Make sure they can be left to work safely without close supervision and monitor performance on a regular basis.

2.2 VDUs and use of computer systems

1. The following areas within the service sectors either are already or will clearly become affected by the use of computers:
 - a. Administration
 - b. Reception
 - c. inventory and stocktaking
 - d. kitchen and restaurant
 - e. others, including general service like banking, finance, insurance and government

Positioning of equipment in working areas

2. Positioning of equipment must be done with regard to the working methods, the rooms and other conditions in each individual case. Visual display terminals (VDUs) pose particular demands. Recommendations for achieving good working postures, proper lighting and ergonomic are primarily applicable to administrative and reception work, where work at the VDU may be long and intensive. Where terminals are only used for short periods now and again, the requirements are by no means so stringent.

Working postures.

3. The task itself will determine whether the operator will be working sitting or standing.
4. The terminal table should be adjustable between 650 - 750mm for a sitting workplace and between 950 - 1150mm for a standing one. The table design affects very much the space for feet and legs under the table. It is very important for there to be sufficient legroom and recommendations are shown in Figures 2.2a and 2.2b.

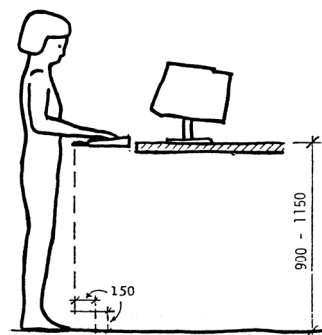


Fig 2.2a Required table measurements for sitting work. The recommended vertical adjustment is given in particular. Note the requirements for foot and knee room.

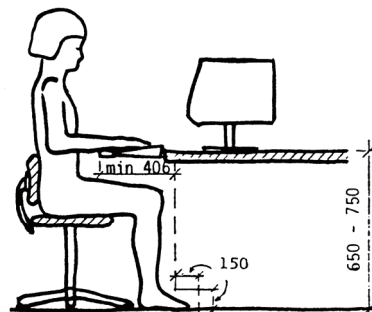


Fig 2.2b Required table measurements for sitting work. The recommended vertical adjustment is given in particular. Note the requirements for foot room.

Working surface.

5. All equipment required for the work should lie inside the maximum reaching distance (except the VDU screen, which should be about 700mm from the operator). The work surface should be sufficiently large to allow suitable positioning of the equipment, but the reach of the operator limits the size. Positioning which forces the operator to stretch to operate the equipment is not recommended.
 - Writing area - 610 x 330mm (min for A4)
 - Optimal reach distance - 350 to 450mm
 - Maximum reach distance - 550 to 650mm.

Visual angles.

6. The horizontal and vertical visual angles are shown in Figure 2.2c. All equipment should be placed within these limits. Their positioning should not result in too much head and eye movement.

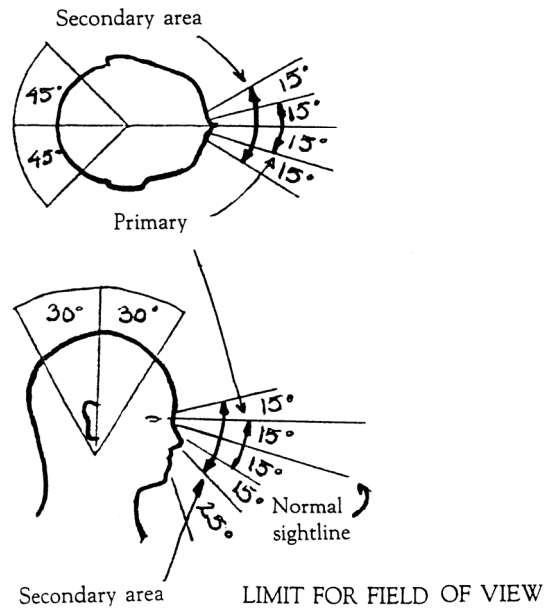


Figure 2.2c Limits for comfortable head movements sideways and vertical

* As a guide, please refer to “Guideline on OSH for VDU user”

2.3 MANUAL HANDLING

General

1. In almost all service sector, manual handling operations (ie transporting or supporting a load by hand or by bodily force -including lifting, putting down, pushing, pulling, carrying or moving) will be undertaken.
2. Manual handling tasks involve a risk of strains and sprains, notably to the back, but also to other parts of the body. The chance of a back disorder developing is increased when handling involves heavy loads, is prolonged, frequent or combined with awkward postures. The stresses within the body vary with the rate of application of force, and with the bodily posture adopted. What may be safe when carried out slowly and smoothly may be dangerous if carried out jerkily and quickly in an unstable posture. What may be safe in the erect posture may be dangerous when stooping. A given force may be acceptable if it is applied only once within a day, and be dangerous if it has to be applied repeatedly. Because of the variation in physical dimensions, for example height and reach, and strength of individuals, what may be acceptable for one employee to handle may be unacceptable for another. It can be seen, therefore, that the weight of an object, while being an important factor, is not the only factor to consider in manual handling operations, and setting weight limits would be too simple a solution to the problem.
3. It should not be forgotten that handling tasks carry additional risks of injury from slips, trips or falls, striking against objects, cuts, trapping of limbs or extremities etc.

Prevention Or Control Of Risk

4. Risks from manual handling operations are best avoided by the elimination of such operations. In workplaces where this is impracticable, manual handling should be minimized as far as is reasonably possible. Employers should consider all systems of work in the workplace involving manual handling operations and, where appropriate, redesign tasks to:
 - a. avoid the need to move loads manually;
 - b. fully utilize mechanical handling devices, for example lift trucks, pallet trucks, trolleys, conveyors, chutes, scissors lifts. Where necessary additional mechanical handling devices should be introduced to avoid or reduce manual handling operations.

Assessment

5. Where hazardous manual handling operations cannot be avoided, the employer should make an assessment of all such operations likely to be carried out in the workplace. The assessment should identify where improvements or other measures are necessary to reduce the risk of injury from manual handling operations. The following factors should be considered when making such an assessment.

(a) THE TASK:

Are there any tasks that involve foreseeable risks? For example unsatisfactory bodily movements or posture; excessive lifting or lowering distances, for example from floor level to above waist height; excessive pushing or pulling distances, or situations where the load is required to be held or manipulated at a distance from the trunk .

- i. Plan the lift
- ii. Determine the best lifting technique
- iii. Get a secure grip
- iv. Pull the load in close to your body
- v. Avoid twisting
- vi. Avoid sideways of the back bending of the back

(b) THE LOAD:

Are there any loads unsuitable for manual handling? For example, too heavy, bulky, slippery, wet, sharp, unknown offset centers of gravity, unstable or contents likely to shift.

(c) THE WORKING ENVIRONMENT:

Are there any areas of the workplace unsuitable for manual handling operations? For example constricted work areas, narrow aisles, areas of extreme temperature (hot or cold), over-steep slopes or changes in floor level.

(d) INDIVIDUAL PERSON'S CAPABILITY:

Are there any employees unsuitable for manual handling operations? For example pregnant workers, people with known medical conditions.

6. Where assessment identifies manual handling operations that involve risk of injury appropriate measures should be taken to reduce those risks as far as is reasonably practicable, for example by redesign of the task or system of work, alteration of shelving heights or layout of the workplaces or introduction of mechanical handling devices to assist in the operation
- (a) Store heavier and frequently used items at waist
 - (b) Raise work level by use of self-adjusting platform level
 - (c) Adjustable height platform
 - (d) Ramps avoid lifting, reduces lifting or dragging

TEAM HANDLING

7. Handling by two or more people introduces additional problems which an assessment should consider. During the handling operation the proportion of the load that is borne by each member of the team will inevitably vary to some extent. Therefore, the load that a team can handle in safety is less than the sum of the loads that the individual team members could cope with when working alone. As an approximate guide the safe capacity of a two-person team is two thirds of the sum of their individual capacities; and for a three-person team the safe capacity is half the sum of their individual capacities. Additional difficulties may arise if team members impede each other's vision or movement.

Information And Training

8. Where it is reasonably practicable to do so, employers should give workers precise information about the weight of a load and, where the center of gravity is not centrally positioned, the location of the heaviest side of the load, perhaps by ensuring that the weight and/or the heaviest side is clearly marked on the load itself. Where this is not done employers should give workers a general indication of the weights and centers of gravity of the range of loads to be handled, sufficient to make workers aware of the potential risks.
9. Employers should also ensure that their employees clearly understand how a manual handling operation has been designed to safeguard their health and safety. Training should complement a safe system of work and not be a substitute for it. A training program should provide a clear understanding of:
 - a. how potentially hazardous loads may be recognized;
 - b. how to deal with unfamiliar loads;
 - c. the proper use of handling aids;
 - d. the proper use of personal protective equipment;
 - e. features of the working environment that contribute to safety;
 - f. the importance of good housekeeping;
 - g. factors affecting individual capability;
 - h. good handling techniques.
10. Check-list for employers
 - a) Have you organized work in the workplace to eliminate or minimize hazardous manual handling operations?
 - b) Have you assessed those handling tasks that cannot be avoided?
 - c) Can mechanical systems be introduced?
 - d) Can the loads be improved? Can they be made smaller, lighter, more portable? Can handles be provided? Can you improve the external state of the loads, for example smooth off jagged edges?
 - e) Can loads be marked to show how or where to hold them?
 - f) Can handling aids be employed, such as trolleys, slides, and chutes, or conveyors? Is personal protective equipment necessary? Is equipment properly maintained and accessible?
 - g) Can the workplace or task be redesigned to reduce bending, twisting, stretching, and carrying distances, frequency of handling? Can jobs be rotated to avoid repetition and constant exertion?
 - h) Is proper allowance made for rest pauses?
 - i) Can the workplace be made safer by widening gangways, removing obstructions, and keeping floors clean, providing proper lighting and temperature control?
 - j) Has allowance been made for individual characteristics of the workforce?
 - k) Is instruction and training necessary? If a training program is introduced, is its effectiveness being monitored?
 - l) Do any of the tasks require special strength or fitness? If so, has this been properly evaluated and employees selected accordingly? Are the effects being monitored?

2.4 VEHICULAR OPERATIONS

1. The movement of goods and materials into out of and around workplace or premises involves the use of a wide range of vehicles and accounts for a large proportion of accidents in workplaces. It is important, therefore, for the employer to devise a safe system of traffic management. Such system should include methods and procedures for arrival, reception, unloading, loading and movement within the cartilage of the premises. The system should be written down and brought to the attention of all people involved or likely to be involved in such activities, for example employees, visiting drivers, and, where necessary, other visitors. It is particularly important that upon arrival, for example at the security house or entrance gate, visiting drivers are made aware of the procedures for unloading/loading and movement within the premises. Clear unambiguous information signs setting out these procedures should be prominently displayed at the entrance and other strategic locations. The issue of information/instruction cards to visiting drivers upon arrival may help to improve awareness.

Road Systems

2. The following safeguards should be considered:
 - a. roadways should be wide enough for the safe movement of the largest vehicle liable to use them;
 - b. the need for vehicles to reverse should be minimized as far as possible, for example by the use of one-way traffic systems or designated areas;
 - c. sharp bends and blind corners should be avoided. Where they are unavoidable the use of suitable warning signs and the provision of suitably placed mirrors may help to reduce danger;
 - d. entrances and gateways should be of sufficient width and there should be enough space to accommodate vehicles stopped for checking, without causing obstruction either within the premises or on the public highway;
 - e. road surfaces should be constructed of tar macadam, concrete or other suitable material. They should have even surfaces and be properly drained. Excessive gradients should be avoided as far as possible, particularly where lift trucks are likely to operate. Steep gradients should be properly signed;
 - f. road surfaces should be properly maintained and, in particular, pot holes should not be allowed to develop;
 - g. all roads should be adequately lit;
 - h. vulnerable items of plant, for example bulk LPG storage tanks, should not be located adjacent to or in close proximity to roads. Where this is unavoidable, suitable vehicular protection should be provided;
 - i. suitable and sufficient designated parking areas should be provided to allow the segregation of private cars from goods traffic;
 - j. realistic speed limits should be in operation and should be enforced. Speed limit signs should be displayed at strategic locations. Where necessary to reduce the speed of vehicles, speed retarders (road humps), together with suitable prominent warning notices, should be provided.

Note: Road humps are unsuitable for use in lift truck operating areas.

Sufficient clear road and direction signs should be provided. The marking of buildings and strategic locations will help to avoid unnecessary traffic movements. All road traffic signs should be of the design prescribed by the Traffic Signs Regulations and set out by JKR for use on public highways.

Pedestrian Movement

3. Separate specific routes should be provided for pedestrians. Routes should include, where appropriate:
 - a. designated and clearly marked crossing places;
 - b. suitable barriers or guardrails at entrances to and exits from buildings;
 - c. a separate route for pedestrians, so far as is reasonably practicable, where vehicles pass through doorways; all such doorways should be provided with vision panels and be clearly and conspicuously marked with the safe clearance height.

Protection Of Pedestrians Working With Vehicles

4. The following safeguards should be adopted when pedestrians are working with, or adjacent to vehicles:
 - a. members of the public and non-essential employees, for example office staff, should not be permitted into areas where vehicles are moving or being loaded/unloaded;
 - b. provide sufficient clear and unambiguous warning signs at strategic locations to inform people that vehicles operate in this area;
 - c. instruct all essential employees to stand clear when vehicles are moving or being loaded/unloaded by mechanical handling devices, for example lift truck, overhead traveling crane;
 - d. provide and instruct essential employees to wear safety footwear and where there is a foreseeable risk of head injury from falling objects, safety helmet. A further useful precaution would be the provision of high visibility clothing or light colored overalls.
5. Provide loading bays with at least one exit, and wide loading bays with at least two exit points, one at each end. If it is not possible to provide with such exit points, a refuge should be provided where a person will not be liable to be struck or crushed by a vehicle. A designated reception/waiting area for lorry drivers should be considered.
6. Where a vehicle is being loaded or unloaded close to the driver's cab, there is a risk of injury from goods or materials collapsing onto the cab or the mechanical handling device piercing the cab, for example forks of an Lift Truck. In such circumstances the lorry driver should not be permitted to remain in the driver's cab and should be instructed to use the reception/waiting area where provided, or instructed to stand in an area which does not place him or her in a vulnerable position.
7. When loading or unloading takes place the lorry driver may need to issue instructions, for example to the Lift Truck driver, regarding positioning of loads. In such circumstances a safe system of work should be adopted to ensure that the lorry driver is not placed in a vulnerable position. Where it is not necessary for the lorry driver to assist in loading/unloading he or she should be instructed to use the reception/waiting area, where provided, or to remain in the cab of the vehicle, unless there is a risk from doing so.

Reversing Vehicles

8. When vehicles reverse a significant hazard is that of people being knocked down or trapped between the vehicle and fixed structures. The risks associated with the reversing of vehicles may be reduced by the following:
 - a. providing an employee to guide the vehicle while it is reversing. Such a person should be properly trained and competent to guide reversing vehicles without placing themselves or others in danger. A clear, unambiguous system of signaling should be employed. The position taken up by the signaler will depend upon the circumstances under which reversing is carried out. The signaler should never stand between the rear of the reversing vehicle and fixed structures. A person standing well clear, using a mobile communication system with the driver, is an alternative, improved method to guide reversing vehicles;
 - b. where it is impracticable for a vehicle to be guided backwards and the driver does not have adequate rear vision, the area behind the vehicle should be checked to ensure it is clear before reversing and that, so far as is reasonably practicable, it stays clear;
 - c. provision of longitudinal guides, white lines on the floor or fixed mirrors to aid reversing;
 - d. fitting audible warning devices to vehicles, arranged to operate when the vehicle reverses;
 - e. fitting audible/visible warning devices at loading bays, arranged to operate when the vehicle reverses.

Premature Vehicle Departure

9. A particular hazard at loading bays is that of a vehicle accidentally driving away during loading/unloading, causing lift trucks or other mechanical handling devices and/or people to fall from the vehicle or loading dock. Such an occurrence can lead to serious injuries and it is therefore essential to establish a safe system of work for loading and unloading and departure of vehicles.
10. Safe systems of work may include:
 - a. a properly managed and supervised procedure, for example where the keys to the vehicle and/or necessary paperwork for the journey are not given to the driver until it has been confirmed that the vehicle is ready for departure;
 - b. the use of suitable vehicle/trailer restraints, whereby the vehicle/trailer is firmly held to the loading dock by a hook or other suitable device, which is effectively secured to the loading dock or other fixed structure;
 - c. the provision of a suitable traffic light system, for example in multi-bays where detached trailers are standing awaiting connection to the tractor unit;
 - d. competent supervisory controls including the use of a marshalling person(s) .

Stability Of Semi-Trailers

11. When uncoupled from the trailer unit a semi-trailer needs support at its front end. A pair of 'landing legs' usually provides this. The legs are usually lowered or raised by manual winding with a handle attached to a drive shaft. As loading or unloading of an uncoupled semi-trailer progress, the distribution of load changes. The shorter trailers may approach the point where they become balanced about the landing legs or front heavy if the load is not evenly distributed. This may cause the trailer to 'nose-dive' or cause collapse of the landing legs, particularly if a lift truck is driven on and off. To reduce the risks arising during loading and unloading the use of safety jacks or other suitable support should be considered (suitable proprietary jacks are available). Semi-trailers should not be uncoupled or loaded/unloaded on soft or rough ground. The semi-trailer handbrake should always be applied before it is uncoupled from the tractor unit. As an additional precaution the wheels of the trailer should be chocked.

2.5 FIRST AID

General

1. All workplaces related to service industry should have first-aid provision. The form it should take depends on various factors, including the nature and degree of the hazards at work, what medical services are available, and the number of employees.

Appointed Persons

2. The minimum requirement for any workplace is that at all times when people are at work, there should be at least one person appointed (preferably a qualified First-Aider) who will take charge of an emergency situation and the first-aid equipment. It is recommended that an appointed person should have received emergency first-aid training.

Contents Of First-Aid Boxes

3. First-aid box (es) should be provided and should contain only items that the appointed person has been trained to use. It should not contain medication of any kind. It should always be adequately locked. Notices should be displayed giving the location of first-aid equipment and the name and location of the appointed person.
4. The appointed person should record all cases dealt with. Records should include at least the name of the casualty, date, time and circumstances of the incident with details of the injury sustained and any treatment given. Employees or their representatives may wish to inspect these records at any time. Records should therefore be kept in a suitable place where they are easily available for inspection.

As a guide, refer to

- a. *"Guidelines on First Aid Facilities" JKKP:GP(1)2/96*
- b. *Fourth Schedule of Factory and Machinery (Safety, Health and Welfare) Regulation 1970.*

2.6. The planning process and the general layout of localities and premises

1. While it may be stated that the employees are often the best experts on how good and efficient working conditions can be created, access is still required to human factors expertise in the planning work. This involvement may either be:
 - i) *Direct*, by engaging experts in the working environment, perhaps as employers' consultants to the planning work. They will help in the working out of environmental specifications, the design of e.g. lighting installations, acoustic equipment, and the design of particularly difficult workplaces, together with the evaluation and measurement (e.g. of air pollutants and noise).
 - ii) *Indirect*, the experience of the experts in working environments can be used in the form of handbooks, models, etc., which exist within the area of ergonomics or human factors.

The planning process

2. There are three different aspects in the planning work which must be acted upon, and which will be discussed in order:
 - The planning process
 - Methods and aids in the planning process
 - Purchasing process
3. There may be a need for rebuilding, extension or a new building. One would then set in motion a process of *evaluation*, in which the requirements for the work are examined more closely. The evaluation in its turn leads to a more general form of *programming* where during the *planning* stage the detailed drawings are produced. During the *purchasing stage*, the installation is purchased in accordance with drawings and specifications worked out during the planning stage. Then follows the *building* stage and commissioning. All interested parties should take part in this continuous process.
4. When the decision has been made, it is often important for the employees, and also for the company management, to have access to a special working environment consultant alongside the other planning consultants. This working environment consultant should as a rule have some or all of the following tasks to perform:
 - i) *Identify the problem areas* which are important for the company to remedy in its planning, and to make proposals as to how the planning of the working environment should be carried out during the project.
 - ii) Work out *working environmental specifications* regarding the different environmental factors, e.g. requirements regarding noise, lighting, climatic conditions, machines, workrooms and ventilation.
 - iii) Act as *detail designer* together with other design consultants, e.g. in the production of proposals for light fittings, air conditioning units, local ventilation, acoustic equipment.
 - iv) Take part in the *evaluation* of the various design proposals. This may involve, *for example*, the measurement of noise, light, climatic conditions and air pollution.

Methods and job aids in the planning work:

- 5 The company management often have the will to create a good working environment, and they are also prepared for the employees to take part in the planning work. Even so, the desired result is not achieved! This may be due to several factors, among which is that the people representing the employees and the company are not accustomed to handling planning questions, and this has been touched on earlier. In addition, however, people are unaccustomed to other factors such as the jargon and the drawings, etc., used in the planning. If the employees' participation in the planning work is to be meaningful, it is necessary for the planners, too, to change their methods and their aids.

Purchasing :

- 6 When buying in *machines and equipment*, it is important from the very start to state the working environment requirements. Different equipment can often produce large differences as regards environmental factors. When considering the tenders for different machines, one should therefore always include an ergonomic specification which states:
 - i) which demands have to be fulfilled from the working environment point of view,
 - ii) the respects in which the supplier must demonstrate the ergonomic and working environment aspects of their respective machines.

2.7 COLD STORES

General

1. Cold stores operate at various temperatures below freezing, according to the requirements of individual products. Air temperatures can be as low as minus 30°C and, in exceptional cases, lower. The hazards associated with this harsh environment include:
 - a. Accidental Locking-In.
This is potentially a very serious hazard which can lead to fatal accidents;
 - b. Accidental Release Of Refrigerant.
Equipment failure, improper maintenance work, or mechanical damage to refrigeration plant, particularly in compressor rooms, may lead to the release of refrigerant, for example ammonia which is toxic and flammable or halocarbons which, although of a low order of toxicity, can displace oxygen and cause suffocation in confined spaces or produce toxic decomposition products;
 - c. Cold Injury.
Freezing of the tissues results in frost nip or frost bite. Prolonged cold exposure, without freezing, may cause chilblains;
 - d. Increased Risk Of Accidents.
Low temperatures may cause slower mental reactions and reduce manual skills which may increase the risk of accidents;
 - e. Special Medical Risks.
People suffering from certain medical conditions including chronic respiratory disease, asthma, cardiovascular disease and arthritis may be particularly vulnerable to low temperatures;
 - f. Ice Build Up.
Ice build-up may occur on the floor, above and around entrance doors and other places when warm moist air enters the cold store. When the door(s) is open, the moisture in the air quickly condenses and freezes onto the nearest cold surface. If not regularly removed, ice deposits can lead to serious accidents should they fall onto a person below, or cause floors to be uneven and slippery. Frozen spillages on the floor can present slipping and tripping hazards for people and skidding and overturning hazards, where mechanical handling devices are used;
 - g. Increased Risk Of Equipment Failure.
Racking structures, lift trucks and other mechanical handling devices which operate permanently in the cold store may require more frequent inspection and maintenance to identify and remedy defects caused by continual exposure to low temperatures. Careful selection of equipment should reduce this problem to a minimum.

Safeguards And Precautions

2. The following safeguards should be adopted when operating a cold store:
 - a. the design, construction and installation of the refrigeration system should be in accordance with International standard.
 - b. Precautions Against Accidental Locking-In:
 - i. Only authorized people should be allowed to enter the cold store. Such people should be fully instructed on the means of escape, the use of 'locked-door' opening devices and trapped-man alarms.
 - ii. Clear, conspicuous signs should be prominently displayed at the entrance door(s), indicating 'No unauthorized entry'.
 - iii. At least one emergency exit should be provided. The employer should, however, make an assessment as to whether additional emergency exits are required. Such exits should be suitably positioned with due regard for the operational layout and should not be obstructed by racking, stock or equipment. Such exits should be adequately signed with either emergency lighting or luminous signs located in such a position as not to be obstructed by racking, stock or equipment.
 - iv. Clear illuminated instructions on the method of escape should be marked on the emergency exit.
 - v. Emergency exit doors should be capable of being opened from the inside at all times. It is recommended that ALL doors at new cold stores be installed so that they can be opened from the inside even when padlocked from the outside.
 - vi. A trapped-man alarm, mains operated, with battery back-up, should be provided. The call point should be located no higher than 900 mm above the floor of the cold store and be suitably marked (illuminated or luminous sign) to indicate its position and function. The alarm should be distinctive sounding, for example clearly distinguishable from the fire alarm and the sounding device located in an area that is normally manned.
 - vii. Battery-operated emergency lighting should be provided to indicate clearly and unambiguously the escape route(s).
 - viii. Trapped-man alarms, door release devices and emergency exits should be properly maintained and regularly tested to ensure that they are in good working order.
 - ix. Before a cold store is locked a thorough check should be made by an appointed member of staff to ensure that it is unoccupied.
 - x. BOMBA should be contacted for advice regarding any arrangements or conditions that may be necessary to meet current fire safety standards

- c. Precautions Against Accidental Release Of Refrigerant
- i. All refrigeration plant should be properly maintained by a person(s) who is properly trained and competent.
 - ii. All people involved in the operation of the plant should be properly trained and competent.
 - iii. A particular requirement of the Regulations is for the user of a refrigeration system to have a written scheme for the periodic examination, by a competent person, of all protective devices, every pressure vessel and pipeline and those parts of the pipe work in which a defect may give rise to danger.
 - iv. A clear emergency procedure including details of the precise duties of all relevant staff and the arrangements for evacuation, rescue, first aid, plant isolation etc should be drawn up and effectively communicated to everyone likely to be effected in an emergency situation.
 - v. Plant rooms should be provided with adequate and suitable ventilation including:
 - adequate ventilation to prevent build-up of toxic or dangerous concentrations of refrigerant from operational leakage. Mechanical ventilation should be provided in plant rooms
 - emergency ventilation to prevent dangerous accumulations of a refrigerant, for example flammable ammonia vapor/air mixtures) in the event of a reasonably foreseeable plant or operational failure, for example valve failure;
 - refrigerant vapor detectors should be provided in plant rooms to activate an alarm and to automatically switch on the ventilation fans;
 - In unmanned machinery rooms, the detector(s) should also isolate all unprotected electrical circuits, other than emergency lighting and ventilation, by circuit breakers located in a safe place.
 - The refrigerant concentration in each plant room should be monitored at one or more points within the room and detectors should be positioned to give warning of any leakage before a dangerous vapor accumulation can occur.
 - The refrigerant detector when sensing a refrigerant concentration exceeding its pre-set limit should, in addition to its other functions, initiate an alarm in the plant room and also elsewhere so that emergency action may be initiated.
 - Electrical equipment likely to operate in flammable concentrations of refrigerant should comply with the requirements for hazardous (potentially explosive) areas. Where refrigerant vapor is likely to be present at a significant level, self-contained or airline breathing apparatus should be provided at suitable locations together with adequate instructions on its correct use, for example for rescue or fault-finding purposes. All such equipment should be suitable for its purpose. Breathing apparatus should be thoroughly examined and tested at least once a month. All personnel likely to be involved in such operations should be effectively trained in the correct use and wearing of such equipment. Safe systems of work should be adopted.
- d. Working At Low Temperatures
- Special arrangements should be made for welfare of personnel who are exposed to low temperatures for extended periods. These will include the provision of thermal/protective clothing. Warm rooms with a hot drinks dispenser, that employees may use during breaks, may also be required. Suitable and sufficient breaks should be arranged for cold store operators so that they may warm themselves. Experience has shown that workers suffering physical discomfort after a period of work in a cold store may require approximately 20 minutes at 20 °C with their outer clothing removed in order to fully recover. The length and frequency of breaks will depend on the nature of the work, the working temperature and exposure time.

e. Protective Clothing

Protective clothing of suitable quality should be provided to protect against low temperatures. Selection of suitable clothing should take into account the temperature, length of exposure and personal preference. Different considerations will apply, for example to extended working periods compared to intermittent or short-term exposure.

i. Examples of protective clothing are as:

- undergarments -thermal quality;
- socks and/or boot liners;
- outer clothing -one-piece insulated suits or jacket and trousers or in some instances, thigh-length insulated coats;
- head covering ranging from balaclava helmets to bump caps to insulated safety helmets;
- gloves or mittens;
- insulated boots;

ii. Several thin layers of clothing are better than one thick layer in providing insulation. Activity in cold weather can quickly cause sweating. Water must be allowed to escape if sweating is not to wet the clothing. If water does not escape properly, heat loss from the body can occur when activity stops, causing a refrigeration effect in addition to discomfort for the wearer.

iii. Clothing worn next to the skin should have good 'wicking' properties. Polypropylene is more suitable than cotton. Nylon is least suitable. All fabrics lose their insulating properties when wet. The clothing system should be designed to keep the inner garments dry both from the inside and the outside.

iv. Suitable facilities should be provided for drying wet or damp clothing. Clothing should be laundered according to the manufacturer's instructions to ensure that it does not lose its thermal properties.

v. Selection of protective footwear will require careful consideration. In some situations, footwear may be needed that is both insulated against low temperature and resistant to impact.

Standard safety footwear, with steel toe-caps, may be unsuitable for extended exposure to lower temperatures. Safety footwear with high impact resistant plastic toe-caps, suitably insulated, may provide the degree of protection needed. Information about suitable clothing for specific working conditions may be obtained from manufacturers and suppliers.

f. Precautions against Special Medical Risks.

People working in cold stores should be physically capable of undertaking the work and be free from any disability likely to be adversely affected by the low temperature. A pre-employment medical examination is recommended and thereafter at regular intervals,

g. Ice Build Up.

All ice build-up, for example above entrance doors, and frozen spillages should be removed on a regular basis, for example daily, to prevent the risk of injury to from falling ice or slipping, tripping or overturning or skidding of mechanical handling devices.

(h) Equipment Failure.

The manufacturers of all equipment used at low temperatures, for example lift trucks, racking systems, should be consulted for advice on special hazards that may exist and the necessary precautions that may be required to be taken to reduce risks associated with the use at low temperatures.

2.8 Ventilation and Thermal Climate

1. Our work environment is divided on physical and chemical factors and work task related factors. The latter is dealing with the design of equipment, layout of work places and building design but also work methods and techniques.
2. The physical environment like heat, humidity, lighting which gives rise to large problems in the service industry.

Ventilation and Thermal conditions

3. Ventilation and thermal factors are extremely important comfort factors. Unsuitable thermal conditions will hamper work performance and reduce leadership abilities. When the climate is poor, our general feeling of well being is affected negatively.

Why a good climate?

4. What we think of first is the *thermal climate*, i.e. our experience of *warmth and cold*, which is mainly dependent on the 'dry bulb' temperature (i.e. that measured with an ordinary thermometer). Our feelings of warmth or cold also depend on the rate of *air movement* in the room. High air speeds usually make us feel colder than the thermometer shows. Air *humidity* also has some relevance. Another important factor in our experiencing of warmth and cold is the *radiant temperature*, which is dependent on the *surface temperature* of the surrounding walls, ceiling, floor, heaters, etc. A cold surface makes us feel colder, and a warm surface produces warmer feelings. Feelings about the climate depend greatly on the warmth of our *clothing* and the *physical effort* our work involves. The heat produced in the body should be of the same order as the average amount given off by the body for the body to be in 'thermal balance' (see Figure 2.8a).

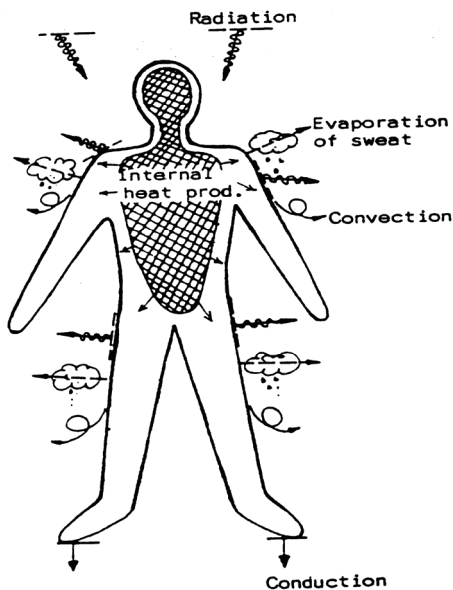


Figure 2.8a The body's heat balance, the same amount of heat is given off to the surrounding as is generated by work or internally.

5. In order for the climate to be felt to be fresh and healthy, the air must be 'fresh' in several respects. There should be little *air pollution*. If the pollution content is high, there are obvious health risks.

General recommendations about ventilation in the Service Sector

6. A typical environment in the service sector consists of very large floor areas and also rather large total volume. This is a rather good basic condition for creation of a good thermal indoor climate in a tropical general environment. However it is important that the construction of the building and its related ventilation and air-conditioning system facilitate the creation of a good thermal climate for human for the personnel and customers. Following guidelines must be considered:
 - The building should be constructed of reasonable heavy material,
 - Window area in relation to floor area should be small particular I direct on of morning and afternoon sunshine
 - Outside walls should be in shadow
 - The indoor volume should be vertical segments – 2 meter up from the floor a human comfort zoon (about 23-26 centigrade) and from 2 meter and upwards an increasing temperature
 - Displacement (high volume but low airspeed) type of incoming conditioned air supply.
 - Air for recirculation is taken on a level of about 2.3 m about the floor.
 - Outdoor air for air exchange is taken from an open area in shadow (as low temperature as possible)
 - Outlet air should be at the highest possible point on each floor of the building, i.e. the place where the air temperature is at its maximum.

7. Similar principles are used in ordinary office rooms. Additional local air conditioners are needed in specific areas, e.g. meeting rooms, which are only used temporarily.

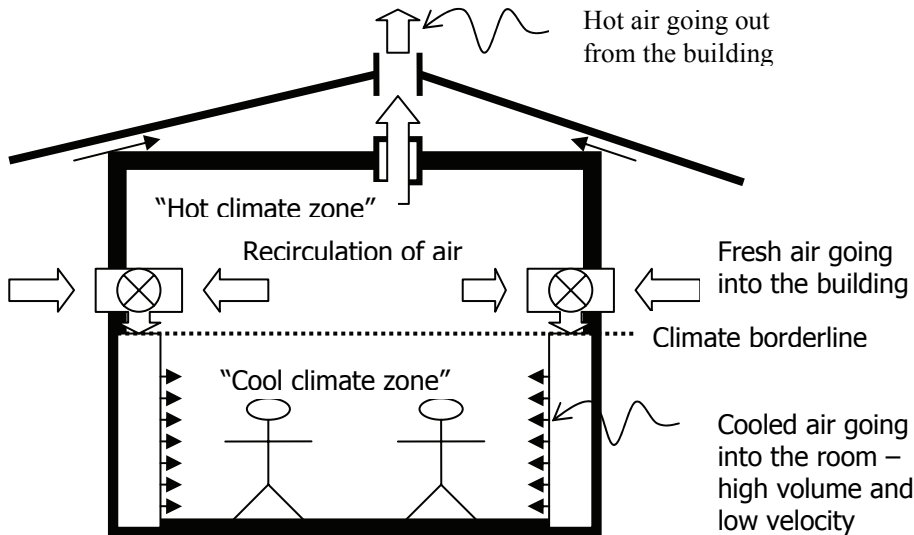


Figure 2.8b Illustration of displacement type of ventilation. Climatized cool air zoon in areas which people occupy. Above is a hot air zoon to make it possible to reuse energy

Facts About Thermal Climate

- ✚ The human body must be in thermal balance with the environment. This means that the same amount of heat must be produced as is given off to the environment.
- ✚ Heat is *produced* primarily by the body's *metabolism* (M) which consists of waste heat from physical activity and basic body functioning (basal metabolism).
- ✚ Other sources of warmth are via radiation and convection.
- ✚ Heat is *lost* primarily by evaporation of sweat (E), radiation (R) and convection (C) (the surrounding air cools the body).
- ✚ Evaporation is dependent on the relative humidity and air speed.
- ✚ Heat balance may be summarised: $M = E \pm R \pm C$.
- ✚ Thermal balance can be *measured* by estimating the sweating (P4SR index) or the WBGT or other index.
- ✚ The safe limit for sweating is stated as 1.6 litres/4 hours, and the comfort limit is 0.2 litre/4 hours.
- ✚ If thermal balance cannot be maintained, the body must be able to cool down in a temperature climate.

2.9 CHEMICAL HEALTH

Substances Hazardous To Health

1. The USECHH 2000 and the associated Approved Codes of Practice lay down essential requirements and a framework for controlling the exposure of people to hazardous substances arising from work activities. A principal requirement of USECHH 2000 is that an assessment should be made of the health risks created by work activities and the steps that need to be taken to prevent or, where this is not reasonably practicable, adequately control exposure of people to these substances.
2. Substances that are 'hazardous to health' include substances that are required to be labeled 'very toxic', 'toxic', 'corrosive', 'harmful' or 'irritant' and substances which have maximum exposure limits or occupational exposure standards set by the CPL REGULATION. They also include harmful micro-organisms, substantial quantities of dust and any material, mixture or compound used at work or arising from work activities which can harm a person's health.
3. Many hazardous substances are likely to be found in workplaces, for example adhesives, solvents, corrosives, acids, gases, powders, dusts and general and specific chemicals. People may be exposed to such substances in use in workplaces, for example using solvents to clean parts of a lift truck or other equipment. Other circumstances in workplaces which may give rise to a risk of exposure to these substances would include:
 - a. leaks from packages and containers;
 - b. accidental spillage;
 - c. puncture of packages or containers;
 - d. subdividing substances or breaking down from bulk storage;
 - e. generating hazardous substances on site, for example exhaust fumes and accidental mixing of incompatible products during storage.
4. The Regulations require all employers to:
 - a. assess the risk to health arising from work and the precautions that are needed;
 - b. introduce appropriate control measures to prevent or adequately control exposure to hazardous substances;
 - c. ensure that control measures are used and that equipment is properly maintained and procedures observed;
 - d. where necessary, monitor the exposure of workers and, if appropriate, provide or carry out health surveillance; and
 - e. inform, instruct and train employees about risks and what precautions to take.

Assessment

5. To tackle any problem, first assess what the problem is and its extent before deciding what, if anything, you need to do about it. The assessment should be a systematic review of all work undertaken which asks:
 - a. what substances are present and in what form?
 - b. what harmful effects are possible and how would they affect the body? for example, inhalation risks from dusts or vapors, skin contact/absorption from solvent, ingestion of chemicals from skin contamination;
 - c. where and how are substances actually used or handled?
 - d. what harmful substances are given off or produced?
 - e. who could be affected, to what extent and for how long?
 - f. under what circumstances would people be affected?
 - g. how likely is it that exposure will happen?
 - h. what precautions need to be taken to comply with the rest of the USECHH?
6. All these questions should be considered and related to what actually happens in the workplace. In this way assessment conclusions will reflect only what is relevant to the real risk in the particular circumstance. In all but the simplest cases the assessment will need to be written down. Much of the information concerning the hazardous nature of substances should be provided by the supplier who has a legal duty to make adequate information available. Each work activity or situation that may give rise to a foreseeable risk to health must be formally assessed. Much assessment will be within the scope of company staff whose should use common sense in following the principles set out. Complex assessments may require the services of a competent occupational hygienist.
7. Sufficient information will need to be recorded to show why decisions about risks and precautions have been made. The assessment should be kept at the workplace to which it relates.
8. In some cases the quantities, the exposure time or the effects may be such that the substances do not or could not constitute a risk and therefore no further action under USECHH would be necessary. If this is the case the employer must have adequate information to verify this conclusion.

Prevention of exposure

9. The employer is required to ensure that exposure of people to hazardous substances is prevented or, if this is not reasonably practicable, adequately controlled. The first aim should be to prevent exposure by:
 - a. changing the system, for example use ready supplied pre-packaged substances instead of breaking down from bulk;
 - b. substituting a hazardous substance with a safe or safer substance or using it in a safer form, for example use palletized material instead of a powdered product.

Control of exposure

10. When this is not reasonably practicable the employer must ensure adequate control of exposure by, for example:
 - a. totally enclosing the process;
 - b. partial enclosure and extract equipment;
 - c. general ventilation;
 - d. safe systems of work and handling procedures;
 - e. personal protective equipment (PPE), for example respirators, eye protectors, protective clothing.

Note: PPE is NOT an alternative to other means of control and must only be considered when adequate control is not reasonably practicable by other means.

Using the controls

11. Employers must ensure that the control measures are properly used or applied. Employees must make full and proper use of the controls and report any defects to their employer.

Maintenance of controls

12. Employers have a duty to ensure that the control measures are kept in efficient working order and good repair. If the control measures consist of engineering controls they should be examined and tested at regular intervals. In particular, local exhaust ventilation equipment should be tested at least once every 12 months and a simple record kept of the results. Records of examinations and tests must be kept for five years.

Planning for emergencies

13. If it is reasonably foreseeable that leaks, spills or other uncontrolled releases of a hazardous substance could occur, the employer must consider ways of limiting the extent of the risks and of regaining control as quickly as possible. Such ways include having:
 - a. people and equipment available to minimize and control quantities released;
 - b. defined emergency procedures and appropriate training (including evacuation procedures where necessary) ;
 - c. safe methods for disposal and decontamination;
 - d. sufficient and suitable personal protective equipment;
 - e. suitable means for decontamination of people and equipment.

Informing employees

14. Employees have to be informed, instructed and trained so that they know and understand:
 - a. the risks arising from their work;
 - b. the precautions to be taken.

15. An employer's obligation under USECHH does not finish with the assessment. This is merely the first stage. After the assessment has been carried out controls have to be implemented, employees informed and, finally, the whole situation should be kept under review to ensure not only that the control measures are being carried out, but also to check whether there have been any significant changes to working practices or substances used which would merit reassessment.

Asbestos

16. Asbestos-containing materials are not likely to be used or handled in workplace premises. Asbestos-containing materials may, however, be present in a workplace, for example, boiler and pipe work lagging. Those materials could release asbestos fibers if in a poor condition or damaged, for example by lift truck.
17. If suspicious materials are discovered it is essential to seek specialist advice to determine whether or not they contain asbestos.
18. In particular, an assessment should be made of the health risks created by work with asbestos, and the steps that need to be taken to prevent or, when this is not reasonably practicable, adequately control exposure to asbestos.

Lead

19. Compounds of lead may be stored or handled in such a way, for example breaking down from bulk. In such circumstances, working conditions should be assessed to determine whether exposure is significant and if further action is necessary to control the risk of exposure to lead. If in doubt seek specialist advice.

As a guide, refer to

- *Guidelines on OSH for preparation of Chemical Register*
- *Guidelines on OSH for Classification of Hazardous Material*
- *Guidelines on Monitoring of airborne contaminant for chemical hazardous to health*
- *Guidelines on Assessment of Health from the use of hazardous chemical at the workplace*
- *OSH (USECHH) Regulation 2000*

2.10 NOISE

General

1. Sources of noise in workplace include lift trucks, compressors and conveyor systems. Such sources may give rise to potentially hazardous levels of noise which can cause incurable hearing damage. Noise at work can cause other problems such as disturbance, interference with communication and stress.
2. It is an obligation on all employers to reduce the risk of damage to the hearing of their employees from exposure to noise to the lowest level reasonably practicable.

Action levels

3. There are three action levels of noise defined in the Regulations:
 - (a) First Action Level -a daily personal noise exposure (LEP,d) of 85 dB(A) .
 - (b) Second Action Level -a daily personal noise exposure (LEP,d) of 90 dB(A) .
 - (c) Peak Action Level -a peak sound pressure of 200 Pascals (140 dB) .
4. As a rough guide the First Action Level is likely to be reached when peoples speaking normally have difficulty in being heard clearly by someone who is about two meters away. The employers are required to take certain basic steps where an employee is likely to be exposed to noise at or above the First Action Level. These steps together with additional action must also be taken where an employee is likely to be exposed at or above the Second or Peak Action Level.

Assessment

5. Employers are required to arrange for a noise assessment whenever an employee is likely to be exposed at or above the First or Peak Action Level. The assessment will need to:
 - (a) identify all workers likely to be so exposed and;
 - (b) provide the employer with the information required to decide what kind of action needs to be taken. For example the assessment should tell the employer:
 - (i) the nature of the problem (if any) and how serious it is;
 - (ii) who is at risk;
 - (iii) where the risk exists;
 - (iv) very broadly why the problem exists, for example noisy lift trucks and the air compressor.
6. A suitable record of the assessment must be kept. Such a record must include details of:
 - a. the workplaces, areas or jobs assessed and what the results were;
 - b. when the assessment was made.
7. The task of carrying out a noise assessment must be done by a competent person, ie someone who is capable of not only measuring noise but of bringing together and presenting enough information about noise exposure to enable the employer to make correct decisions on what should be done.

Reduction of noise exposure

8. Where employees are exposed at or above the Second or Peak Action Levels the employer must reduce exposure as far as is reasonably practicable by means other than provision of personal ear protectors. In some cases noise can be obviated by more fundamental changes, such as using a different, quieter process, or devising alternative ways of doing the job. Where this is not reasonably practicable, the employer will need to implement a program of control measures. Program to control noise by engineering means will only be effective if the staff working on them are competent in noise control engineering, or advised by someone who is.
9. Limiting the time spent in noisy areas, for example by providing a noise refuge, can also help to restrict daily personal exposure but usually only to a limited extent, for example halving the exposure time will reduce LEP,d by only 3 dB(A) .If this method is to be relied upon the exposure time will need to be effectively controlled.

Ear protection

10. In areas where the noise level is potentially hazardous and the employees are provided with, and use, hearing protectors, the employer still has to reduce the noise levels in the working area and keep to a minimum the time workers spend there, so far as is reasonably practicable.

Ear protection zones

11. An Ear Protection Zone means any part of the premises where any employee is likely to be exposed to the Second Action Level or above or to the Peak Action Level or above. Wherever reasonably practicable the employer will have to designate Ear Protection Zones and display signs showing that they are areas where ear protectors are required to be worn.

Information, instruction and training

12. Where employees are likely to be exposed at or above any of the action levels, the employer is required to provide each employee with adequate information, instruction and training. Information should include:
 - (a) the likely noise exposure and consequent risk to hearing;
 - (b) how to report defects in ear protectors and noise control equipment;
 - (c) where and how ear protectors can be obtained;
 - (d) the employee's duties under the Regulations;
 - (e) the advisability of seeking medical advice if an employee thinks there is something wrong with his or her hearing.

EMPLOYER'S DUTIES

13. Risk of hearing damage to be reduced to the lowest level reasonably practicable
14. Noise assessments to be made by a competent person
15. Record of assessments to be kept until a new one is made
16. Reduce exposure to noise as far as is reasonably practicable by means other than ear protectors

Ear Protectors

17. Ensure so far as is practicable that protectors are:
 - a. provided to employees who ask for them
 - b. provided to all exposed
 - c. maintained and repaired
 - d. used by all exposed

18. Ensure so far as reasonably practicable that all who go into a marked ear protection zone use ear protectors

Maintenance And Use Of Equipment

19. Ensure so far as is reasonable that:
 - a. all equipment provided under the Regulations is used, except for the ear protectors provided between 85 and 90 dB(A)
 - b. ensure all equipment is maintained

EMPLOYEE'S DUTIES

Use Of Equipment

20. So far as is practicable:
 - a. use ear protectors
 - b. use any other protective equipment
 - c. report any defects discovered to his or her employer

2.11 PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. PPE includes both:
 - a. protective clothing such as overalls, waterproof equipment, gloves, safety footwear, helmets etc;
 - b. protective equipment such as eye protectors and ear protectors.

PPE should not be used as a substitute for other methods of risk control. It should always be regarded as a 'last resort' means of preventing or controlling exposure to hazards to safety and health. This means that other methods of controlling exposure must be considered before taking the decision to use PPE. In some situations, however, it will be necessary to provide protective clothing and/or equipment.

2. Selection of PPE should take into account the demands of the job. Among other things, this will involve considering the physical effort required to do the job, the methods of work, how long the PPE needs to be worn and requirements for visibility and communication. The aim should always be to choose equipment which will give minimum discomfort to the wearer. Uncomfortable equipment is unlikely to be worn properly. There will be considerable differences in the physical dimensions of different workers and therefore more than one type or size of PPE may be needed. There is a better chance of PPE being used effectively if it is accepted by each wearer. Those having to use PPE should therefore be consulted and involved in the selection and specification of the equipment.

Protective clothing & equipment

FUNCTION	HAZARDS	CHOICES
Eyes	Chemical splash dust, projectiles	Spectacles, goggles, face screens
Head and neck	Impact from falling or flying objects risk of trips bumping, trips adverse climate or temperature.	Helmets , sweater, head insulated head covering (insulated hooded jackets) .
Hearing	Impact noise, high intensities	Earplugs Ear protectors
Hands and arms	Abrasion, temperature extremes, cuts and gauntlets, punctures, chemicals, skin contamination.	Gloves,
Feet and legs	Wet, slipping, Cuts and punctures, falling objects abrasion, crushing	Safety boots and shoes with steel toe, caps and steel mid-sole, gaiters, leggings, non-slip footwear.
Respiratory system	Toxic and harmful Dust, gases and vapors.	Disposable respirators, half or full face mask respirators fitted with filtering cartridge or canister, powered respirators, fresh air hose equipment, self- contained breathing Apparatus.
General body	Heat, cold, bad weather, chemical splash spray from pressure equipment	Overalls, (conventional or disposable), boiler suits, workplace coats, donkey jackets, thermal or insulated clothing, water proof suits

NOTES:

- a. Gloves must never be worn when operating machines where they might get caught. Some materials are easily penetrated by particular chemicals: care in selection is needed.
 - b. All equipment should be suitable for its purpose and should conform to DOSH approved standard or be approved type (where applicable).
 - c. High visibility clothing : see Vehicular Operations section
3. Before purchasing and issuing equipment consider the following points:
- a. choose good quality products made to a recognized or approved standard;
 - b. choose equipment which is suitable for the person using it and is appropriate for the hazard;
 - c. make sure the user is properly trained in the use, fitting and basic maintenance of the equipment and instructed to report defects;
 - d. make sure the user knows why the equipment is needed, when and how it has to be used and its limitations;
 - e. equipment needs to be kept clean and in good repair. Suitable storage facilities should be provided.

2.12 ELECTRICAL SAFETY

GENERAL

1. All electrical equipment and electrical systems installed and used at work premises are subject to the requirement by Jabatan Bekalan Elektrik. Electricity can not only cause shock, but can also cause burns and start fires. It should therefore never be treated lightly. All electrical equipment and systems within work premises should be installed and maintained by a competent person (in most instances this will be a qualified electrician).
2. Where conditions are wet, only electrical equipment suitable for that environment should be used. Where flammable liquids, gases or combustible dusts are stored, all electrical installations and equipment, including powered handling equipment, should be suitable for use in the environment.

Fixed Electrical Installations

3. All fixed electrical installations should be designed, installed, operated and maintained (including being inspected and tested) in accordance with the current edition of the Regulations for Electrical Installations,
4. Where flammable solvents, liquids or flammable gas containers or combustible dusts are stored, specialist advice is required in relation to the electrical installation and equipment to be installed.
5. The electrical wiring should be protected against mechanical damage. This can be achieved by using PVC insulated wires in conduit or trunking or by PVC steel-wire armored cable with an outer PVC sheath. Each machine supplied via a permanent cable should have its own switch suitable for electrical disconnection and isolation from the electrical supply. This switch should be provided with a means to secure it in the 'off' position. This switch should always be used to disconnect the machine and be secured in the 'off' position before cleaning and maintenance work. 'Start' buttons should be recessed or shrouded to prevent unintended operation, while 'stop' buttons should be colored red and protrude for easy operation. They should be within easy reach of the operator.
6. It is recommended that a competent person should test the fixed electrical installation at least once every five years. He or she should advise of any defects, carry out the necessary remedial work or isolate the system or part of the system which is defective and prepare a certificate once satisfied.
7. All electrical switchgear controlling machinery should be clearly and unambiguously labeled and identified to indicate which machine which switchgear controls. All switch gear should be readily accessible at all times. Goods etc should not be stored in front of or obstruct access to switch gear.

Portable And Transportable Equipment

8. Work areas should have sufficient socket outlets to avoid the use of adaptors and trailing cables across floors. Industrial types of plugs and sockets should be used. Where a number of pieces of equipment require electrical supplies in the middle of the work area, consider the provision of overhead sockets. These sockets should be readily reached and be accessible to those who are to use them.

9. All flexible cables should be suitable for their environment. You may require specialist advice as to which cable is most suitable for your premises, for example flexible cables for floor cleaning equipment should be abrasion resistant, for example pcp (polychloroprene) sheathed or similar.
10. Appropriate electrical protection should be provided for all portable and transportable electrical equipment. This protection may take the form of a suitably rated use either at a distribution fuse board in a fixed installation or in a plug top designed for that purpose or alternatively by a suitably rated circuit breaker at the distribution switchboard for a fixed installation.
11. Efficient cable or cord grips should be used both at the plug and where the cable enters the equipment. Cables should be positioned and protected so that they cannot be damaged by heavy equipment or materials and should be checked regularly for any signs of damage. Damaged cables should generally be replaced completely but, if they are repaired, this should be by means of a suitable coupler. Never carry out makeshift repairs to cables.
12. Where electrical equipment, flexible cables, plugs and sockets are likely to be used outside or in wet conditions, the equipment, cables, plugs and sockets should be suitable for that use.
13. All extension cables which are terminated in conventional 13 amp three-pin fittings (plugs and sockets) should be three-core cables with an earth (protective) conductor. This conductor should always be terminated in accordance with the manufacturer's instructions. Extension cables should not be excessively long as the use of such cables may result in a failure to operate the electrical protection in the event of an equipment fault, due to the high electrical impedances of the system. Drum-type extension cables should be unwound before use to avoid a fire risk (a fire risk occurs if high currents pass through a coiled cable).
14. All portable and transportable electrical equipment, flexible cables, plugs, sockets, connectors and extension leads should be separately identified and regularly visually inspected for damage and be routinely electrically tested to ensure continued electrical integrity. Any equipment etc which is found damaged during visual inspection or fails an electrical test should be withdrawn from service immediately for repair/replacement. Appropriate records of inspection and testing should be kept. The intervals between inspections and tests for equipment need to be established by the employer and should take account of the use and possible abuse of the equipment concerned, for example floor cleaning machinery every three months.

2.13 REPORTING ACCIDENTS, DISEASES AND OTHER INCIDENTS

General

1. Under the OSHA 514 Section 32 employers have a legal duty to report accidents, dangerous occurrences and occupational diseases to DOSH.

Immediate Notification

2. Employers should notify DOSH as soon as possible, if:
 - a. someone dies or suffers a major injury in an accident connected with their business;
 - b. an employee is injured and won't be able to perform his normal duty for more than 4 days;
 - c. there is a dangerous occurrence.

Report In Writing

3. Employers should send a report:
 - a. an employee is off work or cannot carry out normal duties for more than 4 days as a result of an accident at work;
 - b. any death, major injury or dangerous occurrence has previously been notified;
 - c. a specified occupational disease is certified by a doctor.

Record Keeping

4. Employers should keep a record of any reportable accident, dangerous occurrence or case of disease. These records should include:
 - (a) date and time of accident Or occurrence;
 - (b) name, occupation and nature of injury of person affected;
 - (c) place where incident happened; and
 - (d) a brief description of the circumstances.

2.14 Working positions and workplace design

General

1. Most workers in the service sector have uncomfortable and fatiguing working positions. Apart from the body becoming tired and fatigued, productivity is adversely affected and the work is felt to be less interesting or pleasant. Difficult working positions and postures, bad access and similar problems also increase accident risks.
2. When planning from new, and when purchasing equipment, many of these 'ergonomic' failings can be largely avoided. By adapting the workplaces, equipment and tools to people's measurements, strength and way of working, many of the problems can be prevented. Further problems may be avoided or ameliorated by choosing a less laborious method of working.
3. There are a number of basic ergonomic principles, which have to be taken into account in the design of workplaces, equipment and tools. All working planning starts from a description of the *tasks* which are to be carried out at the workplace. Against this background, one may determine the demands on:
 - i) storage space
 - ii) working surfaces of different types (e.g. for writing, various cooking tasks, etc.)
 - iii) machines and tools
 - iv) instructions, etc.
4. Thereafter, is determined, the space requirements and the degree of accessibility (frequency of use, order of usage and degree of importance) for these. This then forms the starting point for the planning work proper, which can be divided into three parts:
 - i) Layout and planning of working areas (covered in PART 2.6)
 - ii) Layout and design of the individual workplaces
 - iii) Design of individual machines and tools

General recommendations

5. When designing workplaces, it must be realised that people are of different sizes. A workplace should be designed so that 95% of all men and women will be able to use the workplace.

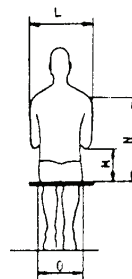
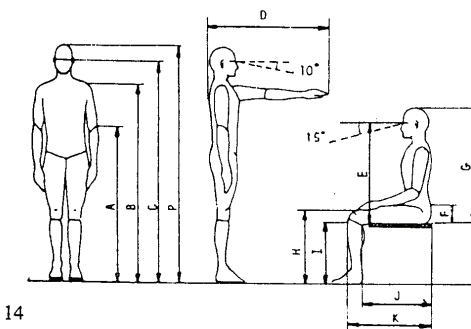


Figure 3.1a The diagram and table show certain of the important measurements for the tallest and shortest men and women. 5% of men and 5% of women are taller than the measurements in the upper group (95%) and 5% are shorter than the lower group (5%).

Fig 2.14a

95%		
	Male	Female
Weight	76.0	65.0
A	114.3	114.8
B	150.7	145.5
C	167.0	154.0
D	83.3	82.0
E	82.0	77.0
F	19.0	23.0
G	94.0	88.3
H	59.0	55.0
I	46.0	44.0
J	51.2	53.0
K	61.0	61.0
L	48.0	43.0
M	29.3	28.0
N	65.7	60.7
O	39.0	41.0
P	178.0	167.0

5%		
	Male	Female
Weight	65.8	58.5
A	96.8	97.0
B	130.2	122.8
C	148.0	134.5
D	72.0	67.2
E	69.0	62.0
F	10.8	10.0
G	80.5	74.0
H	48.5	40.8
I	37.3	31.9
J	40.1	39.0
K	50.0	48.1
L	39.1	33.5
M	17.8	17.0
N	51.2	48.3
O	29.6	30.4
P	159.4	145.4

6. One should thus design the workplaces in such a way that
 - i) they can easily be adjusted and matched to the individual's own characteristics (*built-in flexibility*).
 - ii) allow for a natural downward angle of view in accordance with Figure 2.14a. Given this natural line of sight (eye height), one can then decide dimension heights (or more correctly the height limits) at which other surfaces should be placed.
 - iii) The body position may be varied. The ideal is a varied mixture of sitting, standing and walking work.
 - iv) The work should not be designed so that people are forced to sit still for long periods, as this is also undesirable

7. Figure 2.14b shows the forward reaching distances when the arm is held straight forwards, a little to the side and more to the side. Leaning forwards allows a somewhat greater distance than the measurements given, but this should preferably not be taken into account in the planning of a new workplace. The reach for the thumb is the distance which needs to be considered in order to allow smaller objects to be gripped. If large objects are to be grasped, they must be placed even nearer. Figure 2.14c shows the optimal and the maximal horizontal working area.

8. One should not need to climb stairs or step over high thresholds. Single steps especially should be avoided.

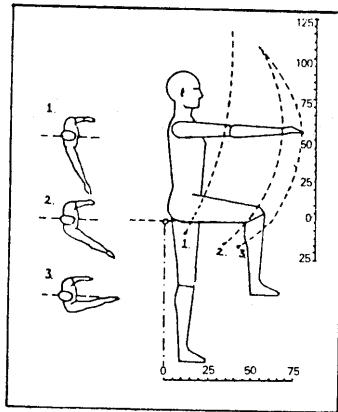


Fig 2.14b

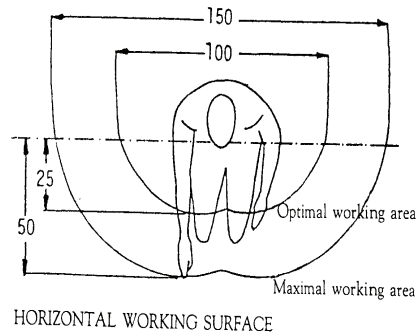


Fig 2.14c

9. Jobs should be designed so that the body can be kept relaxed with shoulders lowered. The chair seat should be sufficiently low that no undue pressure is formed on the undersides of the thighs. Working postures which require working with the arms raised, and especially above shoulder height, should not occur apart from single isolated tasks (e.g. stretching up for something on a shelf). Heavy lifting should not occur from heights above table height. Objects lifted symmetrically with two hands should preferably not be heavier than 12kg. If larger weights than this occur, they should be divided up into smaller one

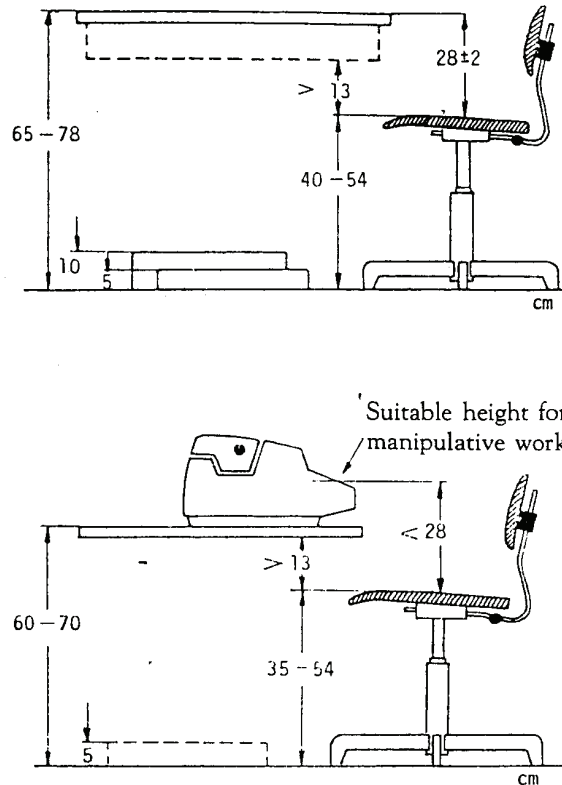


Fig 2.14d Recommended working heights for standing work.

10. Figure 2.14d shows examples of some suitable work surface heights for sitting work, and Figure 3.14e shows the suitable measurements for standing work. It is sometimes not possible to arrange a suitable sitting workplace; one must then compromise and have a support stool or chair at a workplace designed for standing work. The primary aim in this case is to have an ordinary high chair with a proper footstool. If this cannot be done, special high chairs may be chosen, for example of the saddle type, or with a forward-leaning seat (see Figure 2.14f and 2.14g).

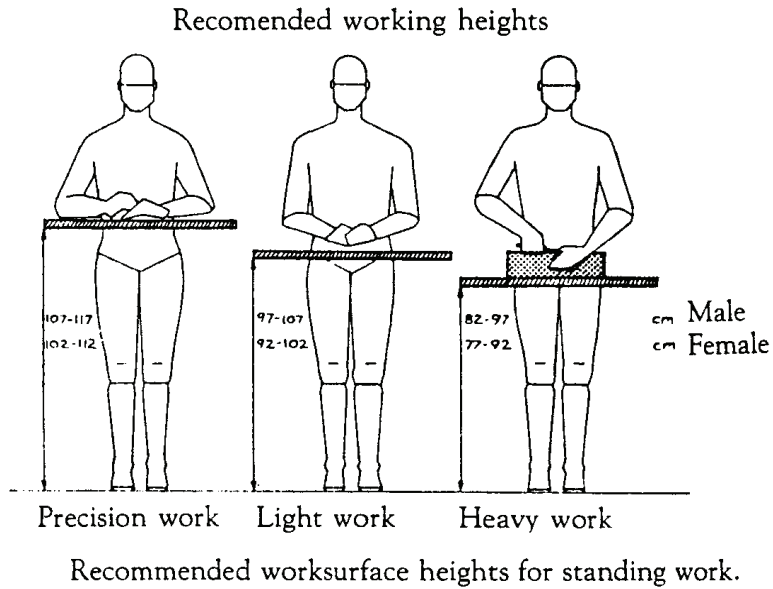


Fig 2.14e

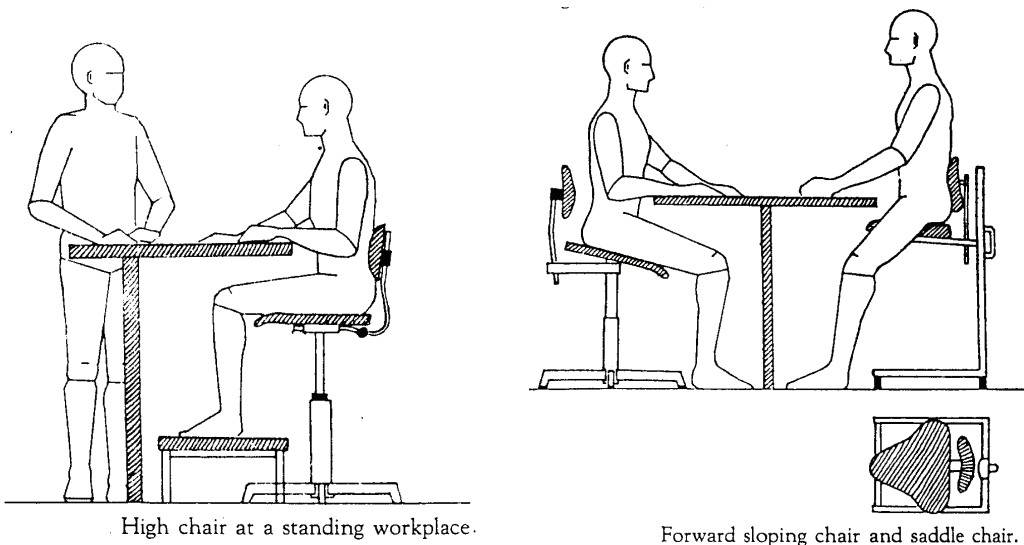


Fig 2.14f

Fig 2.14g

FOR FURTHER READING, REFER TO

- 1. Guidelines on Occupational Safety and Health for Seating at work
JKKP : GP (I) 2/2003 ISBN: 983-2014-25-5*
- 2. Guidelines on Occupational Safety and Health for Standing at Work
JKKP : GP (I) 02/2002 ISBN : 983-2014-21-2*
- 3. Guidelines on Occupational Safety and Health in the Office*

2.15 Lighting design

Lighting

1. Good lighting, whether natural or artificial, is vital in promoting health and safety at work. In all working and access areas sufficient lighting should be provided to enable work activities to be carried out safely. The level and type of lighting depends on:
 - (a) the type of work being carried out;
 - (b) the hazards associated with it.

Some basic concepts.

2. Visual problems are common and often severe. To some extent, the problems can be alleviated by careful planning of the lighting. Such visual problems cause decreased visual efficiency, irritation, and in many cases eye problems which show up as smarting and aching eyes and headaches.
3. In order to obtain the best visual conditions, the following points should be noted:
 - a. The different *critical details* in the visual field should be sufficiently large.
 - b. The *contrast*, i.e. the luminance of the visual target in comparison with the luminance of the background, is also very important for the ability to see it easily. For critical visual tasks, the contrast should be over 90%.
 - c. *Reflections* can totally destroy the contrast, and thereby the visual ability.
 - d. The *average luminance* in the visual field for ordinary reading tasks require at least 20 candelas/ m² in order to be able to see easily.
 - e. The *distribution of luminance* in the room is also important. The highlight luminance must be close to the line of sight, and be reduced outwards in the ratio 5:3: 1.
 - f. Glare can be of two types, *disability glare* and *discomfort glare*. Disability glare is caused by reflections, etc., which affect the focussing and accommodation of the eye. Discomfort glare is usually caused by unsuitable distribution of luminance in the room, for example light bulbs or strip lights, which shine directly into the peripheral parts of the retina.
 - g. The *time available* to see the object also has a certain importance. In the practical working situation there is often time pressure.
 - h. The *direction of the light* affects the modelling of the object, due to the formation of shadows. A high degree of modelling effect can in some cases increase visibility.

Light sources and fittings

4. *Daylight* is still the most important light source at some workplaces. In most places, daylight has to be supplemented by artificial light. *Artificial light* sources can be divided into two main types:
 - a. filament lamps
 - i. produced by passing a current through a wire filament, heating it up so that it emits radiation
 - ii. give off a yellow-red light
 - iii. low efficiency
 - iv. radiates large amounts of heat

- b. discharge lamps
 - i. electrical current is passed through a mixture of gases which are thus activated to emit radiation
 - ii. includes strip (fluorescent) lights, mercury vapour lamps, metal halogen lamps and high and low-pressure sodium lamps
 - iii. gives off relatively large quantities of yellow-green light, to which the eye is very sensitive
5. Light sources cannot be placed naked in the room, as they will then cause far too many glares. It is necessary to put all types of light source
- a. in *fittings (luminaries) with glare shields*. So
 - i. the light source can be shielded
 - ii. making it possible to direct and spread the light in the best way for the visual conditions.
 - iii. If making the reflector deeper reduces the problem of glare.Or / and
 - b. paint the outer part of the reflector in a dark colour in order to reduce the glare problem.
 - c. to provide the luminaries with some form of diffuser, such as squared diffusers of plastic or sheet steel, or a plain type of glare protector, e.g. with a prismatic pattern which optically refracts the light downwards.
6. In the service (for example: hotel and restaurant trade) it is important to remember that there are requirements for light fittings installed in wet areas to have a certain degree of protection against the entry of water. In kitchens, luminaries must be at least drop-protected, or in some cases protected against water sprays. This latter is particularly true of areas where the walls and ceiling have to be able to be hosed down. In garages, light fittings which are proof against water drops, or at least touch-proof luminaries, should be fitted. This type of lighting should also be fitted with glare protection (see Figure 2.15a).

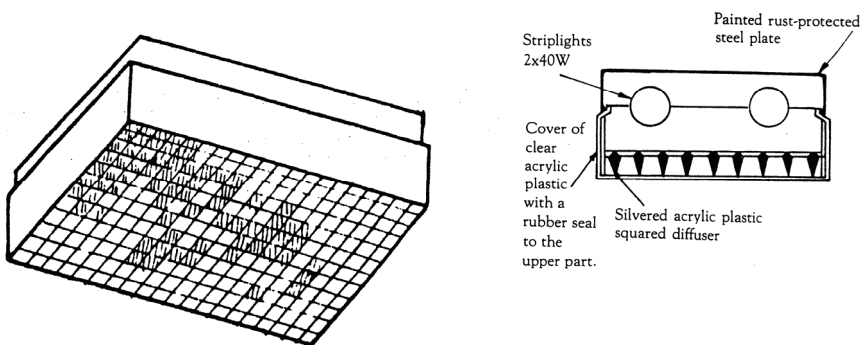


Figure 2.15a Example of glare-shielded luminaries suitable for kitchen

Principles for good lighting

7. In order to create good visual conditions, the following factors should be considered:
 - a. Make the object to be viewed as clear as possible by
 - i. making the critical details in the object as large as possible.
 - ii. designing the visual object as clearly and as neatly as possible (e.g. using an easily-readable typeface)
 - iii. increase the contrast (black text on a white background, or in certain cases in dark rooms, white text on a black background)
 - iv. make sure that the visual distances are as equal as possible
 - v. have a quiet background for the visual object in order to avoid distraction.
 - b. Choose a suitable light level with regard to the degree of difficulty of the visual object.
 - c. Choose a suitable luminance distribution
 - i. around the visual object
 - ii. in the room
 - iii. around the light sources (both windows and lights)
 - d. Avoid glare and reflections.
 - e. The light should have a suitable direction and modulation ability.
 - f. Create a suitable colour rendering for the light.
8. One general principle is to make *daylight* accessible to the greatest possible extent. The physical characteristics of daylight are not noticeably different from some artificial light. On the other hand, the ability to see out of the windows is a necessary condition for a good working environment. Windows should however be placed in such a position as to avoid direct sunlight. Sunlight creates problems of heat, but also glare and large differences in luminance. If it is not possible to site windows facing directions which avoid sunlight, suitable ways of shielding the sunlight must be found, e.g. by using venetian blinds, curtains or an external form of partitioning or screening. One could for example use external blinds or fixed partitions in the building design (see Figure 2.15c).

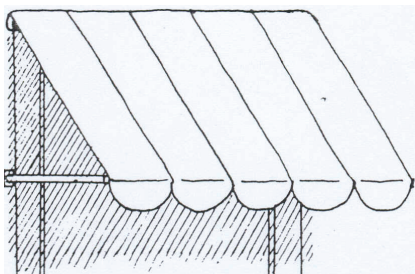


Figure 2.15b Blind for screening sunlight.

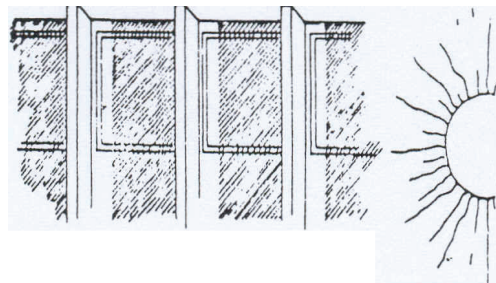


Figure 2.15c Partitions for screening sunlight (not good on south-facing)

As a guide, refer to *Second Schedule, Factory and Machinery (Safety, Health and Welfare) Regulation 1970*

2.16 SANITARY ACCOMMODATION

1. Suitable and sufficient sanitary conveniences should be provided for employees. In most workplaces this will mean at least one WC should be provided for each sex. As a guide, please refer *Factories and Machinery (Safety, Health and Welfare) Regulation 1970*.

Sanitary conveniences should be:

- (a) kept clean and properly maintained;
- (b) well ventilated and lit and not communicating directly with a workroom;
- (c) undercover, partitioned off for privacy with suitable doors and fastenings;
- (d) readily accessible from workrooms;
- (e) so screened that urinals are not visible when the door to the room is open.

Washing And Welfare Facilities

2. Washing facilities should be provided which are both adequate and suitable. At least one wash basin should be provided for each WC. In some work places, for example where dirty materials or substances are handled, more wash basins will be required. Washing facilities should be:
 - (a) kept clean and properly maintained;
 - (b) provided with water together with soap or other proprietary hand cleaner and suitable drying facilities;
 - (c) provided at convenient locations that are sufficiently lit.
3. Suitable accommodation for clothing not worn at work should be provided together with suitable drying facilities. For example, there should be sufficient coat hooks in a clean, dry and well ventilated place.
4. Suitable facilities, for example; adequately lit room with a sink, water, tables and chairs, should be provided for employees to use during meal and tea breaks.

3.1 KITCHEN

Kitchen Design

1. It is important in the design of a kitchen that there are enough working surfaces. A kitchen should be designed with a natural flow between the different functions such as deliveries, store (dry, cold and freezer storage), preparation, cooking and washing.
2. This functions can be used as a general pattern for logical planning of a kitchen taking the flows into account such as:
 - a. Design for tools and smaller pieces of equipment
 - b. Design of machines, furniture and larger equipment
 - c. "Traffic" planning within the kitchen, and finally a few words on
 - d. Working techniques.
3. *Hand tools* and the handles of smaller equipment such as saucepans and frying pans must be designed so that the tools and equipment can be handled easily and so that no unnecessary fatigue or risks result. As a first principle, account must be taken of the dimensions of the human hand, which, as can be seen in Figure 3.1a, can vary considerably in size.

Grip

4. It is also important to give them a good balance. For stewing pots and saucepans, therefore, there should usually be two handles. In general terms, the following factors must be taken into account in the design of equipment and tools: a. Correct grip function, b. Sufficiently large gripping surfaces, c. High friction d. Smooth non-reflective surfaces.

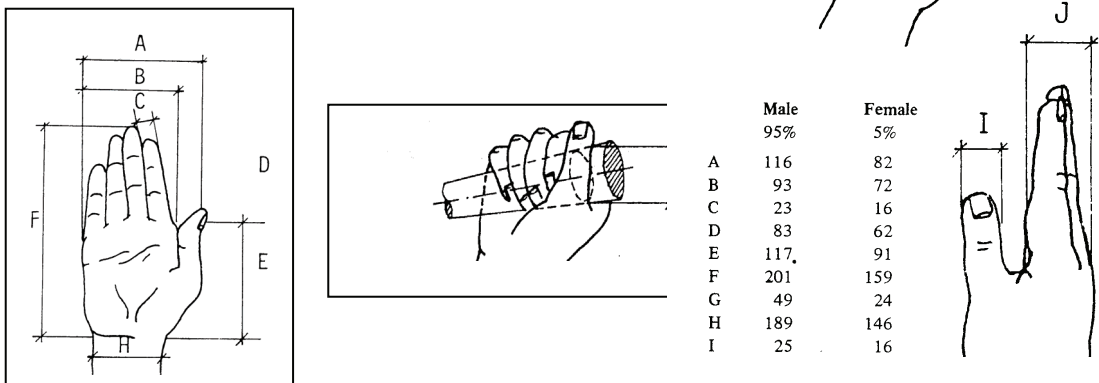


Fig 3.1(a) Hand measurement according to the German DIN standard (33402), Asian about 5% less

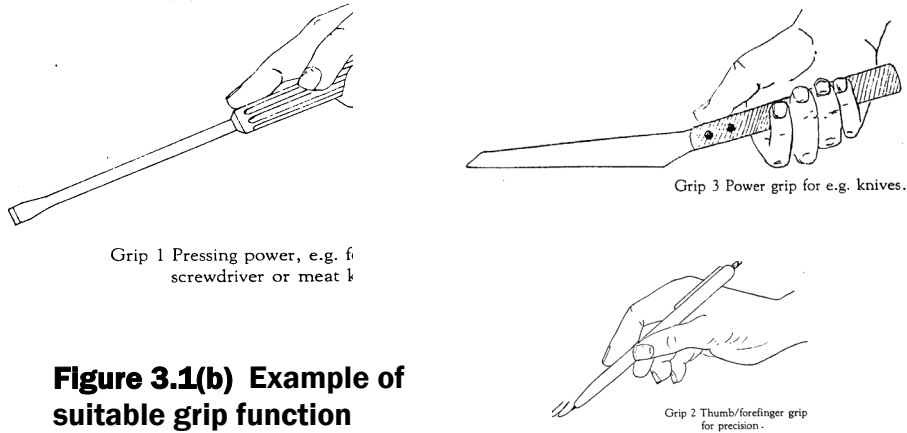


Figure 3.1(b) Example of suitable grip function

5. Figure 3.1(b) shows a number of examples of suitable grip functions. A *power grip*, for example, requires a completely different grip from that for precision work. In the design of e.g. knives, one must also make sure that they do not cause the knuckles to hit the chopping board or bench.
 - a) Muscle loading is reduced by making the grip surface as large as possible.
 - b) The diameter of the handle must be sufficiently large.
 - c) For round handles, the diameter must be larger than 2 cm but smaller than 3.5 cm. So-called anatomical designs (where an attempt has been made to design the handle according to the shape of the hand) are unsuitable, because there are such great differences in hand size - the handles will only suit those who have the same size of hand as the handles was designed for.
 - d) The handle must also have a high friction in order to reduce the muscle power needed to hold it, but must also have smooth enough surfaces to make it easy to clean.
 - e) The handle material should be matt, in order to avoid reflections.
6. Tools and smaller equipment, which are to be carried by hand, should not be too small. Pots and pans holding more than five litres should not be accepted for manual lifting. Lifting devices should be organised for larger pans. Frying pans should not be too big. Light metal pans with an overlay of cast iron weigh half as much as an ordinary cast iron frying pan, and are thus often a good alternative. All handles must be well insulated against the heat.

Larger equipment

7. Of larger equipment, machines and furniture, various environmental factors such as noise and air pollution will also be touched on. Washing up surfaces and worktables as possible should be able to be raised and lowered. The raising and lowering mechanism should be easily maintained. A central crank handle for all legs or via a hydraulic mechanism could for example operate it. Sinks should not be made too deep, as this creates unsatisfactory working postures. The waste outlet should be positioned centrally in the sinks.

Floor

8. The floor should be designed with as slip-free and easily cleaned material as possible. The floor should have sufficient slope for the water to run off quickly. There should also be sufficient drains. In larger kitchens, floor gullies are a good alternative. Water lying on the floor causes a danger of slipping.
9. The space under cupboards and benches should be sufficient to make access simple, for example for cleaning (the minimum distance) should be 25cm, although more than 35cm free space would be preferable). Machines and equipment, which is used frequently, should not be placed under bench height (see Figure 3.1(c)). Ovens, etc., should preferably be placed directly on the benches. Too high a position can be troublesome. High pouring cooking pots result in more comfortable working postures than others.

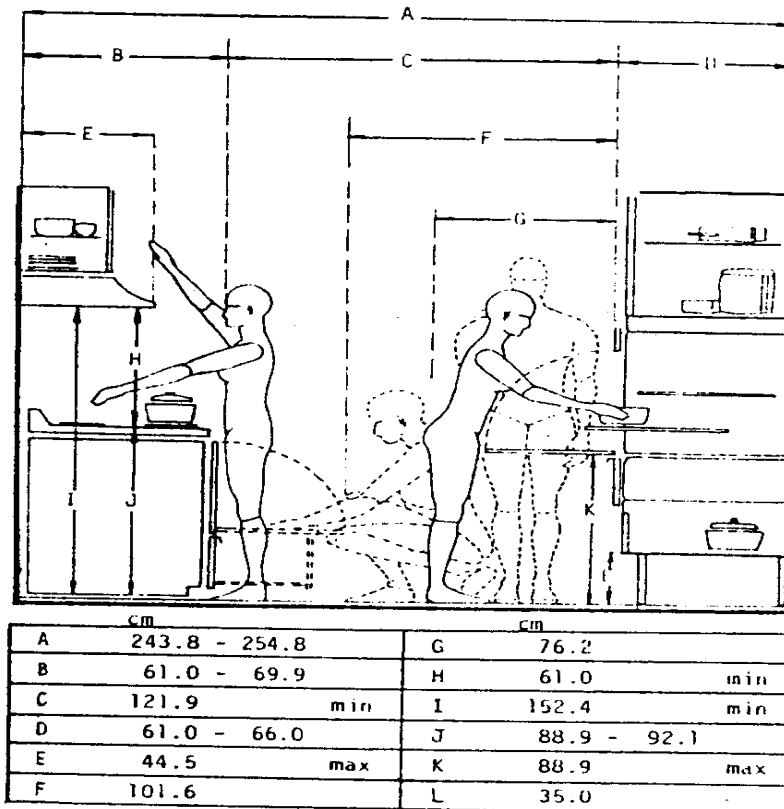


Fig 3.1(c) Space under cupboards and benches.

10. If, despite careful planning, it is not possible to obtain a workplace that is sufficiently easy to work in, a suitable *job analysis technique* may be applied.

Stove and grill

11. It is important for there to be sufficient laying-down space around stoves and grills. These surfaces should be at the same height as the respective stove or grill. There should be access to cold and hot water and waste disposal near the stoves/grills. Handles on grill pans, stewing pots etc. should not be positioned so that there could be a risk of injury by burning. There should also be suitable supporting handles in the vicinity of the stoves and grills, so that one is less likely to grasp for the hot surfaces by mistake if there is a risk of slipping. Fat and suchlike should be able to be drained from the frying surface by giving it a slope. Larger frying pans (over 80x80cm) should have mechanically aided tipping (e.g. hydraulic or motor driven). The frying surface should be adjustable for height.

Cutting machine

12. Cutting machine must be designed:
 - With protective devices on all rotating parts and sharp points
 - the instructions must be available with every machine.
 - they must be easy to clean.
 - must only be used for their designed purpose. A machine designed to cut meat, for example, must not be used to cut bread.
 - Hot surfaces must be protected against touching.

Traffic

13. A *traffic plan* should be produced for the kitchen, so that the distances walked can be made as short as possible. It is especially important to have suitable temporary storage close by. *Crossing traffic* should also be avoided. This will avoid much trouble and danger.
14. When planning the *traffic*, one must make sure that there is no traffic alongside oven doors and stoves. Doors which open downwards must not be sited in frequently-used passages. Hot objects in the form of stoves, cooking pot, etc. should not be positioned at crossing points or curves without being provided with guards.
15. Steps or stairs should be avoided between the different areas of the kitchen; if possible, lifts should be installed.

Washing up and dishwashing

16. The main functions in the handling process for dirty crockery are:
 - a. (Clearing the table)
 - b. (Transporting the dirty items)
 - c. Reception: sorting, scraping, rinsing off, stacking
 - d. Washing up: feeding in, pre-wash, chemical wash, rinsing, draining, drying and feeding out (heat, steam and noise produced).
 - e. Sorting out: sorting, checking, storing
 - f. (Redistributing: choosing and picking out)
 - g. (Transport)
 - h. (Table setting)

17. With the exception of those, which are in parentheses, most of the above functions are part of the area of responsibility of the washing up personnel. The job of washing up is often carried out
- Under poor environment conditions with high noise levels and high temperatures.
 - Under wet condition and is done while standing on slippery floors with considerable risk of slipping.
 - exposure to various chemicals,
 - with physical loading which is usually high, with difficult working postures and heavy lifting.
18. One important problem for the washing-up staff is that the work load tends to vary greatly. By providing the dishwashing area with some form of storage, the peak loadings should be able to be evened out.
19. In order to off-load the washing-up personnel, it is desirable for either the customers or the serving personnel to help in the preparation work by for example sorting, scraping and even soaking. In some cases, the stacking can also be done by the waiters or customers. Having a continuous conveyor belt to the dishwasher avoids heavy lifting when loading it up. The dishwasher is best placed in a separate room and the workplace outside the room.
20. Environmental problems in the form of noise, heat, etc. can be considerably reduced in this way. One possible design for a dishwashing area is shown in Figure 3.1(d).

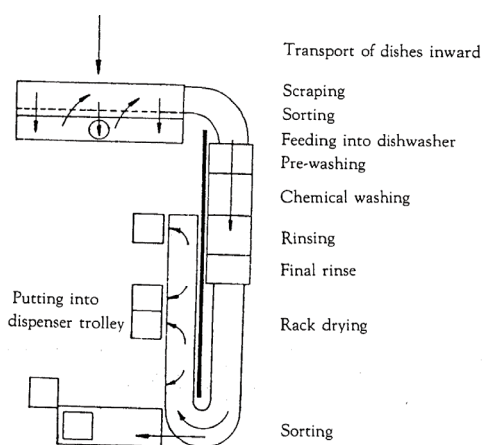


Fig 3.1(d)

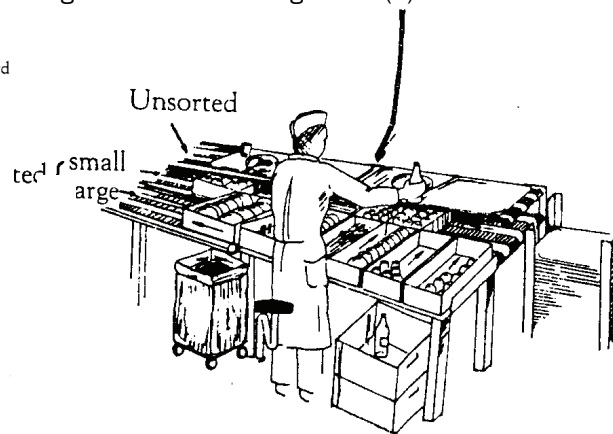
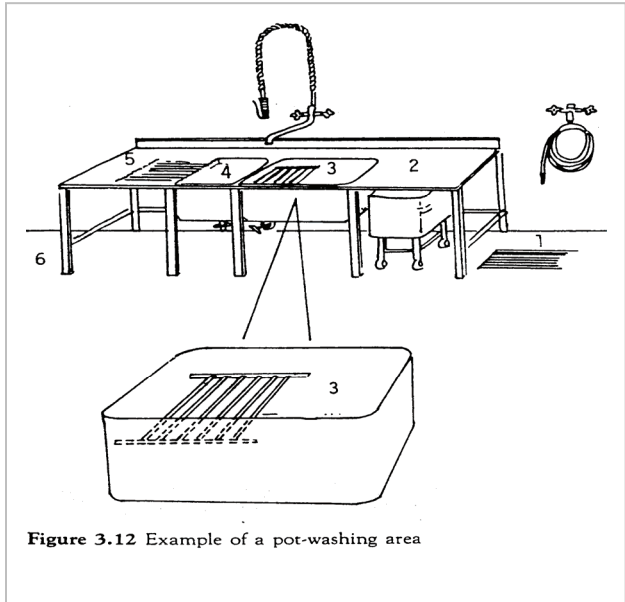


Fig 3.1(e) Reception and sorting of dishes on trays. Cutlery normally has to be soaked.

21. If it is not possible for the customers or serving personnel to carry out any of the preparation work, a special reception position should be organised. Fig 3.1(e) shows an example of such a position. The dishes come in on trays on the conveyor belt at a somewhat higher level than the workplace. Underneath the incoming dishes there is another conveyor for transporting copper, glass, bowls, cutlery, etc. Larger dishes are placed on the left-hand side of the worker, and go into the dish washing machine via a separate conveyor belt. Having two separate belts allows the height of the incoming dishes to be kept as low as possible. The work should also be able to be done sitting down.



22. The clean dishes are put into a dispenser trolley, which has easily adjustable springs, so that the correct working height can be maintained at all times. The dishes are taken directly from the drying side of the dishwasher to the trolley for further transport to where they are put away.
23. Figure 3.1(f) shows an example of a washing-up area for large items. There is access here to a rinsing *arm* which has cold and hot water mixed via a thermostat. This arm hangs down on an off-loading device. The sink has a loose grid in the bottom which can be raised or lowered, and thus forward-bent working positions can be avoided.
22. Washing-up machines for pots and pans using low-pressure water often have insufficient power for cleaning properly. A pressure of more than 50 psi is required for good cleaning. Cleaning of fixed equipment such as stewing pots, etc. can be done using a high pressure spray on an *arm*, or rotating brushes on a long shaft (see Figure 3.1(g)).
23. In order to avoid problems with the handling of chemicals, this job should be automated. Dishwashing machines should be easy to clean, and cleaning should be made easier by providing them with internal lighting.

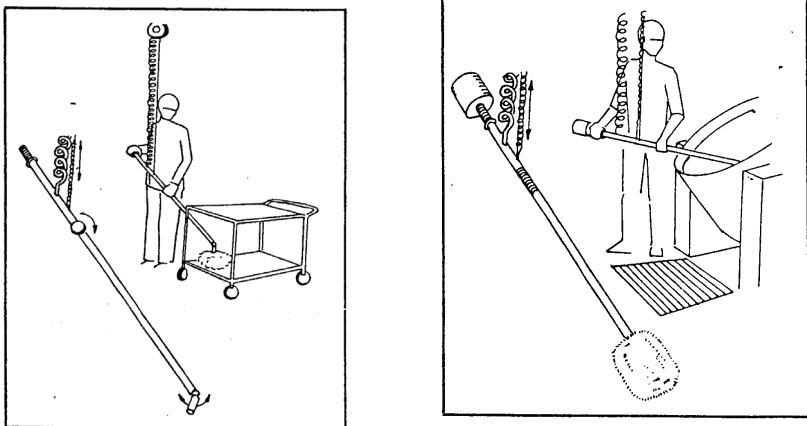


Figure 3.1(g) Ideas from “Washing up small and medium-sized establishment”

3.2 Serving, cafeteria buffets and bar

1. In a typical restaurant, the job of serving consists roughly of the following elements:
 - a. Preparation work
 - b. Selling: putting out the menus, taking the order, giving information
 - c. Writing down order, ordering in the kitchen, salad bar (cold table), bar
 - d. Finishing laying the table, fetching and transport of food/drinks
 - e. Serving: presentation of serving dishes, serving out onto plates, opening bottles, etc.
 - f. Paying: adding up the bill, taking the money
 - g. Bill checking and using the cash register
 - h. Clearing the table.

2. There are also serious environmental problems for the serving personnel, primarily in terms of poor lighting and air pollution, and in some cases also loud noise. The psychosocial environment may also be an important problem, the physical loading which cause bodily fatigue, partly because of awkward working postures. The feet are also heavily loaded. The reason for the physical loading being so great is often that the space is too narrow, that there are stairs and steps in the area, unsuitable working methods and lack of job aids.

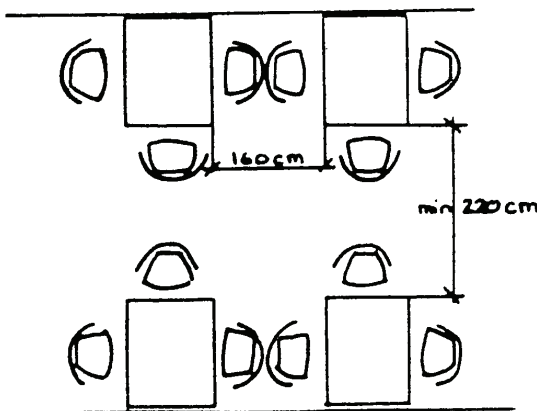


Figure 3.2 (a) Minimum space between tables in the service area

NB : chairs are drawn pulled out

3. Stairs and single steps must be avoided, and the whole serving area must lie on *one level*. The staff areas should also lie on the same level as the kitchens with their corresponding storage spaces.

4. This allows the use of serving trolleys, and many of the problems with lifting and awkward loading can be avoided in this way. The service trolleys, which can carry heavy loads, should have rubber tyred wheels of large diameter. Tables to which access to the serving trolley is not possible can be provided with pullout flaps that can be used in serving.

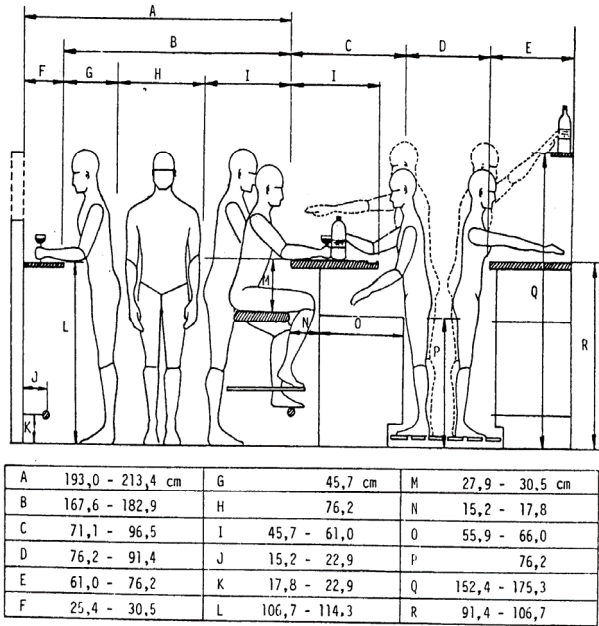
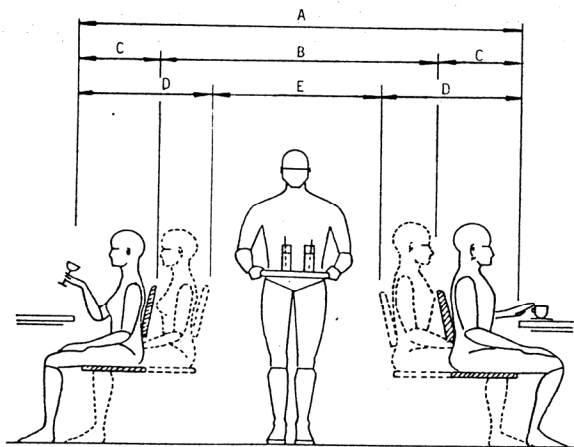


Figure 3.2(b) Measurement in bars



A	min 220 cm
B	130
C	45,7 - 61,0
D	76,2 - 91,4
E	91,4

Figure 3.2(c) Measurement in table service

5. Special *servicing places* can be positioned at suitable places in the service area, and supplied with storage with e.g. plate-warmer and storage for various items such as ashtrays, serviettes and cutlery. There should also be an area here for writing. The design of the serving areas should also take account of the possible future installation of computer terminals, which could be used for ordering, registering the order and possibly producing bills
6. Figures 3.2(a) to Figure 3.2(d)-show information on measurements which should be taken into account in the positioning of tables in the serving area. Note that the plan view of the serving areas should be drawn with the chairs at their outermost position in order to indicate the space requirements best.
7. It is important when buying from new to purchase the lightest trays, dishes and plates possible in order to make the job of serving easier.

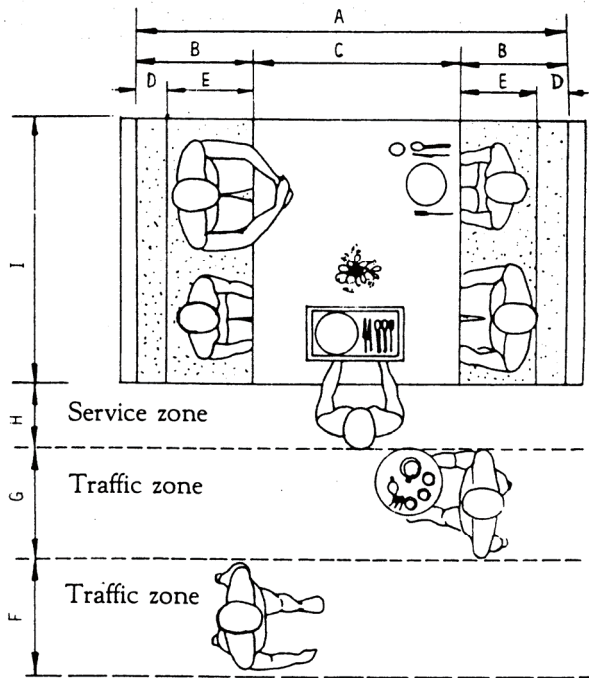


Figure 3.2(d)
Measurement in
cafeteria service -
tables service area

	cm
A	165,1 - 203,2
B	44,5 - 50,8
C	76,2 - 101,6
D	5,1 - 10,2
E	39,4 - 40,6
F	76,2
G	91,4
H	45,7
I	121,9 - 137,2

8. A good *working practice* is essential for avoiding problems in serving work. A natural and relaxed body position must be the aim in the job. The following factors should be remembered by the waiter/waitress:

- a. Balance (e.g. the same weight on both legs and feet)
- b. Symmetry (use both sides of the body, e.g. both arms and hands)
- c. Closeness (keep loads close to the body)
- d. Correctness (be well practised and skilful)
- e. Variation (use different techniques, use support areas, combine sitting, walking and standing)

9. It is important for the body to be in *balance* when, for example, carrying. Figure 3.2(e) shows an example of an unsuitable carrying technique. One should instead ensure that the load is *symmetrical*, using as far as possible both hands and/or changing between hands. It is also important when carrying to carry the load as *close* to the body as possible. When serving out, the serving dish should be held as close to the plate as possible. Use a serving trolley (Figure 3.2(f)).

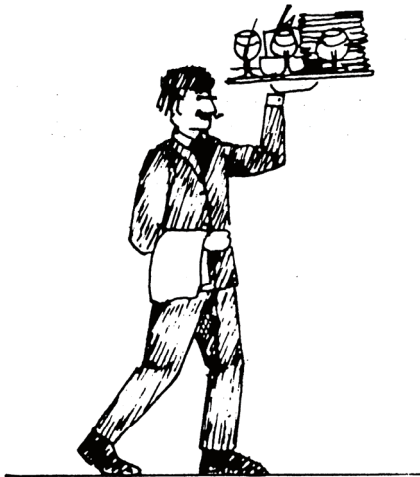


Fig 3.2(e) Carrying technique which tires the body. Heavy loads should not be carried with one hand.

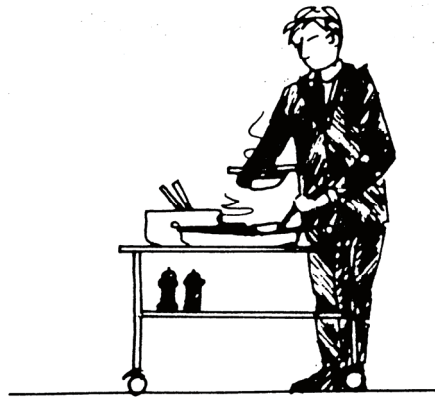
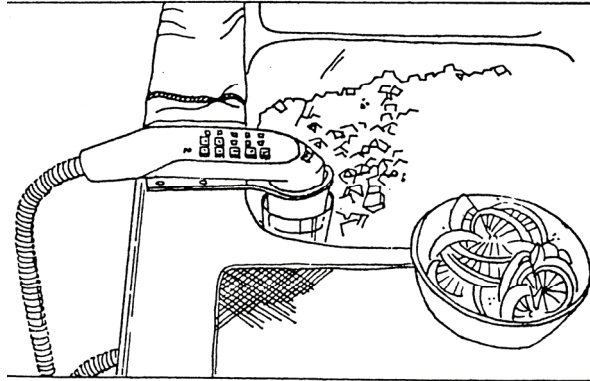


Fig 3.2(f) Using a serving trolley as much as possible.

10. The loading you expose yourself to and the rate of working chosen must be *correct* in relation to your capacity. Avoid overloading by lifting too much or running too much. This destroys the working rhythm and tires you out quicker. The basis for all work is to be able to *vary* a working position. In serving work, which is mainly done standing and walking, it is especially important to be able to sit down sometimes. Take any opportunity to sit!
11. The bar is a very special area of a restaurant. The work of the barman includes the fulfilling of orders from the serving staff for spirits, wine, beer and water. There may also be occasional direct selling to customers, as the bar may also act as a counter. The barman is often also responsible for the cash register. This is where the waitresses' orders would be checked to make sure that they agree with the food and drink which is served.
12. The bar is often tucked away into a very small corner, and has a large number of shelves. This results in very difficult and awkward working postures and in some cases also serious accident risks.
13. Considerable improvements may be obtained if a "pistol" is used for filling glasses (see Figure 3.2(g)).
14. These pistols can be connected to 10-20 different types of spirits, and a pair of such pistols would cover the vast majority (i.e. up to 40) of the assortment. This means that the barman only has a limited number of bottles containing the spirits which are less frequently ordered placed in the bar storage area. In addition, access is required to a small cold shelf for storing cooled bottles. Given these conditions, the work can frequently be done while sitting in a comfortable posture. The need to get up occasionally to reach the less frequent sorts of drinks will still remain, however.
15. But this is only an advantage. The bar should have water and waste, and the possibility of a certain amount of washing-up. The spirit store should be directly beside the bar, with frequently used lines in the crate rack. The fridge should not be lower than bench height.



**Figure 3.2(g):
Drink 'Pistol' for
dispensing up to
20 different type**

3.3 Cleaning, Housekeeping, Laundry

1. The cleaning room forms the cleaners' service space during work. The cleaning space should be designed for the following functions:
 - a. Filling and emptying of water, both in buckets and in multi purpose and other cleaning machines.
 - b. Washing of clothes when there is no access to washing machines.
 - c. Drying of cleaning cloths.
 - d. Storage of cleaning equipment, trolleys and wet cleaning equipment, vacuum cleaners and consumables.
 - e. Vacuum cleaning of dirty carpets, etc.
 - f. Hand washing after work is over.

The cleaning room must not be used as a staff room!

2. Apart from the cleaning room itself, it should have a direct connection with a linen storage cupboard. In addition, there should be space for washing and waste. Each cleaner should preferably have his or her own cleaning room positioned centrally in the area to be cleaned. There must always be one per floor, preferably close to where the laundry is delivered. The cleaning rooms should be placed close to areas which need the most frequent cleaning, especially using wet methods, such as toilets, showers, baths, etc. Figure 3.3(a) shows an example of how a cleaning room can best be laid out, based on suggestions from the Swedish Building Research Council.
3. The unloading shelf can be used for laying out textiles when vacuum cleaning or washing, and also for items such as buckets. The sink is used for emptying buckets. There should be sufficient lighting from the ceiling fitting over the sink. The mixer should be supplied with a rinsing hose.

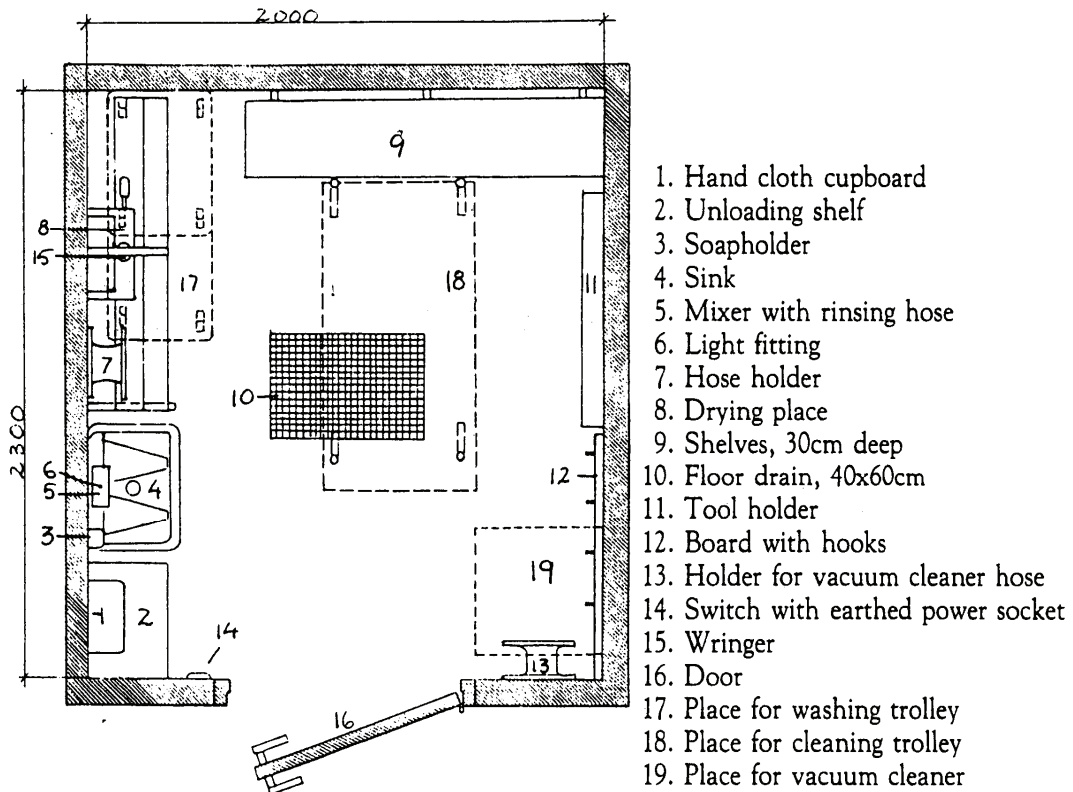
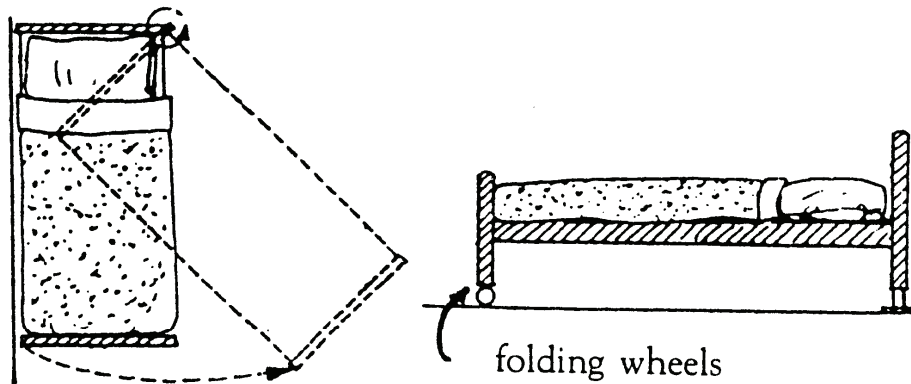


Figure 3.3(a) Example of a design for cleaning room with no access to cleaning centre. The example shows the principles of designing based on the functions which the room is to fulfil. The dimensions for the cleaning room are minimum measurements. The cleaning room should have direct access to linen store.

4. When planning from new, it is important to consider choosing floor material and cleaning materials which are easy to clean:
 - a. The wet areas and corridors should have floors with rounded edges against the walls in order to simplify cleaning.
 - b. The beds should be easy to swing out to allow access from both sides. This can be done, for example, as shown in Figure 3.3(b).
 - c. There are also other solutions, e.g. beds which use a lifting mechanism to lift them out from the wall. These give all-round access.
 - d. Tables, shelves, we pans, etc. should be mounted on the walls in order to avoid legs which make cleaning difficult.
5. In larger buildings where 10 or more cleaners are employed, it may be possible to have a special cleaning centre as a supplement to the cleaning rooms. Place must be provided for cleaning and linen trolleys.
6. Personnel engaged in cleaning work must have access to protective clothing, e.g. proper gloves.



Fi Figure 3.3(b) The bed may be swung away from the wall

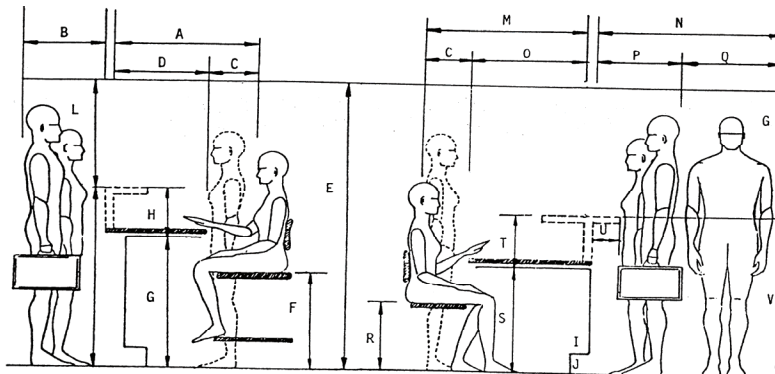
7. Laundry and dry cleaning are being outsourced from many hotels and restaurants. However in some cases these functions have become special business centres selling services to the public, hospitals and other hotels and restaurants. There are many environmental and industrial hygiene problems related to laundries and dry-cleaning, e.g. extreme high ambient temperatures, air pollutions from solvents and detergents. Detergents can also cause skin problems.

3.4 Reception, lobby and cashier

1. Problems that are facing by the receptionist, cashier and porter (if there is one) in the reception area is very high pikes in the work load. Others are
 - a. conflict and stress
 - b. lack of thermal comfort,
 - c. insufficient or faulty lighting conditions.
 - d. Draught problems,
 - e. unpleasant environment of VDUs and keyboards.

Conflict and stress

2. Where possible, the work in the reception area (both for the receptionist and the cashier, and also for the porter (if there is one) should be able to be done seated. Figure 3.4(a) shows a reception area where the work can be done both standing and seated. In a case like this, a chair with a forward-leaning or tipping seat would be suitable. Another alternative is to have a higher floor level in the cashier and reception sections than on the general floor area. In this way, the personnel can sit comfortably, but still be at a suitable eye height in relation to the customers. If a computer system is used for bookings etc., it should be possible to carry out the majority of the work sitting. The solution involving the raised floor is thus to be preferred. If possible the staff side of the reception desk should have a floor level on or two steps above the floor level on the guest side. This makes it possible to have seats for the staff.



cm		cm	
A	101,6-121,9	L	86,4 min
B	61,0 min	M	111,8-121,9
C	45,7	N	137,2
D	55,9-76,2	O	66,0-76,2
E	198,1 min	P	61,0
F	61,0-58,0	Q	76,2
G	91,4-99,1	R	38,1-45,7
H	20,3-22,9	S	73,7-76,2
I	5,1-10,2	T	25,4-30,5
J	10,2	U	15,2-22,9
K	111,8-121,9	V	99,1-106,7

Figure 3.4(a) Reception area for sitting and standing work

3. Another method worth trying is getting both the customers and the staff to sit down. This solution can have many advantages, among which is that the work becomes quieter and calmer if both the guest/customer and the personnel are sitting. In large hotels part of the reception is organized with seats for guests as well as for staff. This form of sitting down type of arrangement creates a more relaxed atmosphere and reduces stress.
4. The reception should be located in a reasonable quiet area. The reception staffs have a very difficult task to communicate on different languages direct or via phone. A noisy environment will make this task impossible.

VDU and arrangement

5. Most modern receptions are equipped with VDUs and keyboards. This demands special lighting requirements and windows arrangements. *This is discussed in the part of PART 2.2 VDUs USE OF COMPUTER SYSTEM and PART 2.15 Lighting*

Lack of comfort

6. Many of the problems in the reception areas arise because of the unpleasant environment. A certain degree of separateness should therefore be created for the reception personnel. The ceiling and any walls around the area should be made of a material which gives a sufficiently short resonance time (there should be sound-absorbent material under the ceiling). In certain cases, special protection against robbery may be necessary in the reception area.
7. Draught can be a particular nuisance. It is important for the hotel entrance to be provided with an air lock, as this can eliminate much of the draught and infiltration of hot ambient air.
8. The work of the telephone operator is no different from that of telephonists in general. It is important for the telephonist to be able to use an ordinary headset. The telephonist's workplace should be in close contact with the reception, as there is a need for frequent contacts between the telephonist and the reception staff
9. For further information, refer to
 - Guidelines on Seating at work
 - Guidelines on Standing at work
 - Guidelines on OSH in the office

3.5 Process Ventilation and Climatic problems in hotels and restaurants

Climate and discomfort

1. In serving areas, air pollution occurs because of smoking. In addition - particularly in busy dance rooms - the air temperature can be too high in relation to the work to be carried out.
2. The kitchen areas often have problems of excessive warmth, partly from radiation from hot surfaces. At the same time as exposure to high temperatures, there may be local draught problems due to poorly-designed ventilation systems. The air humidity in the washing-up room can sometimes be a problem, particularly in combination with high air temperatures. Air pollution can arise from cooking smells, etc., and if the ventilation is poor this can reach troublesome concentrations. On the other hand, measurements have shown that the health risks are minimal.

What criteria should be used for the climate?

3. There are three different effects on man which must be taken into account when specifying climate:
 - a. Health risks - hygiene requirements
 - b. Discomfort - comfort requirements
 - c. Performance effects - performance criteria
4. The basic and most important aspect is of course to eliminate the health risks. In addition, one should ensure optimum comfort and as good a working situation as possible.
5. In order to avoid *health problems* there are special *hygiene limits*. Table 3.5(a) shows the hygiene limit values for a number of substances that may occur in hotels and restaurants. As a general rule, the risk of overstepping the hygiene limit values in hotels and restaurants is very small. In a number of special cases, such as hotel garages, however, the risks can be high.

Substance	Highest value	Notes
Carbon monoxide	40 mg/m ³	May occur in garages and kitchen areas.
Benzo(a)pyrene	0.005 mg/m ³	Carcinogenic, absorbed through skin. Produced in small amounts in e.g. frying.
Organic dust	5 mg/m ³	e.g. Textile dust.
Nitrogen oxides	4(C) mg/m ³	e.g. in vehicle exhausts.
Perchloroethylene	140 mg/m ³	e.g. in dry cleaning.
Acetic acid	25 mg/m ³	
Turpentine	500 mg/m ³	
Benzene	16 mg/m ³	Carcinogenic
Acetone	600 mg/m ³	

Table 3.5(a) Hygiene limit values (average concentration over 8 hours) for a number of substance which maybe found in hotels and restaurants. The ceiling value (Shown by a [C] after the limit value) means the highest permissible short-term exposure.

6. Table 3.5(b) also shows the acceptable WBGT values (in degrees Celsius) at different work rates, where one can rest in a cool environment for different percentages of the time. These values can be exceeded in restaurant kitchens.

- a. Outdoors : $WBGT = 0.7 WB + 0.2 GT + 0.1 DB$
- b. Indoors : $WBGT = 0.7 WB + 0.3 GT$

where WBGT = Wet Bulb Globe Temperature
 WB = Natural (unventilated) Wet Bulb temperature
 DB = Dry Bulb temperature
 GT = Black Globe temperature

Per hour		Work load		
Work %	Rest %	Light	Moderate	Heavy
100	0	30.0	26.7	25.0
75	25	30.6	28.0	25.9
50	50	31.4	29.4	27.9
25	75	32.2	31.1	30.0

Light work : Sitting, occasional standing work with hands or light arm work.
 Moderate work: Walking, standing, light lifting, pushing, etc.
 Heavy work : Heavy lifting, walking up stairs, sawing, shoveling sand, etc.

Table 3.5(b) Permissible thermal loads in WBGT (deg. Celsius).

7. Table 3.5(c) gives some of the recommended climate limit values used in hotels and restaurants.

	Recom. air temp	Max Temp	Air Speed (at rec. room temp)m/s
Serving areas	20	23	0,25
Kitchen	18	25	0,30
Washing-up	18	25	0,30
Staff room	22	24	0,20
Reception	22	24	0,15
Bar	22	24	0,20
Cloakroom	20	24	0,20
Delivery area	20	25	0,30
Dry store	18	25	0,30
Salad bar	18	20	0,15
Freezer room	-22	-10	0,30
Cold room, meat	2	4	0,30
fish	0	2	0,30
Rubbish area	10	10	0,30

Table 3.5(c) Recommended values for temperature and air speed in different hotel and restaurant areas. With very high outdoor temperature, a 5-degree higher temperature can be accepted for a few days (max. 10) per year.

8. There must also not be too much *temperature difference* in the room. The difference between the front and the back of the body should not be greater than 2.5 degrees, and the difference between foot and head should not be greater than 3 degrees.
9. In the comfort region, the *relative humidity* only has a limited effect on the sensation of warmth and cold. However, the humidity can be important from the point of view of infection. If the climate is dry, the risk of spreading throat infections is greater. Also, a certain degree of drying out of the mucous membranes can occur, which makes them more sensitive to dust and smoke. The air humidity should therefore be over 30%. If the humidity is too high (much over 60%) there may be problems of condensation on walls and windows.

Preventive measures

10. For climate and air pollution problems, the problems should be tackled according to one or more of the following methods, in order of priority:
 - a. Prevent the problem arising in the first place
 - b. Limit and isolate the problem
 - c. Reduce the scope of the problem with general measures
 - d. Measures for the individual, e.g. personal protective equipment.
11. Figure 3.5(c) shows the principles of a ventilation system.
 - a. (1) is the *outside air* which is brought in from outside by the ventilation system. The round rings with triangles represent fans.
 - b. *Input air* (2) is the air which is fed into the area in a processed form.
 - c. *Transferred air* (3) is that which goes from one room to another, e.g. via cracks in the door or ducts in the wall.
 - d. *Exit air* (4) is air sucked out from the room.
 - e. *Feed5ack air* (5) is that part of the exit air which is reused by being occasionally mixed with the input air to become new input air.
 - f. The portion of the air which is blown outside the building is the *output air* (6).
 - g. *Circulated air* (7) is the air circulating around the room, with or without the help of fans. *Infiltration* (8) is air which is unintentionally supplied from outside (e.g. through gaps in windows and doors)

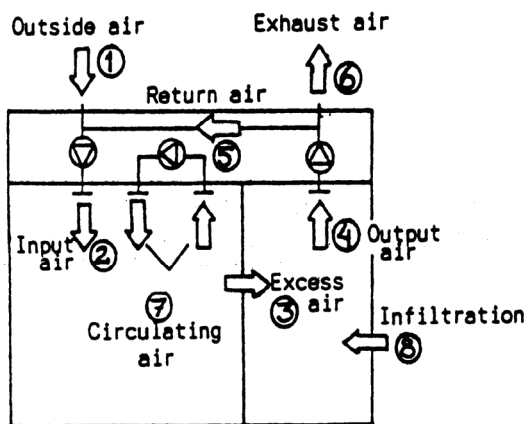


Figure 3.5(c) Nomenclature for air flow

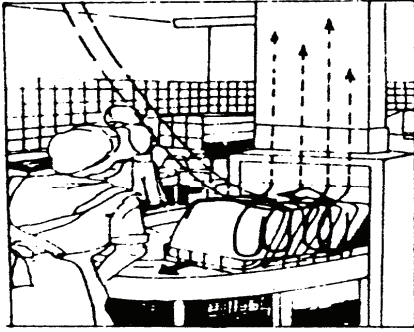


Figure 4.16

12. General ventilation (*) is the ventilation system which is used to take care of pollution which arises because of people in the room. Pollution from machines, frying, washing up, etc. should be dealt with using a special ventilation system - process ventilation (*). General ventilation can also be used for creating a good thermal climate in the room by warming, cooling and/or humidifying the input air - a process called air conditioning. Steam humidifiers should be used for humidifying. Other types of humidifier risk causing growth of micro-organisms. The thermal climate can also be conditioned by the use of heating elements on the walls. One may also raise or lower the temperature of the surrounding surfaces, e.g. via warmed or cooled ceilings.

(*) Note: The Swedish authorities define general ventilation as the minimum ventilation required, and process ventilation any additional ventilation requirement.

13. Air in the process ventilation must not be mixed with the general ventilation. The output air from the process ventilation should not normally be used as feedback air.
14. Figure 3.5(d) Dishwashers supplied with extraction both on input and output sides. The air flow on the input and output sides should be at least 1250 litres/sec per m² of open front area (750 litres/sec per m² where the front has a curtain over it). If there is a drying tunnel, the ventilation can be connected directly to this.

Preventing the problem at source

15. Counteracting the occurrence of warmth or cold or of air pollution in general can be very difficult, and is normally impossible in hotel and restaurant areas. The preparation of food requires heat, just as food storage requires cold. Food preparation processes produce certain amounts of pollution, and in the serving area it is very difficult, for example, to forbid smoking. On the other hand, the problem can often be prevented from spreading out into the room by proper design of machines and changes to the machines and equipment in the kitchens.
16. Because of the high surface temperatures of the dishwashers, stoves, ovens etc., unnecessarily great problems of heat arise. In addition, there are also considerable problems of radiated heat because of these high surface temperatures in combination with unsuitable surface materials.
17. The provision of dishwashers, convection and ordinary ovens, cookers and other equipment with sufficiently thick insulation can lower the temperature of the surfaces to less than 50 degrees, or a maximum acceptable 60 degrees. In this way, a number of the problems can be avoided. In addition, the insulation should be covered with a light shiny material, such as polished stainless steel. Table 3.6 shows that a painted sheet surface gives off about 1100 w per square metre to the environment via radiation. If the painted sheet is changed to a polished steel plate at the same temperature, the heat radiation to the environment is reduced to 250 w per square metre.

18. If a layer of insulation is then put under the polished steel plate so that the surface temperature drops to 50 degrees, the heat $Q = \min 250.P$ l/s (min 300 l/s) radiation to the environment is only 40 w per square metre.
19. The low surface temperatures are also important for preventing burn injuries. They should preferably be kept under 45 degrees.

Q = Output air flow

P = Free periphery in m ($2L + 2B$ minus the covered area, e.g. the short side in the diagram).

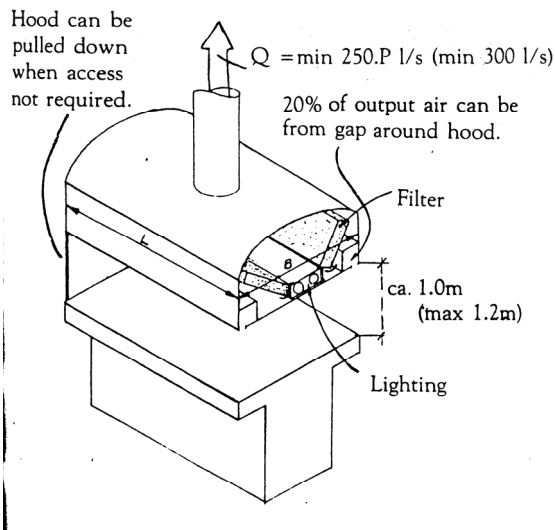
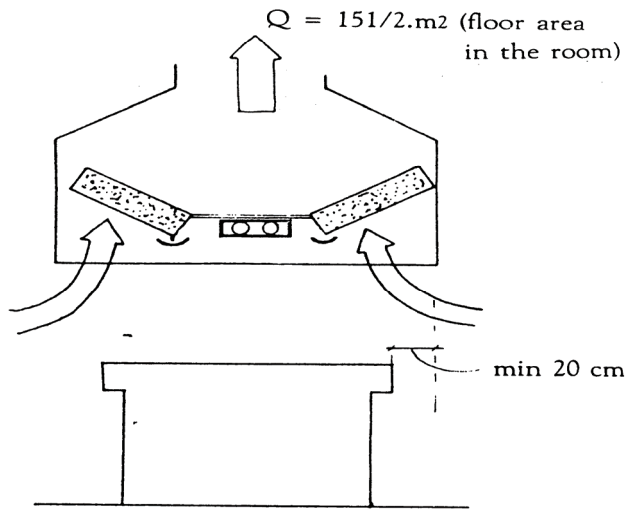


Figure 3.5(e) Ventilation over grill

20. In many cases, it is impossible to build equipment which seals off heat completely. For example, it is necessary to be able to look into an oven. It is also necessary to be able to see the whole top surface of a cooker at a glance. What can be done instead is to position an armoured glass or heat-resistant plastic sheet between the hot surface or equipment and the person. The glass or plastic plate should be provided with low-emission film (or reflective shield) which considerably reduces the heat radiated while maintaining transparency.

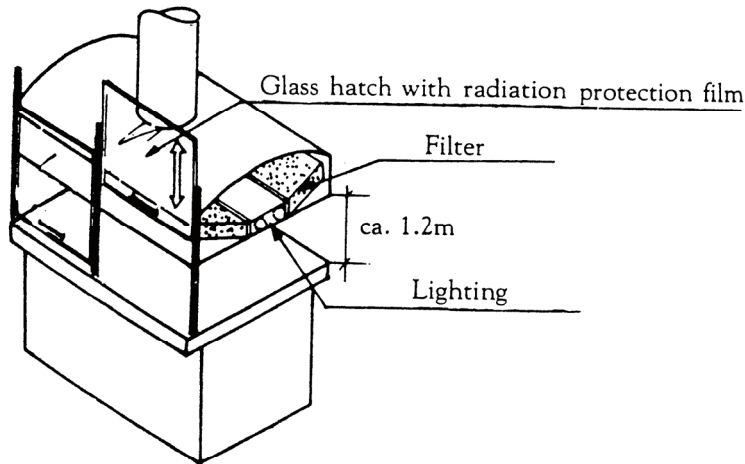


Figure 3.5(f) The grill can be provided with hatched covered with radiation protective film

Process ventilation

21. Process ventilation may be used to prevent the spread of heat and air pollution to the workplaces. The primary aim is to connect ventilation directly to the various machines. There are for example different types of dishwashers to which output air ventilation can be connected. The supplier of these machines should specify the amounts of air which should be extracted
22. In other cases special hoods have to be built over the equipment. This is then a question of placing the hood as close to the polluting process as possible. *Figures 3.5(d) - Figure 3.5(g)* give some examples of suitable quantities of air for different types of ventilation hoods for use in the kitchen and dishwashing areas. Process ventilation ducting should be able to be cleaned easily, and the filters should be easy to take out and clean/change.
23. It may also be necessary to supply the workplace, as shown in Figure 3.19, with its own input air at about the same rate as the output air into the process ventilation. The staff would in this way be standing in a fresh air zone.

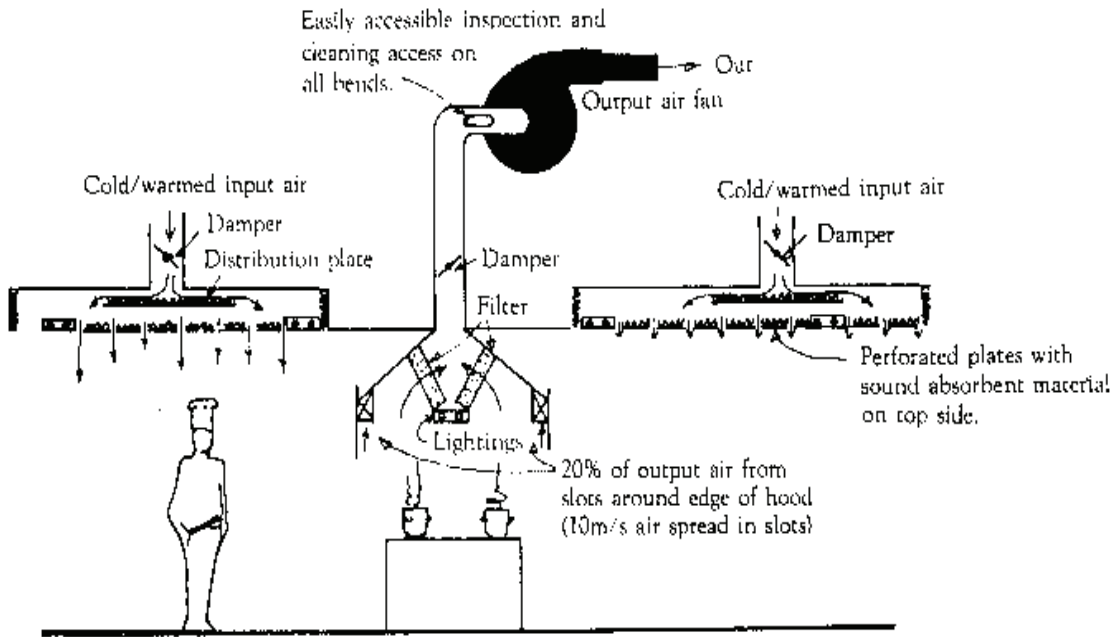


Figure 3.5(g) Example of ventilation in kitchen

General ventilation

24. Despite different types of local measures such as insulation and process ventilation, it is necessary to have good general ventilation. Good general ventilation is practically the only way to deal with pollution in the serving area. Figure 3.5(h) gives the amounts of air which should be supplied to different hotel and restaurant areas in order to achieve effective general ventilation
25. The bar is an example of an area where one should provide large amounts of fresh air. In order to avoid draught problems for the staff, who are relatively static, it is necessary to use a perforated false ceiling which is sized so that air speeds cannot exceed 0.2 *m/s*. If air conditioning is provided it may also be desirable to provide cooling in the false ceiling so that the temperatures of the air supplied are not too low, as this in turn can cause draught problems.

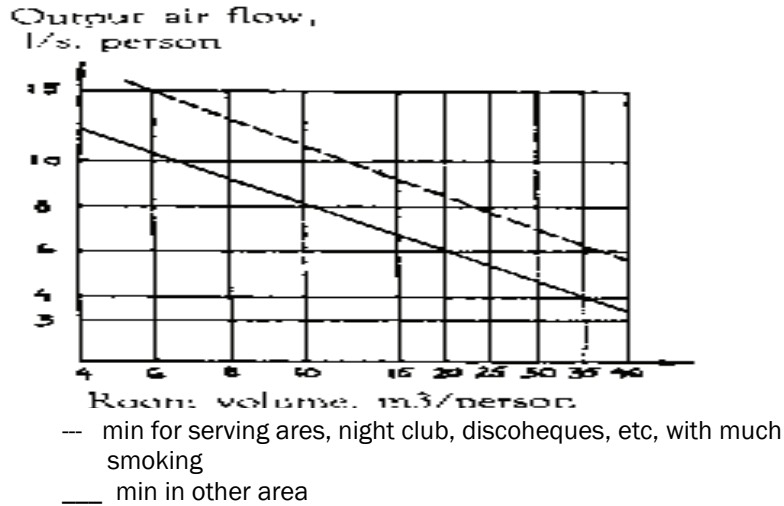
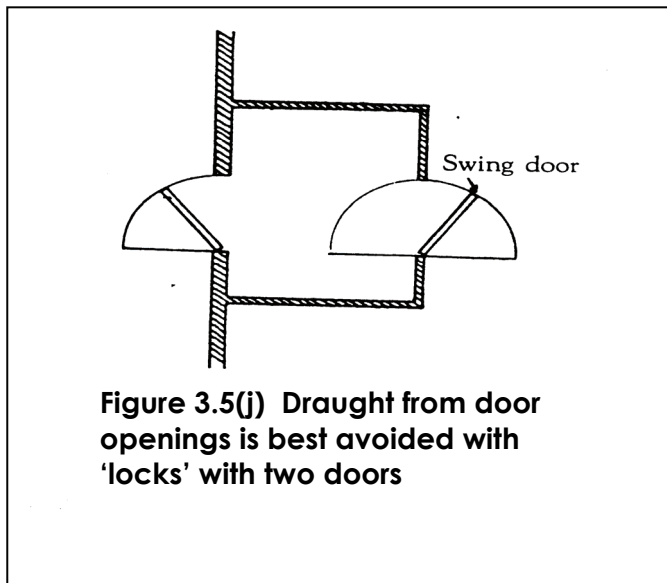


Figure 3.5(h) Fresh air requirement

26. In other areas, too, where excess warmth has to be cooled down, it may be best to combine air conditioning with removal of the heat by means of the ventilation air and lower ceiling temperatures. In this case, the ceiling is fitted with water tubes in which cooled water circulates, and this reduces the problems of draughts.



27. The kitchen should have a certain under pressure in relation to other rooms. The output air should therefore be greater than the input air quantity. The windows in the kitchen should face north or east (in the northern hemisphere).

28. Local draughts from windows and other colder sources are best avoided by not having any fixed workplaces in these areas. If this is not possible, one should:

- a. Insulate the surface. Cover it with shiny material.
- b. Compensate for the cold effect by placing a heat radiator, such as an electric bar fire, beside the cold surface.

29. Draught from the delivery area, entrances, cold room and other doors which are used frequently should be provided with an 'air lock' (see Figure 3.5(j)).

30. Humidifying should be carried out with caution in food areas. A steam humidifier should be used if one is necessary.

Other environmental factors

31. Apart from the factors already covered, there are a large number of others of which only a few are of interest to the hotel and restaurant trade. These include
- a. chemicals,
 - b. radio-frequency radiation (e.g. microwave radiation),
 - c. UV and IR light - Ultraviolet light may sometimes be used as an effect light in night clubs and infra-red may occur in grills.
 - d. ultrasound and infrasound and electric fields - infrasound, i.e. very low frequency sound occur due to badly dimensioned ventilation or heating installations.
 - e. microwave radiation in connection with the use of microwave ovens
 - f. the handling of chemicals - in particular various types of cleaning

Facts About Chemical Risks

Chemical substances can affect the body in a large number of different ways depending on substance, concentration, exposure, time, presentation, etc.

- The injurious effects increase, the longer one is exposed to a pollutant and the higher the concentration.
- Presentation may be via breathing, skin or the gastro-intestinal tract.
- Disposal may be via breath, urine, sweat or faeces.
- Injurious effects may be *local* or affect the whole body (*general poisoning*).
- Effects may be *acute* or *chronic*.
- Hygiene limits are usually determined by governmental authorities, and specify the highest concentrations which may occur at workplaces.
- Sensitive individuals may get injurious effects even at concentrations under the hygiene limits.
- Certain substances (e.g. carcinogenic) have no concentration levels under which no injurious effects may occur.
- Every year several thousand new chemical substances appear, and nature is regularly polluted by over 50,000 different substances.
- Injurious effects of most substances are not fully researched. The hygiene limits therefore change when knowledge increases, but the question mark is particularly large for low concentrations over long periods.




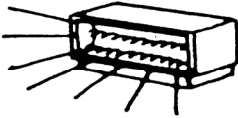

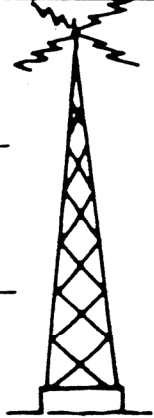
Ionising radiation	Gamma and X-ray radiation	
	Ultraviolet radiation	
Optical radiation	Visible light	
	Infra-red light (Heat radiation)	
Radio frequency radiation	1mm Microwave	
	1m Short wave	
	100m Medium wave	
	1000m Long wave	

Figure 3.5(k)

Type of electromagnetic energy (radiation) arranged by wavelength. The ionizing radiation has shortest wavelength and radio frequencies the longest. Waves with wavelength between 1m and 1 mm are known as microwave.

Microwave ovens

32. Microwave radiation is an electromagnetic radiation of the nonionizing type (i.e. is not radioactive). Figure 3.5(k) shows the spectrum of the different forms of electromagnetic radiation. It shows for example that visible light is a form of electromagnetic radiation, as is heat radiation, i.e. infra-red radiation.
33. Electromagnetic radiation with a longer wavelength than optical radiation is known as radio-frequency radiation. Occupational health or special radiological protection authorities in most countries today have produced regulations on the use of radio frequency radiation, and in certain cases also on microwave ovens but not in Malaysia.

34. Microwaves radiation have the warming-up effect which occurs when microwaves enter the body and
- have the ability to penetrate water-containing material, e.g. most food substances. The same is of course true for man's own body.
 - create the risk of eye damage if one looks directly at the grill element over a long time.
 - Also have a deleterious effect on implanted heart stimulators or 'pacemakers'. Wearers of these must seek medical advice before starting to work where they might be exposed to microwave radiation
35. Microwave ovens should be approved and tested before they are brought into service. The norms (Swedish) specify that
- microwave leakage in normal use should not exceed 50 W/m² at 5cm distance from the oven
 - the manufacturers of microwave ovens must ensure that the microwave leakage does not exceed 20W at 5cm distance. The measurements are made both with the door closed and with the door as open as it can be without switching the microwave power off.
36. Normal use of microwave ovens in restaurant kitchens should not cause any risk to health. There are no special health requirements in the positioning of ovens. But
- it may be better to place the microwave oven in sites where people are not standing permanently or working directly in front of the oven.
 - The oven should not be placed right in front of a person's groin at his normal workplaces.
 - Neither should the oven be positioned in such a way that customers pass too close to it (bearing in mind the risk of disturbing pacemakers).
37. The most common reason for microwave ovens leaking too much is that the oven door does not close properly. Warping, food remnants and other damage to the oven door or its supports (e.g. hinges) can produce similar leakage. Damaged or worn safety switches which allow an oven to run when not completely closed can be very dangerous. If the door can be opened without the radiation stopping, permanent eye damage can occur in a very short time.
38. Even though only few planning regulations are relevant to microwave ovens, there are many factors which should be considered when using them. The following recommendations should be adhered to:
- Ensure that the oven door is properly shut before switching on
 - Don't put objects in the way so that the door cannot close, and don't let food remnants, etc. build up on the front or edge of the oven.
 - Check that the closing surfaces on the oven front and the edge of the door are not damaged.
 - Don't interfere with the safety switches in any way or try to inactivate them.
 - Make sure that the oven door is not damaged, bent or crooked, and that the hinges and locking mechanism work well.
 - Never use the open oven door as a resting place for objects.
 - If a fault is confirmed, the oven must not be used before the necessary repairs have been carried out. Servicing of microwave ovens must only be done by someone of proven competence in the area. Information about this can be obtained from the Factory Inspector or equivalent.
 - Do not place ovens at eye height.

Use of chemicals

39. Different types of chemicals can give rise to different forms of injury to people, from irritation to cancer-producing effects. Chemicals affect people via:
- a. Breathing organs
 - b. Skin
 - c. Digestive organs

In many cases, the effect is via a combination of these.

40. Some chemicals occur as air pollutants. Their effect is then largely through the breathing mechanism, but may also be via the skin.
41. Preventive measures in this case are concerned with ventilation, and are covered in the chapter on 'ventilation and climate'.

Other aspects other than air pollution.

42. In order to minimise the creasing of textiles, they are often treated with resins containing formaldehyde. These formaldehyde resins are strongly allergenic. *This type of crease-resistant treatment must not be used on textiles in hotels or restaurants.*
43. The commonest chemicals occurring in hotels and restaurants are those used for cleaning and various forms of 'conservation' of textiles.
44. Some types of carpet are treated with substance to protect them against the formation of moulds. As long as these substances stay in the carpets they are no great problem, but when the carpets are being cleaned (e.g. vacuum cleaned) the substances may loosen and come out into the air. They; too, can be allergy-producing.
45. A large amount of cleaning and degreasing materials are used, e.g. detergents for washing up pots and pans, dish washing and when cleaning. Most of the chemicals used for this purpose can give rise to allergies and other health risks. We shall look here at some of the general risks such cleaning agents present; this will be followed by some general advice. Cleaning and degreasing substances may be divided into three groups, alkalis, acids and solvents. Practically all these products contain *tens ides* as an active additive.
46. The alkali part normally consists of phosphates, carbonates, silicates and hydroxides. Alkalis corrode and irritate skin and mucous membranes in the eyes 'and air passages. The least possible amount of alkali should therefore be included in cleaning materials. Lye (caustic hydroxides) must therefore only be used in them if it is absolutely necessary.
47. Acids are necessary to dissolve certain coatings such as chalk and rust on cooking utensils and in wash basins and toilets. Acids can have a very corrosive effect on the skin and mucous membranes. Nitric and sulphuric acids are important examples of strongly corrosive acids which must be used with great caution. Organic solvents occur in the form of ethyl esters, glycol ethers, ketones, chlorinated hydrocarbons and petroleum derivatives which are used primarily as degreasing agents. All have an effect on the nervous system, and some also affect the liver and kidneys; some are also suspected as being carcinogenic. Most solvents are unnecessary in the hotel and restaurant trade.

48. Tensides, whose task is to loosen the dirt and lower the surface tension of water, can be very variable from the risk point of view. Some products are practically risk-free, and others can even cause a risk of cancer on long-term exposure. Tensides which contain ethylene oxide are among other things suspected of being carcinogenic.
49. Using a combination of dish washing and drying agents may cause unwanted gases to be produced. If the washing powder contains *chlorine* combined with a drying agent with a low pH value (5 or lower), there is a great risk that chlorine gas will be produced. The amounts must be correct! This type of unwanted combination can also occur in the laundry.
50. One should also try to use the product in such a way as to produce as little dust as possible. If possible the dishwashers should have some form of automatic filling, as should washing machines and others using large quantities of cleaning agents.
51. Silver cleaning substances should be used as little as possible. Use a cleaning machine instead.
52. One should also attempt to find a method of working which produces as little pollution in the air as possible and causes as little contact with the skin as possible. Spraying of cleaning agent is a typical example of a method which should be avoided as much as possible because spraying almost always involves producing increased concentrations of pollution in the air (also, protective glasses must be worn when spraying). As there is no cleaning agent which is completely risk-free, personal protective equipment should often be worn. Protective gloves are the commonest form of protection. It is important to use protective gloves which do not cause allergic reactions themselves, which may be the case with certain plastic and rubber gloves. Chromium-tanned leather may also give rise to allergies.
53. One should strive to store cleaning agents and other chemicals in one place. At the site where they are stored, there should be clear instructions on:
 - Any risks from the substance
 - Protection and handling instructions
 - Contents of the product
 - Marking according to existing norms.
54. If there are staff who do not speak the language, they must be given instructions on the dangerous products in a language they do understand. It is the responsibility of the employer to inform the personnel on the methods for use, the risks and the protective measures. Protective gloves and glasses should be provided at every workplace.
55. As a guide, refer to USECHH Regulation 2000.

3.6 Special Lighting in e.g. Hotel and Restaurants and other parts of Service

Two alternative suggestions for restaurant lighting

1. A common method of creating a good aesthetic environment in the dining rooms is the choice of dimmed lighting and the use of relatively dark material for walls and furniture. The average luminance is thus made very low (0-5 cd/m²). At the same time, very high lighting levels are demanded in the kitchen areas. In addition, it is usual for hygienic reasons to choose a light, shiny surface material, giving a very high average luminance.
2. These lighting conditions are unsatisfactory for the serving personnel who have to go from the light kitchen area into the dark serving area as often as once per minute. No complete solution exists to this problem while it is felt necessary to have light walls in the kitchens and to have such relatively dark surroundings in the serving area. However, we shall discuss here two compromises. If the criteria for one of these two compromise alternatives are fulfilled, it should be possible to create aesthetically acceptable conditions in the serving areas and satisfactory lighting for the kitchen staff, while avoiding the problem for the serving personnel. Both proposals are based on making the visual object as clear and legible as possible, with high contrast and large clear details. The first suggestion may make the psycho-social conditions more difficult, so for this reason suggestion 1 should be avoided.
3. In the *first place*, one should aim to have a relatively high light level in the serving area, preferably not less than 50% of the levels in the kitchen. Suitable choice of warm colours, textiles and warm light sources (e.g. filament lamps and/or warm white strip lights) should be sufficient to satisfy the aesthetic requirements of most serving areas. There may of course be certain problems with this for night clubs and discotheques, and in this case one should investigate alternative 2 first.

Alternative 1

4. This suggestion is based on having a relatively low light level throughout the serving area. The aim is to create some form of 'lock' into the kitchen for the serving personnel, so that they will be able to keep the eyes adapted the whole time to the low light levels in the serving area. The average luminances in these areas can be kept very low. This means that one can choose relatively dark colours for walls, ceiling, floor and furniture. The lighting levels should also be able to be kept low. In order to avoid the area giving a bright impression, one could perhaps choose a light which directed the light mainly downwards, e.g. by means of small . spotlights sunk into the ceiling.
5. These illuminate mainly the horizontal surfaces, and little of the light falls on vertical surfaces. The general impression of the room will be that it looks relatively dark, In spite of this, the lighting on the tables and other horizontal surfaces is good, which is an advantage in the presentation of the dishes, while eating, reading the menu, price list, etc, The horizontal light level should be at least 10 lux, The wall luminance should be under 1 cd/m²,
6. From the lighting point of view, this alternative is probably relatively good for the serving personnel. Unfortunately, the suggestion has psychological disadvantages, as one is running the risk of reducing good cooperation between waiters and kitchen staff, It may also be difficult to achieve rational planning using this alternative, so that irritation can easily occur during the peak periods,

Alternative 2

7. Alternative 2 is based on accepting that a certain degree of re-adaptation must happen when going from somewhat lighter areas in the kitchen to the darker serving areas. An attempt is made, however, to achieve as gradual a change as possible. It is necessary to have an average of at least 10 lux on horizontal surfaces in the serving area. It is also preferable to try to have somewhat lighter wall surfaces in order to raise the average luminance level. Special reading places must also be organised, where there is at least 40 lux on the horizontal surface. Figure 4,6(a) shows a suggestion of how the entrance and exit to the kitchen can be designed to give a satisfactory result from the lighting point of view. Remember that it is fitting to have good and high levels of lighting in an exclusive environment,

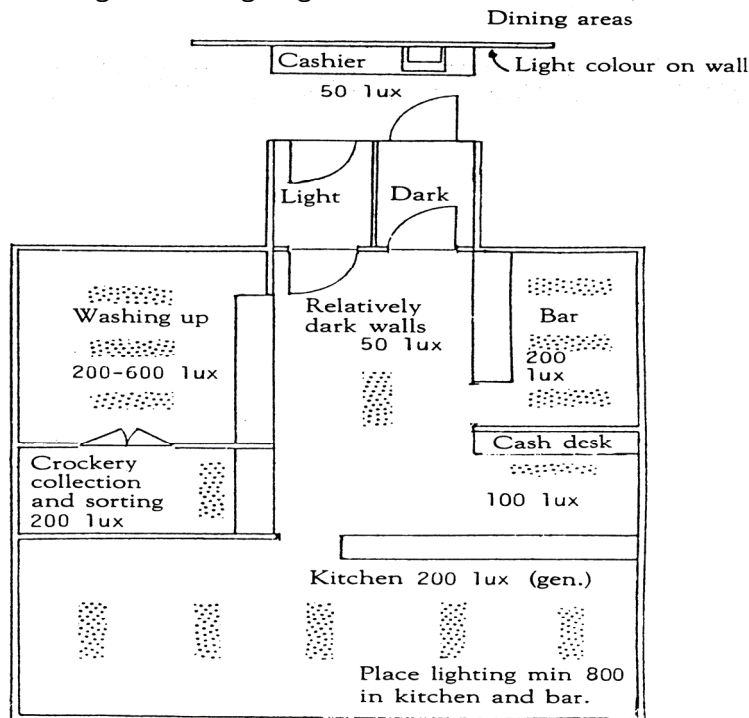


Figure 3.6(a) Design of gentle transition of lighting between kitchen and dining areas.

Common to both proposals

- In the serving area the tablecloths should be white, as should the bills and menus (in Alternative 1, one could use dark bills and menus with white text). The light levels in the walkways should be somewhat higher than the general lighting in the room. One should also have lighter flooring material in the walkways. The doors should be painted a lighter colour than in the rest of the area. The serving area can use warm light sources, such as filament lamps or warm white strip lights.
- It is necessary to have special lighting for cleaning of at least 400 lux for the whole serving area.
- The kitchen should preferably have a general light level of 400 lux. In alternative 2, the general lighting level in the kitchen area should be kept as low as possible - 100-200 lux is a suitable level for general lighting. For the surfaces where the serving personnel are also working, the light level should be reduced to 50 lux. In addition, the wall material in these areas should be as dark as possible.

11. It is also important for the general lighting in the kitchen to be complemented by place lighting. Over stoves, frying surfaces, chopping board, salad bar surfaces, etc., the light level should be as much as 800-1000 lux. In the washing up area, the light levels for sorting should be 200 lux, and for inspection of the washed items, 600 lux. Both in the kitchen and the washing-up areas, the light should have as good a colour rendering as possible, using e.g. strip lights of the daylight type.

Table 3.6 (a) Recommendation for differential area

Area/room	Light level	Colour rendering	Type of light source
• Serving areas			
– general	200 lux	Warm colours	Filament lamp/warm white fluorescent light
– discotheque/night clubs	10–50 lux	–”–	–”–
• Kitchen/salad bar			
– general	100–400 lux	Relatively light	Daylight striplights
– local lighting	ca 800 lux		
• Washing up	200–600 lux	–”–	–”–
• Bar	200 lux	–”–	Warm white striplight
• Serving space in kitchen			
– general	200 lux	Warm colours	–”–
– in dark serving area	50 lux	–”–	–”–
• Reception	400 lux	–”–	–”–
• Corridors	100–200 lux	–”–	–”–
• Hotel rooms			
– general	100 lux	–”–	–”–
– local	200 lux	–”–	–”–

Examples of detailed solutions

12. The following section presents a few examples of solutions to different problems which occur with lighting. In a serving area, it is necessary to have one or more serving stations where the lighting conditions allow the carrying out of more difficult visual tasks. Figure 3.6(b) gives a suggestion for the lighting of this type of workplace.

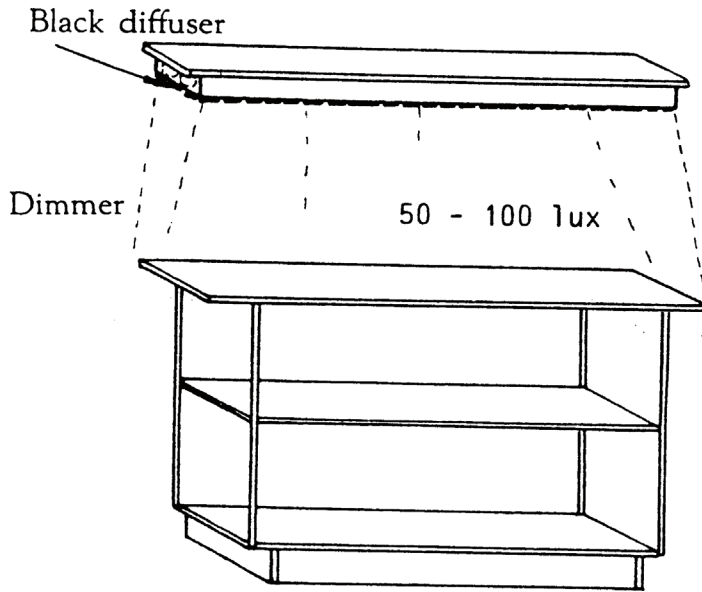


Figure 3.6(b) Lighting of serving station

13. Apart from the walkways within the serving area being lit at a rather higher lighting level, and being marked out with lighter flooring material, it is important for obstacles such as railings, etc., to be marked clearly. This may be done, for example, by painting them a lighter colour. It is especially important for stairs, and particularly single steps, to be clearly marked. Figure 3.6(c) shows how the lighting can be arranged fitted into or above the stairs.

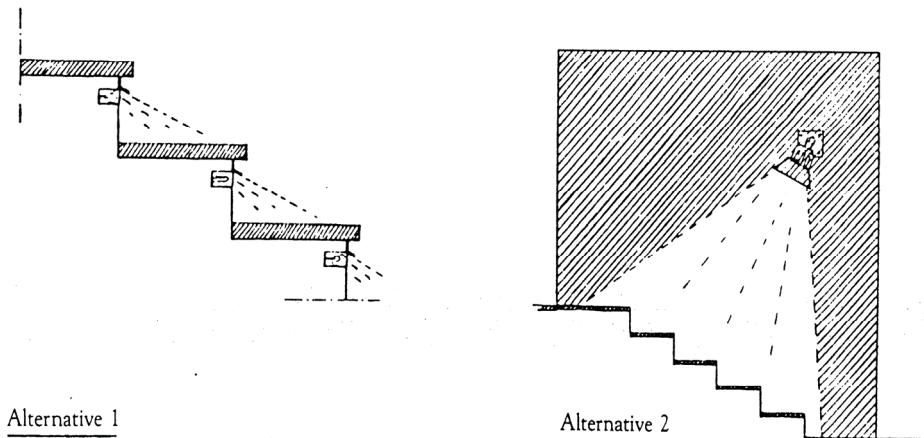


Figure 3.6 (c) Lighting of stairs

14. *Naked flames such as candles should be avoided, because the flickering flame causes considerable glare.* If, however, there are special reasons for having naked flames, these should be shaded in order to avoid flicker (Figure 3.6(d)). One should also for preference use coloured glass in order to reduce the glare still further.

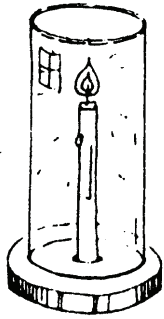


Figure 3.6(d) Shading of naked light

15. In the kitchen, the light should be concentrated on the different workplaces. The lights can be hung from the ceiling, or mounted into stands over benches. In certain cases, it may be even better to place lighting under shelves (Figure 3.6(e)). Figure 4.10 shows an example of how light fittings can be built into cooker hoods. The lighting over the frying surface and workbenches in the kitchen should be of the daylight type in order to give a good colour rendering. They should also be watertight.

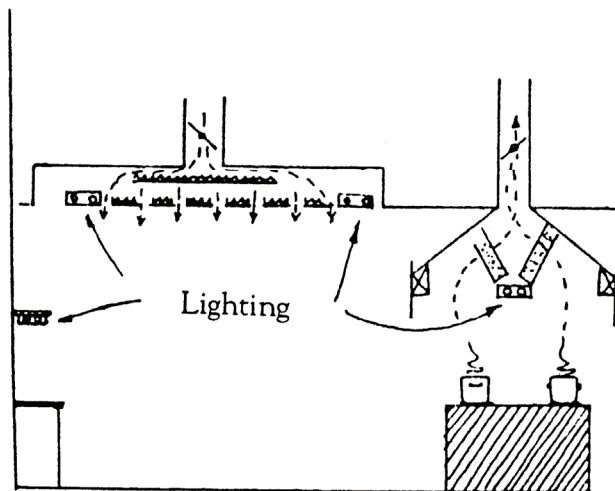


Figure 3.6(e) Lighting fittings in the cooker hood

16. Figure 3.6(f) gives examples of suitable table lamps which can be used at office workplaces and other places where more concentrated place lighting may be necessary. The advantage of this type of lamp is that the lamp reflector cannot be tilted up. This avoids the glare problems which are otherwise a common fault with badly-directed lamps where one can see the light source directly.

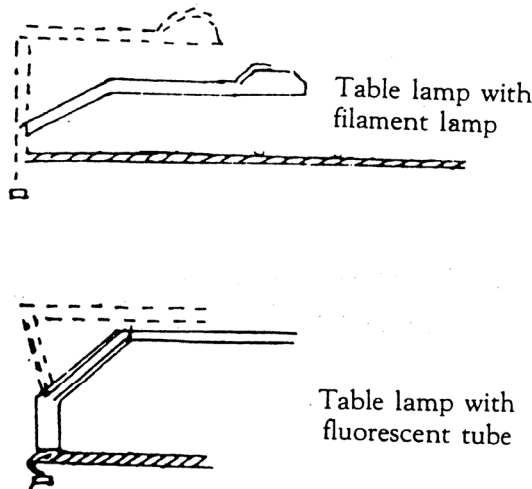


Figure 3.6(f) Good type of place lighting for terminal tables

17. In the next chapter we shall show how the lighting can be organised when VOU screens are in use. It is important when using these to avoid reflections in the screen or the keyboard. Also, the screen must be positioned in such a way that it has a quiet and relatively dark background. Screens cannot be placed directly up against a window.
18. Vacuum cleaning under table and beds causes a special problem. It is difficult to get sufficient light into these places. Modern vacuum cleaners are fitted with a special electrical socket which are designed, among other things, for motor-driven brushes mounted on the cleaning head. One could imagine in certain cases having a light on the cleaning head powered from this socket. In this way one would achieve lighting around the area being cleaned (see Figure 3.6(g)). However, this is not a substitute for good general cleaning lighting (min 400 lux).

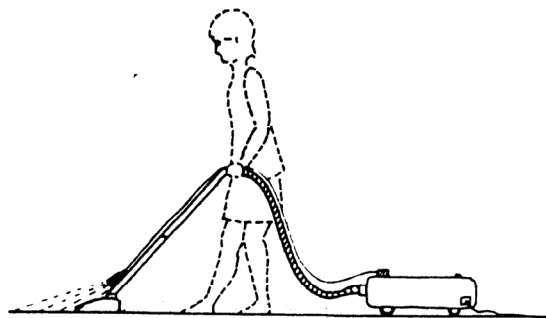


Figure 3.6(g) Lighting positioned on the vacuum cleaner nozzle

19. Effect lights are often used in discotheques and dance restaurants. Sometimes, ultra-violet light is also used (it makes white colours light up) in order to produce colour effects of different types. This form of lighting must be used with extreme care, as ultra-violet light can be injurious both to the eyes and the skin. Other types of effect light can cause problems, and even injuries (e.g. laser lights have begun to be used by bands). Installation of effect lights should be done in a way to allow as much flexibility as possible so that the personnel can change its characteristics if it becomes too troublesome.

20. Menus, wine list, bills, etc. should, as already mentioned, be designed to be read as easily as possible, with a large clear typeface. One should normally use black text on a white background, but a yellow background and another very dark colour may also give sufficiently good contrast. A black background with white or very light yellow green text may also be good. Here, though, a typeface should be chosen which has a rather fatter style than usual.

Visual tasks in hotels and restaurants

21. As with all planning, it is important when planning the visual conditions to know what the jobs involve, and especially the visual elements which are involved. There are many widely different visual tasks in hotel and restaurant work.

Table 2.15 Problems in various visual tasks in H&R		x = problem occurs to modest extent xx = problem occurs to a great extent (x) = problem occurs occasionally			
Special visual characteristics and problems	Contrast	Colours	Critical size	Glare	Reflections
Serving					
- Read notes	x/(x)	-	x	-	(x)
- Read orders	x/(x)	-	x	-	(x)
- Read menu and wine list	x/(x)	-	x	-	(x)
- See corridors	-	-	-	-	(x)
- See stairs	-	-	-	-	-
- See other obstacles	-	-	-	-	-
- Coins and notes	x	x	x	(x)	x
- Serving	-	(x)	(x)	(x)	x
- Setting and clearing	-	(x)	(x)	(x)	x
Kitchen					
- Salad bar	x	xx	x	x	x
- Meat preparation	xx	x	x	x	x
- Sauces	xx	xx	xx	x	-
- Cooking, grilling frying	xx	xx	xx	xx	-
- Reading and ordering	x	-	x	x	(x)
- Washing up	x	(x)	x	x	x
Reception and office					
- Read printed text	x	(x)	x	-	(x)
- Read handwritten text	x/(xx)	-	x	-	(x)
- VDU screens	xx	(x)	x	x	xx
- See coins and notes	x	x	x	(x)	x
- Misc. reception work	-	x	(x)	(x)	(x)
Floor service and cleaning					
- Cleaning	x	x	xx	(x)	x
- Bed-making	-	(x)	-	(x)	x
- Floor service	-	(x)	(x)	(x)	x

A dash means that there is no problem. A single x means that the problem exists to some extent, and two - xx means that the problems are very considerable. If the (x) is in brackets, this means that problems may occur occasionally

- 22 Within the hotel and restaurant trade, apart from the primary aim of caring for the visual demands and risk of problems for the personnel, one must also consider the guests. Their requirements include a pleasant and aesthetically satisfying environment, but also the need to see and to get about, including those with reduced visual abilities.
- 23 The steps which have to be taken in designing lighting for the hotel part are in principle the same as those required in the design of offices and other general public areas. On the other hand, it is a considerably more difficult and more specialised task to design lighting in restaurants.

4.1 ENVIRONMENT AND WELFARE

DESIGN AND LAYOUT

- 1 Workplace or workstation layout should be designed in such a way that risks of physical loads which are dangerous to health or unnecessarily fatiguing are averted. The employees should also have sufficient knowledge concerning
 - a. Suitable work posture
 - b. The proper use of technical equipment
 - c. The risk entailed by unsuitable work posture, working movements and unsuitable manual handling and
 - d. Early indication of overloading of joints and muscles

As a guide, refer to Guideline on Ergonomic.....

- 2 Workplace design should take account condition of the following:
 - a) peoples and vehicles should be segregated as far as is reasonably practicable. Traffic route internally and externally should be clearly defined and conspicuously marked. One-way traffic systems should be considered;
 - b) emergency exits should be clearly marked, easily and immediately open able and should always remain unobstructed and readily accessible. Wherever possible and in all cases from areas of high fire risk, emergency exits should open in line with the route of exit;
 - c) where lift trucks and other vehicles are used, areas should be flat and unobstructed; awkwardly sited doors or tight corners should be avoided as far as possible;
 - d) storage areas and gangways should be clearly marked out on the floor, including floor markings where necessary. Gangways should be wide enough to ensure that mechanical handling equipment can be easily maneuvered;
 - e) external doorways used by mechanical handling equipment should be protected from adverse weather conditions, by for example hinged rubber doors with vision panels, plastic strip curtains
 - f) staircases and ramps used for pedestrian access should be provided with suitable handrails;
 - g) access to automated areas should be strictly controlled, for example interlocked access routes, permit-to-work systems (see Automated Storage of Retrieval Systems section) .

FLOORS

- 3 Floors should be capable of bearing the general overall load to which they may be subjected and any point loading from stock either with or without pallet racking. Floors should be constructed and designed to withstand the use to which they may be subjected, for example physical damage from lift trucks and wheeled equipment, corrosion from chemical substances.
- 4 Where personnel are allowed access, all openings and edges of the floor should be guarded to prevent any goods or people falling and a safe means of access must be provided. It is particularly important that any sections of the guard which are removable for loading, for example by lift truck, are replaced as soon as loading is complete. A system of guarding is available which allows goods to be transferred to and from mezzanine floors while maintaining adequate protection against falls.

LIGHTING

- 5 Good lighting, whether natural or artificial, is vital in promoting health and safety at work. In all working and access areas sufficient lighting should be provided to enable work activities to be carried out safely. The level and type of lighting depends on:
 - (a) the type of work being carried out;
 - (b) the hazards associated with it.
- 6 In a workplace, there can be considerable obstruction to lighting, for example from racking. It is therefore important to arrange lighting to avoid shadows.
- 7 As a guide, refer to Second Schedule, Factory and Machinery (Safety, Health and Welfare) Regulation 1970

Notes:

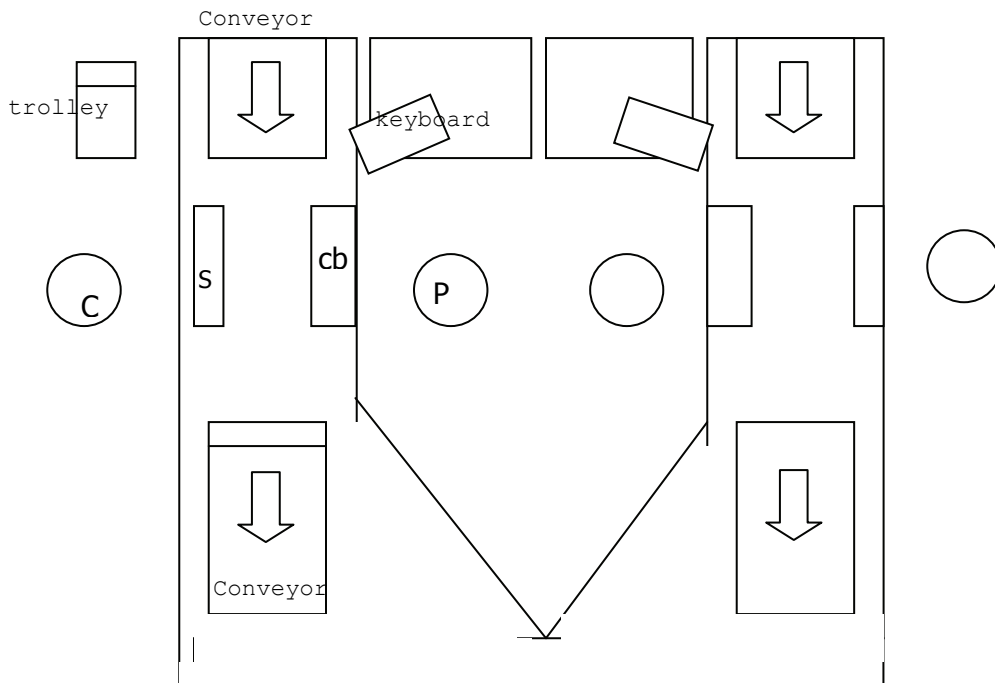
- i. Average illuminance is for the work area as a whole.
- ii. Minimum measured illuminance is the minimum permitted at any position within the work area.
- iii. Where the work or task is predominantly on one plane or vertical, the recommended illuminances are intended for that plane.

VENTILATION

- 8 Generally, effective and suitable provision should be made for securing and maintaining adequate ventilation by the circulation of fresh air in every part of workplace or workstation and for rendering harmless, so far as practicable, all gasses, fume, dust and other impurities that may be injurious to health arising in the course of any process or work carried on in a workplace.
- 9 Warehouses where loading/unloading doors are open during the working day will not usually require any special ventilation arrangements. However, specific ventilation requirements may be necessary for the storage of some materials or where combustion equipment is used inside the warehouse. A warehouse containing combustion equipment or plant, such as oil or gas fired heaters and lift trucks with internal combustion engines, will require air for the combustion process and, if the plant or equipment is not flued, to dilute toxic combustion products (carbon monoxide, carbon dioxide and oxides of nitrogen) to an acceptable level.

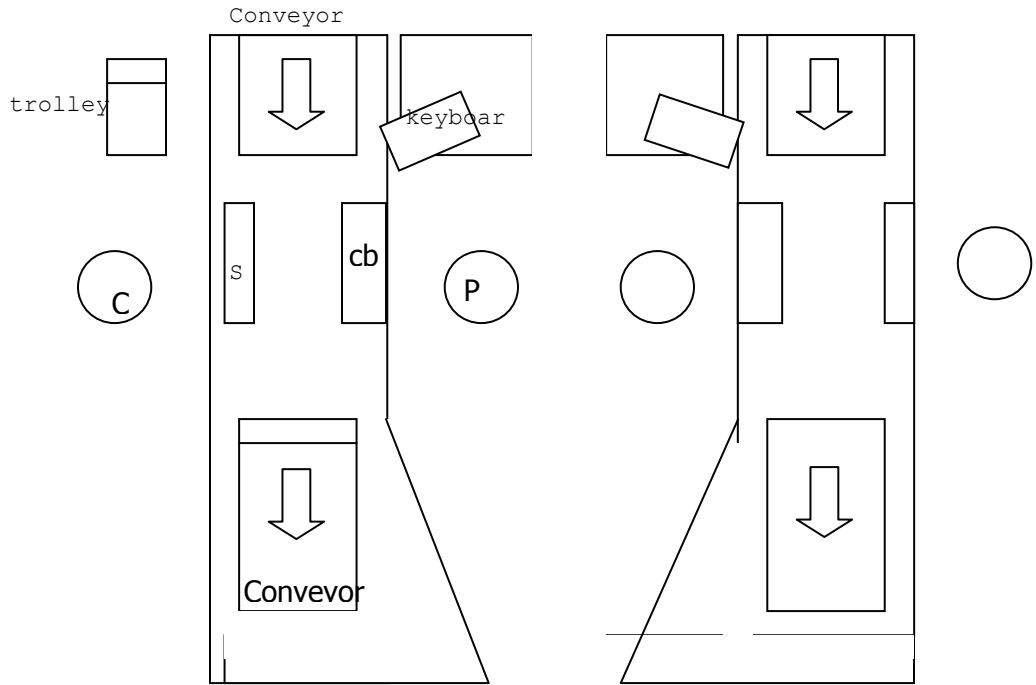
4.2 Guidelines for Cashier (transfer of ownership) workplaces

1. In self-service (wholesale or retail) trade the cashier function is integrated in special checkout systems. There are three main types of checkouts (1,2 & 3) of this type, according to the classification below and two more (4 & 5) for other applications. The first two are illustrated in figure 4.2(a) below. All the desks are for alternative proper sitting down or standing working positions. Chairs are adjustable.
2. Classification of Cashier systems:
 - 1. Twin checkout desks (a)
 - 2. One way checkout desks (b)
 - 3. Checkouts for large bulky goods
 - 4. Stand alone cash desks
 - 5. As a part of manual service desk



C – Customer cb – cash box P – Cashier S - Scanner

Figure 4.2(a)



C – Customer cb – cash box P – Cashier S - Scanner
Figure 4.2(b) One way checkout desk

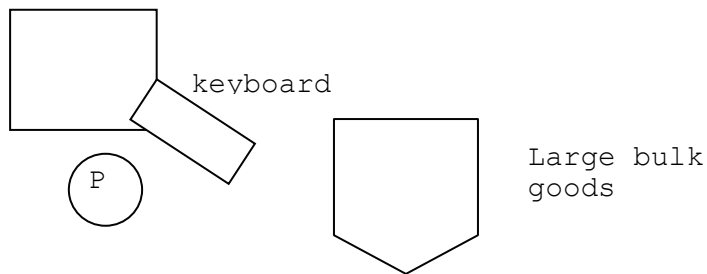


Figure 4.2(c) Checkouts for large bulk goods

3. The 'Twin checkout' is the cashier desk which require least floor space and it also the one with the highest overall level of functionality. It consists of a 'one way checkout desk' + a mirror layout of the same desk. One advantage of this twin layout is that two persons are working together in a team and can help and support each other. They are working in a confined space and are protected from the surrounding. In this way the risks of thefts are reduced. It also provides opportunities for more variation in working posture by having goods coming from the left or the right.

4. Both (1) and (2) contains one or two conveyor belts per cashier. They should be provided with a fixed scanner and a handheld scanner. The cashbox is mounted sunken into the desk in front of the cashier. The cashbox is covered by an automatic lockable lid (controlled by the keyboard). The keyboard is placed optional to the left or to the right of the cashier on a flexible arm. They also include credit card facilities.
5. The third desk is mainly for the use in wholesale stores and in supermarkets selling large, bulky goods. It assumes use of very large trolleys or pallets on small trucks. It has a small free standing desk, including cash box, credit card facilities and a handheld scanner. The scanner is preferably cord free, with communication via IR (note, it has to be different from IR in scanner) or radio-waves. The cashier is supposed to move around the trolley or truck and read the codes by the use of the handheld scanner.
6. The forth system is a cashier function standing alone in e.g. a large departmental store where the customers are only picking a few items per time. It usual consists of a manual scanner, a cash draw, credit card equipment, and a wrapping table. It is always an advantage if a high chair is available to reduce the load on feet, legs and back. Wrapping materials should be fitted in a special rack to make it easy and comfortable to use.
7. The fifth system is a cash desk integrated in a traditional manual service shop. Added is only a manual scanner. Otherwise it is a very traditional manual system. However, a chair should be provided.

4.3 Manual service and preparation areas

1. Most supermarkets and larger self-service shops have some kind of manual service, e.g. for meat (sometimes divided on beef, mutton, etc), fish and bakery. In more advanced shops staffs with special training and skills in the actual areas supervise the work. They can in some cases have special qualifications and even licenses (e.g. as profess of ability to cut (break) up meat in special ways). To cut meat and to prepare fish are an advanced specialties which demands high class work tools (e.g. very sharp knives) and good environmental conditions.
2. To match advanced precision, high quality and a fast workplace are difficult and create many severe risks for cuts and sticks. The best preventive action is probably advanced skill training, including safety aspects. Good lighting (min. 1000 lux) with a very high illumination level is a basic requirement. Red meat demands extra high illumination (min 2000 lux). But even white meat absorbs a lot of lights (high absorption means a low reflection and makes it difficult to perceive). The use of local maneuverable florescent tube lighting can make it possible to obtain several thousands of Lux.
3. From a food hygiene point of view, it is a requirement for a low ambient temperature and preferably use of gloves. However, the use of gloves and the low temperature reduces the sensor motoric ability.
4. The requirement at the fish and seafood desks are about the same.
5. The requirement at the bakery and the fruit and vegetable are lower.
6. At least one workplace should be arranged for sedentary work.
7. Special noisy machineries like sausage machines and high speed meat choppers should be place in separate sound isolated¹ rooms.
8. None slippery floor material is important as tripping when using very sharps knife could be very dangerous.

¹ The walls of heavy material and with sound absorption materials on the inside. The absorption material is covered with plastic to make it washable.

4.4 MECHANICAL HANDLING (LIFT TRUCK)

General

1. Mechanical handling devices are used extensively to move materials and goods into, out of, and inside warehouse premises. Lift trucks, order picking machines, scissor lifts, conveyors, teagles and overhead traveling cranes are common examples of such devices.

Lift Trucks

2. Lift trucks (LTs) are designed to lift loads, move and re-stack them in a different place. LTs are usually powered by electric batteries or by an internal combustion engine (LPG, diesel or petrol).
3. LTs account for a large proportion of accidents in warehouses. Many of these accidents are due to operator error associated with inadequate or lack of training. There are, however, other reasons for LT accidents, including unsuitable premises, poor layout and design of LT operating areas and poor truck maintenance. Employers using LTs should therefore adopt safe systems of work, for example procedures for training employees, for traffic and pedestrian movement, and for control and maintenance of trucks.

DESIGN FEATURES OF REACH, COUNTERBALANCED AND VERY NARROW AISLE TRUCKS

4. The following points apply to all trucks. The following information should be displayed on the truck:
 - a. the name of the manufacturer (or importer) of the truck;
 - b. truck type;
 - c. serial number;
 - d. unloaded weight (electric lift trucks are shown without the battery weight which is marked on its own plate);
 - e. rated capacity;
 - f. load centre distance;
 - g. maximum lift height;
 - h. inflation pressures (if pneumatic tires are fitted).
5. The LT should be fitted with:
 - a. brakes (service and parking) capable of holding the truck and its maximum permissible load when parked;
 - b. a safety lock or switch with removable key to prevent unauthorized use;
 - c. a clearly audible warning device (horn);
 - d. an overhead guard, of sufficient strength to protect the operator from falling objects;
 - e. guards to prevent access to dangerous moving parts, for example telescopic mast sections which are within the operator's reach in normal operating position;
 - f. a load back rest, if the LT is used to move small objects liable to fall on the operator;
 - g. lights, if the LT is used in drive in or drive through racking, or in other poorly lit areas;
 - h. it may be desirable to equip the LT with a flashing warning beacon and/or automatic reverse warning device.
6. The risk of loads falling from the truck can be reduced by the use of suitable attachments, for example fork extensions or barrel clamps. In all cases the manufacturers of the LT should be consulted about the suitability of the attachment for a particular truck.

Training Of Lift Truck Operators

7. No person should be permitted to operate an LT unless properly trained, competent and authorized in writing by the employer to do so. The authorization should only be given for the type or types of truck for which training has been successfully completed.
8. Employers should be careful in selecting potential LT operators. Those selected should be:
 - (a) reliable;
 - (b) able to do the job;
 - (c) responsible in their attitude;
 - (d) physically capable;
 - (e) have good eyesight and hearing;
 - (f) over 18 years old.
9. The training of operators should be carried out by a competent person and always include three stages:
 - basic training -the basic skills and knowledge required for safe operation;
 - specific job training -knowledge of workplace and experience of any special needs and handling attachments;
 - familiarization training -operation on-the-job under close competent supervision.
10. The first two stages may be combined or integrated but should always be off-the-job. The employer should keep a record for each employee who has satisfactorily completed any stage of LT training. This should include sufficient information to identify the employee, the nature of training completed and copies or details of any certificate of training.
11. Successful training is dependent on the competence of the instructor who should be asked to supply evidence of training and experience both as an instructor and as an operator.

PROTECTION OF PUBLIC, EMPLOYEES AND VISITING DRIVERS

The Public

1. Members of the public should not be permitted in LT operating areas. Where members of the public visit warehouse premises the following general precautions should be adopted:
 - (i) provide sufficient clear and unambiguous warning signs at strategic locations to inform people that LTs operate in the premises or area (see Figure 25) ;
 - (ii) define, designate and clearly mark pedestrian routes and crossing places;
 - (iii) provide suitable barriers to segregate the public from LT operating areas.

The Employees.

2. Wherever possible, access to lift truck operating areas should be restricted to those staff who operate LT equipment or have a supervisory role. The same general precautions as listed above for members of the public may be appropriate to protect employees who do not normally have to enter LT operating areas. Where employees work in conjunction with LTs, the following general precautions should be adopted:
 - i. provide sufficient clear and unambiguous warning signs at strategic locations to inform employees that LTs operate in the premises or area ;
 - ii. provide suitable and sufficient notices at strategic locations and instructing LT operators to sound the horn of the LT;
 - iii. use LTs with flashing warning beacons;
 - iv. instruct employees to stand clear of LTs that are lifting or lowering loads and to use separate walkways where provided. People should be reminded of the dangers of entering areas such as those behind the LT where they may not be fully visible to the driver;
 - v. provide and instruct LT operators and employees to wear footwear, and where there is a foreseeable risk of head injury from falling objects, safety helmets .A further useful precaution would be the provision of high visibility clothing or light colored overalls.

The Visiting Drivers

3. Where a lorry is being loaded or unloaded close to the cab, an assessment should be made of the risk to the driver and any passenger of injury from goods or materials collapsing onto the cab or forks piercing it. The potential risk is affected by features such as the direction of loading (side/back), type of load, lorry design etc. Where a risk is identified, a designated safe reception/waiting area should be provided and the cab occupants directed to it. A further useful precaution would be the provision of high visibility clothing or light colored overalls if visiting drivers are in areas where there may be a risk of them being struck.

LIFT TRUCK OPERATING AREAS

1. All LT operating areas should be suitably designed and properly maintained. When designing the layout of LT operating areas the following points should be considered:
 - (a) driving areas should be as flat as possible and free from obstructions. Features of the building or operating area, for example support columns, pipework or other plant, should be identified, protected and clearly marked by black and yellow diagonal stripes. The edges of loading bays should be clearly marked in a similar way;
 - (b) roads, gangways and aisles should have sufficient width and overhead clearance for the largest LT using them to do so safely, whether loaded or unloaded, and if necessary to allow other vehicles and loads to pass each other in safety. If speed retarders (sleeping policemen) are used to reduce the speed of other traffic, a by-pass will need to be provided for use by LTs. One-way traffic systems should be considered to reduce the risk of collisions;
 - (c) buildings, rooms, doorways, and traffic routes should be clearly marked to avoid unnecessary traffic movements;
 - (d) sharp bends and overhead obstructions should be avoided;
 - (e) notices instructing bT operators to sound horns at appropriate locations should be displayed.
 All warning signs should conform to the Safety Signs Regulations;

- (f) lighting should be arranged to avoid glare -for example flexible doors of transparent or translucent material will reflect like a mirror if it is appreciably darker on one side of the door than on the other -and sudden changes of lighting levels, for example where LTs may pass from bright sunlight into the building;
- (g) sufficient parking areas should be provided for all LTs. Parking areas should be away from the main thoroughfare and work areas. Where parking areas are used for recharging or refueling further considerations are necessary

CONTROL OF THE USE OF LTS

20. Keys should be kept in a secure place when the LT is not in use. They should be issued only to authorized operators and retained by them until the end of the work period. On completion of work LTs should be parked in the designated parking area with the engine switched off, fork arms lowered flat to the ground and the brake applied. On battery operated trucks the battery should be disconnected. On LPG powered trucks the gas supply should be turned off at the cylinder.

BASIC RULES FOR LIFT TRUCK OPERATORS

1. The following simple rules should always be applied by operators of warehouse reach and counterbalanced LTs. Where appropriate these rules should be followed by the operators of other types of LTs. These rules are not intended to be a substitute for the often extensive guidance available from LT manufacturers.

NEVER:

- allow unauthorized people to operate the LT.
- lift loads which exceed the truck's rated capacity;
- travel forwards with a bulky load obscuring vision;
- travel on soft ground unless the LT is suitable for this purpose;
- carry passengers;
- block fire-fighting equipment or exits by parking or stacking in front of it;
- attempt to carry out repairs -leave this to a qualified maintenance engineer;
- use attachments unless:
 - (i) derating (ie reducing the rated capacity of the LT) has been carried out by a competent and authorised dealer or manufacturer;
 - (ii) operators have been properly trained and are competent and authorized to use the truck with the attachment; and
 - (iii) attachment is used in accordance with the manufacturer's instructions.
- allow people to walk under a raised mast or load;
- travel with a raised load;
- attempt to turn on an incline.

ALWAYS:

- ☑ observe floor loading limits -find out the weight of the laden truck;
- ☑ watch out for obstructions;
- ☑ ensure the load is not wider than the width of the gangways;
- ☑ when driving on inclines ensure that:
 - i. when carrying the load, it faces uphill;
 - ii. when no load is carried, the fork arms face downhill;
 - iii. where fitted, the tilt is adjusted to suit the gradient and the fork arms are raised to provide ground clearance;
- ☑ avoid sudden stops;
- ☑ slow down for corners and sound horn where appropriate;
- ☑ travel with fork arms lowered while maintaining ground clearance;
- ☑ ensure that bridge plates are secure and strong to withstand the weight of the truck and the load;
- ☑ carry out a pre-shift check of the LT (see paragraph 176);
- ☑ lower loads as soon as they are clear of the racking;
- ☑ lower heavy loads slowly;
- ☑ leave the truck with the fork arms fully lowered;
- ☑ switch off and remove the key when leaving the truck;
- ☑ take note of the load capacity indicator when fitted.

CONTROL OF THE USE OF LTS

2. Keys should be kept in a secure place when the LT is not in use. They should be issued only to authorised operators and retained by them until the end of the work period. On completion of work LTs should be parked in the designated parking area with the engine switched off, fork arms lowered flat to the ground and the brake applied. On battery operated trucks the battery should be disconnected.

MAINTENANCE AND EXAMINATION OF LTS

3. Employers should have:
 - (a) a system for reporting defects and for ensuring that remedial work is carried out;
 - (b) a planned routine maintenance system.

Manufacturer's instructions on inspection, maintenance and servicing should be followed. The operator, unless suitably qualified and authorised, should not carry out repairs and adjustments to the truck. If a truck is hired, arrangements should be made to ensure proper inspection, maintenance and servicing. (In some cases, the hire company may undertake regular inspection, maintenance and servicing as part of the hire contract) .The employer should keep a written record of six monthly examinations.

Daily maintenance

4. At the beginning of each shift, check that:
 - (a) tyre pressures are correct and tyres are not damaged, for example by nails or cuts;
 - (b) parking and service brakes operate efficiently;
 - (c) audible warning signal works;
 - (d) lights, if fitted, work;
 - (e) fluid levels, for example fuel, water, lubricating oil and hydraulic oil levels are correct in internal combustion engined LTs;
 - (f) where appropriate, batteries of LTs are adequately charged;
 - (g) systems for lifting, tilting and manipulation are working properly.

Weekly maintenance (50 hours or the period recommended by the manufacturer)

5. Trucks should be checked by a person authorised for the purpose. Checks should include:
 - (a) all daily checks;
 - (b) operation of steering gear, lifting gear and other working parts;
 - (c) condition of the mast, forks, attachments and any chains or ropes used in the lifting mechanisms;
 - (d) checking hydraulic cylinders and hoses for signs of damage and leaks.
6. A written report should be made of the condition of the LT: if it is unsafe to use the fault s) should be rectified immediately or the LT should be withdrawn from service. These reports should be retained by the employer until the next six-monthly examination.
Six-monthly examination (1000 running hours or the period recommended by the manufacturer)
7. All working parts of the truck, including the chains or ropes, should be thoroughly examined at least once every six months. Such examinations should be carried out by a competent person, for example insurance company engineer or manufacturer. A certificate should be issued by the examiner that the truck is free from patent defect. The certificate should be retained by the employer for at least six months. Where the examination shows that the truck is unsafe to use, it should be taken out of service until the necessary remedial repairs can be carried out. The truck should then be re-examined before being taken back into use.

REFUELLING OF LIFT TRUCKS

8. Areas used for refuelling LTs should be outside the warehouse. Refuelling should not take place where there is a likelihood of an accumulation of flammable vapours in the event of a spillage, for example pits, gulleys etc..Notices prohibiting smoking should be clearly displayed in these areas and engines should be switched off before refuelling.
9. The cylinders of LPG fuelled LTs should be changed outside the warehouse away from all possible sources of ignition.
10. If the LT is fitted with integral tanks or employers refill their own cylinders the installation should be outside the warehouse.

CHARGING OF BATTERIES OF ELECTRICALLY POWERED LIFT TRUCKS

11. During the charging of lead-acid batteries hydrogen is evolved from the cells and there is a risk of fire and/or explosion if flammable mixtures of hydrogen with air accumulate. The acid also presents a hazard to skin and eyes. Face masks or goggles, protective aprons, gloves and emergency eye washing facilities should be provided whenever there is a risk of splashing, for example during acid dilution or battery filling etc.
12. The following general precautions should be adopted:
 - a. a separate room or area should be designated for charging of batteries;
 - b. charging rooms or areas should have good ventilation located at high level immediately above the batteries;
 - c. electrical apparatus and any other potential sources of ignition should be kept well to one side and/or sited below the level of the battery, but not in a position where any spillage of electrolyte could fall onto the electrical apparatus;
 - d. the area should be designated 'No smoking' and 'No naked lights';
 - e. to avoid sparks the charger should be switched off before the battery is connected to or disconnected from it.

USE OF LIFT TRUCKS WHERE FLAMMABLE MATERIALS MAY BE PRESENT

13. There are two main hazards associated with the use of LTs in flammable atmospheres:
 - a. direct ignition of the surrounding flammable atmosphere, for example by hot surfaces, unprotected electrical equipment or hot sparks from the exhaust);
 - b. ingestion of a flammable atmosphere into the air intake of the engine. If this happens, the engine is liable to accelerate out of control causing over speeding, possible flashback through the intake, to ignite the surrounding flammable atmosphere.

For these reasons LTs should not be used in areas where flammable vapor, gases or dusts are liable to be present, unless they have been suitably designed and equipped for such use.
14. Diesel-fuelled trucks may be used providing certain precautions are being taken. Petrol and LPG-fuelled trucks should not be used because they cannot, as yet, be protected for such use. If there is any doubt about the suitability of an LT for use in such circumstances, advice should be sought from the manufacturer before it is used.

4.5 GAS AND OIL FIRED EQUIPMENT

1. Fresh air requirements for gas and oil fired equipment will depend on whether the equipment is open flued (drawing air from the room and discharging combustion products to the atmosphere), room sealed (drawing air from and discharging combustion products to the atmosphere) or flue less (drawing air from and discharging products to the room) .If ventilation is inadequate, carbon monoxide levels can increase rapidly, increasing the danger of carbon monoxide poisoning from unflued combustion equipment.
Note: Unflued space heaters are not recommended. Room sealed appliances are recommended where ventilation is difficult.

INTERNAL COMBUSTION ENGINES

2. Lift trucks (LTs) powered by internal combustion engines (petrol, diesel, liquefied petroleum gas (LPG)) emit toxic exhaust gases and particulates. If these trucks are used inside a warehouse it may be necessary to provide adequate ventilation to remove exhaust fumes. Ventilation requirements will vary according to:
 - (a) the number of LTs used;
 - (b) the volume of the warehouse or LT operating area;
 - (c) the type of fuel used (for example petrol engines emit more carbon monoxide than diesel or LPG engines);
 - (d) the condition of the engine (proper engine maintenance will reduce toxic emissions) .

Note: LTs powered by internal combustion engines of any type should not be used in any workspace where the lack of ventilation would lead to a build-up of toxic fume

4.6 AUTOMATED STORAGE AND RETRIEVAL SYSTEMS

General

1. automated and semi-automated comprises a reception point where palletized goods are placed onto mechanical handling devices, for example lift trucks, conveyors, automatic guided vehicles, and which are then taken to a transfer point where the palletized goods are transferred onto a storage and retrieval machine and placed into storage racking. The retrieval of palletized goods from the storage racking is the reverse procedure.
2. In an automated warehouse the movement of goods is carried out by a computer controlled storage and retrieval machine. In a semi-automated warehouse the storage and retrieval machine is rider-operated, the operator receiving information from a computer via an on board visual display device.

Hazards

3. Hazards include those between reception and transfer points. For hazards associated with lift trucks and conveyor systems see Manual Handling section.

AUTOMATIC GUIDED VEHICLES (AGVS)

4. AGVs may be used to transfer goods from reception to transfer point. AGVs normally operate at about walking speed and are commonly controlled and guided by a wire-guidance system hereby the AGV follows a low-voltage signal carried in a wire buried below the floor surface.
5. The hazards associated with the use of AGVs include:
 - a. collision between AGVs and people;
 - b. trapping points between AGVs and stationary objects or fixed structures;
 - c. dangerous occurrences by inadvertent movement of the AGV, for example where AGVs interact with storage and retrieval machines the AGV could move off before the load transfer is complete, causing displacement or collapse of the load or other devices.
6. Hazards at transfer points include:
 - a. trapping points between mechanical handling devices, palletized loads and the structure of transfer point;
 - b. collapse of palletized load;
 - c. trapping points between automated storage retrieval machine, palletized load, mechanical handling devices and the structure of transfer point.

AUTOMATED STACKING MACHINE

7. Hazards in an automated storage area include:
 - (a) being struck by automated storage and retrieval machine;
 - (b) trapping points between automated storage and retrieval machines and fixed structures, for example racking;
 - (c) trapping points between dangerous moving parts of the automated storage and retrieval machine
 - (d) trapping points at transfer points for goods, for example transfer arms, transfer pallets;
 - (e) trapping points at transfer points for automated storage and retrieval machines which serve more than one aisle (movement of stacker onto transfer bogey, movement of the transfer bogey) ;
 - (f) collapse of an automated storage and retrieval machine or load;
 - (g) fall of load (due to, for example, miss location of load);
 - (h) overrun of automated storage machine in horizontal or vertical travel;
 - (i) inadvertent movement of an automated storage and retrieval machine.

Hazard Analysis And Risk Assessment

8. To ensure that people are adequately safeguarded the system should be subjected to a hazard analysis, followed by an assessment of the risk. Hazard analysis should include a detailed and systematic scrutiny of all actions and events that may take place in the automated system to identify dangerous events. It should include those occurring during normal use and also under foreseeable fault conditions. Risk assessment should include a prediction of the likelihood of people being injured by the hazards identified, balanced with the potential severity of the injury. This will enable a judgment to be made about which safeguards should be adopted.
9. Because of the complexity of most automated systems it is recommended that the techniques of hazard analysis and risk assessment be applied to the design of the installation and its systems at an early stage. Such assessments should be included in the design of any Programmable Electronic System (PES).

SAFEGUARDING AUTOMATED AND SEMI-AUTOMATED SYSTEMS

10. The type of hazard created and the level of risk will determine which safeguard(s) are appropriate.
11. It is not implied that the only suitable safeguards are those described here, but any alternative means should be demonstrably at least as safe and reliable as the appropriate conventional safeguarding method.
Note:
Safeguards for lift trucks and conveyor systems are described in the Manual Handling section.

Between reception and transfer points

12. Where AGVs are used, safeguards include:

- (a) segregation of AGV operating areas from pedestrian traffic
- (b) provision of trip devices in the direction of travel of the vehicle, such as front and rear bumpers, which will stop the movements of the AGV if depressed; trip devices should be designed with flexible bumpers to ensure that the vehicle stops before the object touching the bumper is reached by the main structure of the vehicle;
- (c) provision of trip whiskers, probes or optical devices along the sides which will stop the vehicle when activated;
- (d) means to slow the AGV from full to crawl speed should an obstacle be detected in its path (for example ultrasonic or optical sensors);
- (e) means to ensure accurate positioning of the AGV at transfer points;
- (f) emergency stop buttons on the vehicle accessible from any side;
- (g) automatic monitoring of the safety system; this includes automatic monitoring of the machine condition, for example brakes and sensors, so that the main computer can arrange to take suitable action, for example an emergency stop, should a system failure occur;
- (h) audible and visual signals to indicate that the vehicle is moving or about to move or that an obstacle has been detected.

At transfer points

13. In automated and semi-automated warehousing the palletized load is transferred from the mechanical handling device to the automated storage and retrieval machine, usually via an opening in the perimeter fence surrounding the storage area. Risks may arise from: contact with dangerous moving parts of the transfer mechanism; and access into the restricted area of the warehouse through large openings for feeding and delivery of pallets.

14. Dangerous moving parts of the transfer mechanism should be dealt with by, as far as possible, eliminating them by design, by providing close guarding, for example for chains and sprockets, V belt drives, and by fixed or interlocked guards. The use of electro-sensitive safety systems, including pressure sensitive mats and photo-electric devices may be necessary either to supplement fixed or interlocked guarding, or instead of such guarding if it is not practicable. Access through the feed and delivery openings into the restricted area of the automated warehouse should be prevented by the following:

- (a) restricting the size of the opening to the minimum possible, for example when trays of components are being fed into the system. This may present a simple and effective way of preventing access. Secondary traps between the load and sides of the fixed opening should, however, be avoided. It may be necessary to provide sensitive edges or trip flaps at the openings to prevent finger traps;
- (b) if it is not possible to reduce the opening to the extent that a person is not able to climb through, other means will be required, for example a photo-electric safety device which causes a shut-down of the transfer system and those parts of the automated warehouse which would be accessible following access through the opening. This PE system would be muted after positive identification of the presence of incoming or outgoing goods for a timed period to allow goods in out. Means of identification include a combination of transponders, identification tags, pallet profile identification, patterns and sequences of tripping of photo-electric sensors, load sensors etc.

The objective should be to allow legitimate goods entry and egress, but to prevent human access to an automated storage area when it is in operation.

15. Examples of safety systems include:

(a) Electro-Sensitive Safety Systems.

These systems may be arranged to operate as trip devices, on the principle of detecting the approach of people or as presence-sensing devices where dangerous parts cannot be set in motion when a person or object is detected.

(b) Photo-Electric (PE) Safety Systems.

These systems operate on the principle of the detection of an obstruction in the path taken by a beam or beams of light (visible or invisible, for example infra-red) .

16. They may be used as:

(a) a trip device;

(b) a presence-sensing device;

(c) a combination or zoning system where two or more PE devices are used as sensors and/or trip devices.

Pressure sensitive mats

17. These devices are placed on and secured to the floor with a sensitive upper surface so that the pressure applied by a person standing on them will cause dangerous motion to stop.

18. The use of electro-sensitive safety systems, PE safety systems, pressure sensitive mats or other suitable safeguards should be such that the presence of a person or people in an identified and defined hazardous area will be detected and the appropriate action taken to remove or reduce the risk of injury, for example conveyor system stopped and approach to the automated stacking machine prevented.

Storage area

19. Safeguards for storage areas include:

(a) conventional perimeter fencing, made from rigid panels 2 meters high, securely fastened to the floor or to some convenient structure, for example racking, and positioned so that it is not possible to reach any dangerous parts of machinery or trapping points between automated stacking machines and fixed structures;

(b) access gates provided with interlocking device(s), for example a trapped key exchange which positively isolates the power supply or the control to all or parts of the storage system. The essential elements are a lock on the gate(s) in the perimeter fencing and another lock on the control unit for the automated stacking machine. The key cannot be removed from the control unit to open the gate lock until a safe condition is established, for example isolation of the power supply to automated stacking machine;

- (c) safe systems of work. It is particularly important to establish a safe system of work, for example for routine maintenance work, access for statutory examination of plant and where the automated stacking machine is rider-operated. It is important that the design of the system allows safe systems of work to be adopted. (Hence the importance of detailed discussions between the supplier and user of the system.) If it is necessary to restore power to the system with a 'person inside the restricted area, for example for fault finding, fault recovery or maintenance, there should be means to enable this to be done in safety which should embody the following principles:
- i. restoration of power to the system should be in the hands of the person within the restricted area, for example key exchange system which allows the person within the restricted area to restore power to a specific stacking machine);
 - ii. operation of the stacking machine or other unit should be under the sole control of the person within the restricted area. There should be no other possibility of restoring automatic operation, and the stacking machine or other item of equipment should not respond to remote signals;
 - iii. all other equipment should remain isolated. Alternatively, if there are multiple bays and several stacking machines, there should be means of safely isolating the stacking machine in the bay being worked on to prevent transfer bogies or other machines moving into that bay and to prevent maintenance staff moving into operating areas. The effective means should include software control features, hardware features and physical barriers;
 - iv. there should be a safe place or places of work for the person within the restricted area, for example areas around the subsidiary control panel (if any), working platform on the stacking machine etc;
 - v. access/egress routes to rider-operated stacking machines should be designed so that entry into other parts of the restricted area, for example aisles, is not possible. For example access gate cannot be opened until stacking machine is stationary and in a precise location to allow safe access/egress.

A safe system of work should comprise a carefully considered analysis of the hazards, taking into account all the modes of operation, the needs for access/approach, leading to the formulation of a method of working which will ensure the safety of those engaged in the particular activity.

For each activity involving access to automated storage areas a formal written safe system of work should be adopted. In some situations, for example repair work, it may be necessary to introduce a formal permit-to-work system which should set out:

- (i) clear hand-over procedure;
- (ii) what work is to be done;
- (iii) who is to carry it out and the equipment necessary for the task;
- (iv) what safety precautions are to be taken;
- (v) a clear hand-back procedure;

- (d) effective means should be provided to prevent overrun in the horizontal and vertical directions of travel, and to ensure the stacking machine is correctly positioned for loading, unloading and stacking etc. An adequate combination of limit switches and position-sensing devices should be provided and clearly identified in maintenance manuals etc. As a final safeguard, buffers should be provided on track-mounted systems at the limits of horizontal travel
- (e) In particular, increased protection will be achieved if a two-handed 'hold-to-run' control is combined with a sensor fitted to the operators seat such that the operator must be seated with both hands on the controls before the stacking machine can be operated;

- (f) clear, unambiguous warning notices should be prominently displayed at all access gates and strategic locations. Such notices may include:
 - i. Restricted access. Authorized persons only.
 - ii. Authorized persons must have read and understood the written safe systems of work.
 - iii. Procedures specified in the safe system of work must be strictly adhered to.

4.7 ORDER PICKING MACHINES (OPMS)

1. OPMS are used to transfer goods and materials to and from racking or storage systems by providing the operator with a place to deposit items that have been picked, and usually a platform or cage to facilitate reaching higher levels.
2. There are various basic types of OPM and these include:
 - a. free ranging -steered by the operator at all times and not normally intended for use within narrow aisles (ie those aisles whose width exceeds the width of the OPM by not more than 300 m);
 - b. guided rail/free ranging -can operate within narrow aisles and open areas. Rollers on the sides of the OPM engage with low level guide rails fitted to the racking to provide lateral restraint;
 - c. guided and supported by track/rail (commonly known as stacker cranes) -intended for use within narrow aisles. Upper and/or lower guidance also offers support for mast and platform;
 - d. electronically guided/free ranging -guided by an electronic guidance system while in a narrow aisle by a signal generated from a wire buried in the warehouse floor and steered by the operator when in other areas;
 - e. dedicated industry based -manufactured for and used within a specific industry, for example a whisky cask hoist.

An OPM fitted with a platform or cage on which a person is raised or lowered is considered to be a lift or hoist within the meaning of the FMA 1967 and are required to be periodically examined by a competent person. The provision and maintenance of OPMS that are, so far as is reasonably practicable, safe and without risks to health is a requirement under Section 15 OSHA 1994.

Hazards associated with the use of OPMS

3. The following hazards exist when OPMS are used:
 - a. overturning, for example by overloading, gradients, disengagement with guides or extreme acceleration/deceleration;
 - b. falls of people, goods or materials from the platform/cage;
 - c. trapping of people in the raising, lowering or traveling mechanisms;
 - d. trapping of people between the platform/cages or other parts of the machine and fixed structures, for example racking, building walls, overhead pipe work;
 - e. people being struck by a moving OPM or being trapped within racking aisles between the racking and the machine;
 - f. failure of the platform/cage supporting mechanism;
 - g. people being stranded on the platform/cage due to power failure;
 - h. inadvertent movements, for example misapplication of the controls.

Training of OPM operators

4. No person should be permitted to operate an OPM unless properly trained, competent and authorized in writing by the employer to do so, or undergoing formal training under competent supervision. It is recommended that a comparable training format to that detailed in ABOVE paragraphs is adopted.

General safety precautions for use of OPMs

5. The following general safety precautions should be followed when OPMs are used:
- a. only properly trained and authorised persons should be permitted to operate OPMs;
 - b. a safe working load notice should be conspicuously displayed on the OPM. The notice should also indicate the maximum number of people permitted on the operator's platform when in use. The safe working load notice should never be exceeded;
 - c. every OPM should be tested and examined by a competent person before it is taken into use and thereafter examined by a competent person at least once every six months. Where any report or examination shows that the OPM cannot be used with safety the OPM should be taken out of use until remedial repair works have been carried out;
 - d. suitable precautions should be provided to prevent operator access to dangerous parts of the OPM, for example mast sections, ropes, chains;
 - e. The edges of the operator's platform should be provided with rails or other equally effective means of protection, comprising top rails, intermediate rails and toe boards. The height of the upper surface of the top rail above the platform shall be neither less than 900 mm nor greater than 1100 mm, the toe boards having a minimum height of 100 mm. Any gate provided should not open outwards or downwards and should be so arranged as to automatically return to the closed or fastened position, unless it is electrically interlocked to prevent motion when not in the closed position.
 - f. suitable overhead guards should be provided at platforms to prevent falling objects striking the operator;
 - g. the OPM should be capable of being controlled from the platform. Where only one person is on the platform it is acceptable for suitable two-hand controls and safety pads for the feet to be provided to prevent access to trapping points. Controls should be:
 - i. clearly marked to indicate their function and mode of operation;
 - ii. of a 'hold-to-run' type (ie permits movement of the machine only as long as the control is held in a set position, returning automatically to the stop position when released) ; two-hand hold-to-run controls will give increased protection;
 - iii. designed and installed so that unintentional operation is prevented, so far as is reasonably practicable;
 - iv. designed and positioned so that the operator cannot place any part of his or her body between the moving OPM and fixed obstructions, for example racking;
 - v. such that movement of the controls is in the same direction as the intended movement of the OPM;
 - h. two person operated OPMs should be fitted with additional two hand 'hold-to-run' controls for the second operator. It should not be possible to move the machine unless both operators are in position at the controls;
 - i. the OPM should be fitted with suitable brakes, so designed that the OPM does not become unstable when braking. A parking brake should be fitted to prevent movement of the OPM when not in operation;
 - j. the OPM should be fitted with suitable 'safety gear' to prevent 'free-fall' of the platform should suspension mechanisms fail;

- k. the OPM should be provided with a device, for example a key, which prevents unauthorized use;
- l. the OPM should be provided with a clearly audible warning device. Consideration should be given to providing an audible warning device which will operate automatically during descent of the platform/cage;
- m. suitable means should be provided to enable the operator to descend safely should the operator's platform/cage jam in a raised position;
- n. stocktaking: Certain machines designed for one person only order picking operations are required to carry two people, specifically for the purposes of stocktaking. Where the design of the machine cannot intrinsically guarantee that each person is safe within the confines of the platform/cage before or while movement of the OPM takes place, further protection must be provided. The protection normally takes the form of wing guards attached to the sides of the platform. The guards should extend to a height of 2 m above the platform floor and be so arranged that the person on the platform cannot place any part of his or her body between the moving OPM and fixed obstructions such as racking.

4.8 CONVEYORS

1. There are many types of conveyor system but the two commonest types found in warehouses are belt conveyors and roller conveyors.

Belt conveyors

2. These comprise a moving belt, driven by a drum (head pulley) at one end, passing over a free-running drum (tail pulley) at the other end, the upper portion of the belt being supported by free-running idler rollers or suitable flat surfaces. This type of conveyor can be arranged for horizontal or inclined travel, the angle of slope depending on the goods conveyed and the type of belt surface.

Roller conveyors

3. These comprise a series of moving steel rollers either free running or power driven. They can be arranged for horizontal or inclined travel. The main hazards associated with belt and/or roller conveyors are:

- a. trapping or entanglement with transmission machinery, for example rotating shafts, couplings, chains etc;
- b. in-running nips between the belt and head and tail pulleys;
- c. trapping at the transfer point between a belt conveyor and a roller conveyor;
- d. in-running nips between the belt and return idler rollers;
- e. in-running nips between rollers of a roller conveyor;
- f. trapping between the load being carried and a fixed structure;
- g. trapping between the load being carried and rollers.

4. The following safeguards should be adopted when such conveyor systems are used:

- a. head and tail pulleys, all transmission machinery and in-running nips between belt and idler rollers should be suitably guarded.
- b. at the transfer point between a belt conveyor and roller conveyor provide 'jump-out' rollers ie those that are designed as to be free to 'jump-out' should an object or part of a person's body come between the roller and moving belt
- c. power driven roller conveyors should have the following:
 - i. all rollers should be power driven;
 - ii. where powered and non-powered rollers are present, nip guards should be provided between rollers
 - iii. each non-powered roller should be of a 'jump out' type;
- d. suitable emergency stop arrangements should be provided, for example emergency stop buttons strategically located or a trip wire along the length of the conveyor. Emergency stop arrangements should be designed so that manual re-setting by an authorized person is necessary;
- e. a safe system of work should be established for long or complex conveyor systems to ensure that people are not exposed to any unnecessary risks, for example when a conveyor system is set in motion at the start of a working period or after an emergency stop has been used;
- f. where overhead conveyor systems are used, screening or other suitable arrangements should be provided to protect people from falling objects;
- g. riding on conveyor systems should be strictly prohibited;

4.9 LOADING AND UNLOADING

1. The following practices should be followed wherever possible:
 - a. no vehicle should be loaded beyond its rated capacity or beyond the legal limit of gross weight;
 - b. before loading is started, the floor of the vehicle should be checked to ensure that it is safe to load;
 - c. loads should be properly secured or arranged so that they are safe for both transportation and unloading, for example so that they do not slide forward in the event of the driver having to brake suddenly, or move sideways when cornering;
 - d. loading/unloading should be carried out so as to maintain, as far as possible, a uniform distribution of the load. Uneven loading may result in the vehicle or trailer becoming unstable, particularly if it is an articulated or similar type of trailer which has been detached from the tractor unit.
 - e. loading and unloading vehicles from one side using lift trucks can result in pallets on the opposite side being disturbed sufficiently to cause a pallet(s) to fall. The opposite curtain or side should be retained in position while loading/unloading;
 - f. before ropes, tarpaulins or the curtains of curtain-sider lorries are removed, the vehicle and load should be checked to ensure that the removal of ropes or other security devices will not allow materials or goods to fall;
 - g. the driver of the vehicle is responsible for ensuring that the load is secure: operators of lift trucks should take instructions from the driver concerning positioning of loads;
 - h. loading/unloading should never be carried out on significant gradients.
2. When an opening or edge is being used to load/unload goods or materials from one level to another, where there is a danger of a person falling, it should be fenced as far as possible. If fencing is not possible, alternative safeguards should be used as far as possible, for example a secure guard rail which goods or materials may safely pass under or over.

Dock Levelers

3. Dock levelers are devices used to bridge the gap between the loading dock and vehicle trailer, thereby providing access for lift trucks and roll containers etc. There are two basic types:
 - a. hydraulic- raised and lowered by an electrically powered hydraulic cylinder;
 - b. mechanical -activated by a pull chain or other device that releases a spring mechanism, raising the platform and extending the lip. The platform descends into its working position on the trailer bed when an employee 'walks down' the platform.
4. The main hazards associated with dock levelers are:
 - a. trapping of feet or toes between the descending platform and loading dock;
 - b. overturning of mechanical handling devices (for example by contact with raised or depressed platform);
 - c. trips or falls caused by raised or depressed platform;
 - d. falls of people, goods or materials from platform.
 - e. trapping of people underneath dock leveler.

5. The following safeguards should be adopted when dock levelers are used:

- a. when dock levelers, which are installed as an integral part of the loading dock, are not in use and people, lift trucks, roll containers or other mechanical handling devices are likely to travel over or adjacent to the dock leveler, its platform should be returned to a horizontal position flush with the loading dock as soon as loading/unloading is completed. A mechanism fitted to the dock leveler which automatically returns the platform to a horizontal position after use will give increased protection against the risks caused by inadvertent raised or depressed platform positions;
- b. toe guards should be provided, for example fencing at the sides of the leveler that prevent feet or toes from being caught under the platform as it descends
- c. provide a mechanism which prevents the springs from pulling back the platform to its raised position during loading/unloading on mechanical dock levelers (this will prevent the risk of a lift truck reversing into the raised platform when leaving the trailer);
- d. provide a mechanism which prevents the platform from free-falling in the event of an emergency, for example premature departure of a vehicle.
- e. provide skirt plates or other suitable devices to enclose the trapping hazards below the platform;
- f. provide manually operated scotches or other equally effective means to enable the dock leveler to be mechanically locked in a raised position when maintenance or repair work is necessary.

Maintenance

6. Defective dock leveler safety features, twisted, cracked or misaligned platforms or other defects can cause serious accidents, for example overturning of lift trucks. Employers should therefore have:

- a. an effective system to report defects and carry out remedial repair work;
- b. a planned routine maintenance system.

Tail Lifts

7. Tail lifts (ie lifts, fitted to a vehicle, which enable a load-carrying platform to be raised and lowered) are commonly used in warehouses for loading and unloading vehicles. Two common types are:

- a. column lifts -the lifting platform runs vertically between guides fixed to the vehicle body;
- b. cantilever lifts -the lifting platform is raised and lowered by hydraulic rams and a series of linkages so that the platform moves horizontally and vertically.

8. The main hazards associated with tail lifts are:

- a. trapping of feet or toes between the moving platform and ground or stationary parts of the vehicle or lift;
- b. trapping of fingers or parts of the body by moving mechanisms;
- c. trapping of people under the platform;
- d. crushing of people by unsecured loads falling or rolling on or off the platform;
- e. falling of people from the platform.

Safeguards

9. Safeguards include the following:

- a. provision of 'hold-to-run' controls, ie movement of the lift platform can only take place while the controls are being operated, the controls returning automatically to the 'off' position when released. All controls should be:
 - (i) designed to prevent accidental operation;
 - (ii) clearly marked to indicate the direction of movement;
 - (iii) so sited that the operator has a clear view of the platform throughout its travel.
- b. elimination of finger and toe traps within the mechanism by providing a minimum gap of 75 mm between the platform and any fixed part of the vehicle except at those points where adequate toe protection is provided. Where it is impracticable to provide minimum safety gaps, for example on some types of cantilever lift, tripping devices are an acceptable alternative;
- c. where the tail lift platform height exceeds 2 meters above floor or ground level:
 1. effectively secured grab rails should be provided at both sides of the vehicle aperture, so positioned as to be conveniently held by people working above 2 metres from the floor or ground level;
 2. it should have suitable fixings for guard rails on the three sides remote from the vehicle;
 3. guard rails or other equally effective means, to a height of at least one meter should be provided for use at the tail lift platform;
 4. a notice should be affixed adjacent to the controls, advising on the following points:
 - fitting of guardrails;
 - that care is needed when standing near an unguarded opening or edge;
 - the desirability of pushing (as opposed to pulling) loads from the vehicle onto the platform;
 - the importance of preventing loads from rolling, sliding or tipping;
- d. every tail lift should be thoroughly examined by a competent person at least once in every period of 12 months and a report of the result of every such examination should be signed by the person making the examination (where chains or ropes are fitted the inspection should be carried out every six months) .The report should detail any repairs, renewals or alterations required to enable the tail lift to continue to be used with safety, specifying whether such work is required immediately or within a specified time;
- e. proper maintenance and lubrication should be carried out in accordance with the manufacturer's instructions;
- f. all tail lifts should be clearly marked with the safe working load, the manufacturer's name and address, the type, serial number and year of manufacture. The safe working load should never be exceeded;
- g. under no circumstances should vehicles be driven with a loaded tail lift platform;
- h. before traveling, the platform should be checked to ensure that it is securely fastened in the stowed position.

4.10 SCISSOR LIFTS

1. Scissor lifts can be either fixed or portable and are used to transfer goods or people from one level to another. In warehouses they are commonly used in loading areas to assist in the loading and unloading of lorries.
2. Scissor platform lifts that are used to transfer goods or people from one level to another are deemed to be lifts under the FMA 1967.
3. Associated hazards include:
 - a. trapping of hands and feet at the closing scissor mechanism during lowering;
 - b. trapping between the underside edges of the platform and the base frame or ground during lowering;
 - c. trapping of people against walls or other fixed objects;
 - d. trapping of people under the platform;
 - e. trapping of introduced extraneous material during raising or lowering, causing hazards to people nearby.
4. Scissor lifts should be provided with the following safeguards:
 - a. clear notice fixed to it, specifying:
 - i. the safe working load;
 - ii. that people should not work under the platform unless it has been mechanically locked to prevent descent;
 - b. aprons or other guards to enclose the trapping hazards, or a tripping device below the level of the platform which will immediately stop the platform descending should an object, for example a person's foot, be met during descent. *Note: Where scissor lifts are installed in a location to which the public have access, guarding of sufficient rigidity, for example bellows, steel mesh, sheet steel etc, should be provided to prevent access to the underside of the platform.*
 - c. unless the scissor lift is totally enclosed or so constructed that the scissor arms are safe by position, the minimum clearance between adjacent scissor arms should be 30 mm and the minimum horizontal clearance between the scissor arms and the platform or the base frame should be 50 mm;
 - d. controls should be of a 'hold-to-run' type. An emergency stop button should be provided at ground or floor level;
 - e. manually operated scotches or other equally effective means should be provided to enable the lift to be mechanically locked in a raised position when maintenance or repair work is necessary;
 - f. scissor lifts used as working platforms, where the maximum height of the platform above ground or floor level exceeds 1.98 m, should be provided with suitable fencing or gates to prevent people accidentally falling from the platform. Any gate fitted should be at least 1 m in height and be so arranged to return automatically to the closed position.

4.11 STORAGE OF PACKAGED DANGEROUS SUBSTANCES

General

1. The storage of packaged dangerous substances in substantial quantities may create serious risks, not only in the working place but also to the general public in the area and to the environment. The precautions needed to achieve a reasonable standard of control should take into account the properties of the substances to be stored. Different substances create very different risks and it is important that the standards adopted at the workplace are based on an understanding of the physical and chemical properties of the substances concerned. Other important factors are the overall quantities of the substances to be stored and the maximum size of individual packages.
2. At all workplaces where packaged dangerous substances are to be stored the employer should, before undertaking such storage, consider the risks created and the means adopted to control such risks, under the categories of:
 - a. identification and assessment;
 - b. prevention and control;
 - c. mitigation of risk.
3. It is recommended that the means adopted to control risks from the storage of dangerous packaged substances be written into the company safety policy. A periodic review of these matters should be carried out, particularly if storage conditions changed.

IDENTIFICATION AND ASSESSMENT

Information

4. The hazards of packaged dangerous substances should be identified by discussion and/or correspondence with the supplier before being accepted for storage. Manufacturers and suppliers have a legal duty to provide adequate information about any risks to health or safety to which the inherent properties of a dangerous substance may give rise and about any conditions necessary to ensure that the substance will be safe and without risks to health when it is being used, handled, stored or transported. Dangerous substances arriving at the workplace will be marked with CPL (The Classification, Packaging and Labeling of Dangerous Substances, Regulations 1997) conveyance labeling, but goods in international transit may be marked using the similar but more comprehensive UN (United Nations) scheme.

Actions pre-arrival on-site

5. Some substances will require special conditions for storage which should be clearly identified in advance, for example segregation. Substances requiring special conditions should only be accepted for storage when the required conditions can be made available at the workplace.

Actions on arrival

6. On arrival, the contents of each consignment or individual package should be checked, identified and assessed against the shipment documents to verify acceptability. A check should also be made against records detailing what the supplier said would be sent to avoid a situation where an employee checking the goods confirms they are what the lorry driver's ticket says they are, but is at the same time unaware that his or her employer did not agree to receive those goods in the first place. Dangerous substances should usually be identifiable by the conveyance labeling attached to the outer layer(s) of the packaging and for most purposes can be assessed accordingly. The additional information obtained from the manufacturers and suppliers may identify specific examples of non-compatibility, and storage location should take account of this
7. If the contents of any package are not immediately identifiable, it should not be sent to store. Such packages should be held only for the minimum time necessary to obtain information, or the supplier should be required to have them removed from the site promptly.
8. Once the storage location for a consignment has been allocated, a physical check should be made to confirm that adjacent materials are those shown on stock records. If all or part of a consignment is moved during its period of storage, the check procedures should be repeated to ensure that the new storage location will still be valid.

PREVENTION AND CONTROL STRATEGY

Package integrity

9. The primary protection against the dangers arising from storing dangerous substances is the integrity of the packaging. Individual containers may leak, break or be punctured, causing a small escape of material, and arrangements should be in place to deal with this eventuality. Much greater risks arise where a large number of containers fail in a short time and the principal means by which this may occur is fire.

Segregation

10. Often the first material ignited in a fire is not itself a dangerous substance. For this reason, stocks of combustible materials such as easily ignitable packaging should not be kept in storerooms with dangerous substances. Separate storage areas should be provided. Similarly, even small quantities of dangerous substances stored in a workplace for general goods may seriously increase the consequences of any fire, and in particular add to the dangers for the fire brigade. Dangerous substances should preferably be stored in dedicated places or compartments, which are effectively fire-separated from the rest of the building.
11. The intensity of a fire, or its rate of growth, may be increased if incompatible materials are stored together. In addition, a fire may grow and involve dangerous substances which of themselves are not combustible. In this way toxic materials may be widely dispersed. To prevent this type of escalation a system of segregation is necessary in a workplace storing dangerous substances.

Ignition sources

12. All possible sources of ignition, for example smoking, maintenance work, electrical power supplies, arson, heating systems, workplace vehicles and battery charging facilities, should be strictly controlled.

Handling

13. All packages containing dangerous substances should be handled carefully to avoid damage to the containers, or spillage of the contents. Damaged or leaking containers should not be placed in store, but should be repacked or disposed of safely in accordance with arrangements made with, or information provided by, the supplier. Repacking should be carried out in an area remote from the main storage areas.

Stock control

14. Store rooms and compounds should not be overstocked, and permanent instructions should specify a maximum storage capacity for each location. Gangways should be kept clear of obstructions, especially those designated as means of escape. At least 1 m of clear space should be left between all stock tops and the workplace roof, roof beams or light fittings. Where sprinklers are fitted, spacing should be in accordance with the design code for the system. This information should be available from the system installers.
15. Where a number of different types of dangerous substance are stored, a comprehensive record of stocks, providing details of the quantity, nature and exact location of all dangerous substances in a store, should be made and carefully updated each time a stock movement occurs. A copy of the records should be kept available at a point on the site that is unlikely to be affected in an emergency, so that they can be used by both management and the emergency services when dealing with an incident.

Storage stability

16. Some types of materials may degrade or become unstable during prolonged storage. These should be identified by information supplied by the supplier or the manufacturer. Maximum recommended storage times should not be exceeded and this should be achieved by careful stock rotation. The advice of the supplier should be sought if material is found which has reached, or is about to reach, the recommended latest storage date.
17. Any stock held for a prolonged period should be inspected at intervals to detect any damaged or degrading packaging.

SPILLAGES

18. The employer should ensure that there is a safe system of work to deal with spillages. When dealing with spillages, all non-essential or untrained staff should be evacuated.

Liquid spillages

19. Where liquids are stored, methods for containing spillage should be provided. Barrier materials such as sand bags or proprietary absorbent granules are recommended, depending on the nature of the substance and the quantities involved.

Solid spillages

20. Spillages of dangerous substances in a fine dusty form should not be cleared up by dry brushing. Vacuum cleaners should be used in preference

Personal protection

21. Protective clothing and equipment will be necessary for dealing with accidental releases of dangerous substances. Protective footwear, gloves and eye protection are likely to be the minimum requirements. In some cases additional items will be needed, for example respiratory protective equipment.
22. When corrosive materials have been spilt, care should be taken to ensure that clothing with the necessary resistance is worn by people dealing with the spillage. Clothing contaminated with any dangerous substance should be removed immediately. Contaminated clothing should not be sent with other general laundry, nor taken home. It may be cleaned by arrangement with a specialist laundry, or disposed of as dangerous waste.

Warning Signs

23. Warning notices or signs should be posted at entrances to a workplace storing dangerous substances. CPL Regulation makes specific requirements for posting hazard warning signs and the design of signs used.

MANAGEMENT AND TRAINING

24. A senior member of staff should be appointed by the employer to be directly responsible for the identification, assessment, handling and safe storage of all dangerous substances on site. The person appointed should have suitable qualifications, training and experience. Written operating procedures should be adopted covering matters such as selection of storage locations, dealing with spillages and security arrangements. This person should be familiar with the legislation relevant to the activities undertaken, and be responsible for liaising with the enforcing authorities and the emergency services.
25. Employees should be trained to recognize and understand the risks associated with the particular classes of dangerous substances that will be kept in the workplace. They should be shown how to understand the system of labeling adopted under the CPL Regulations. They should also be told where particular substances should be stored and why, and should be made familiar with the precautions and safety procedures adopted by the workplace.
26. Instructions for dealing with an emergency should include the steps necessary to enable staff to identify easily and deal with damaged and/or leaking packages and containers. Training should be given in the use of safety equipment provided and in the actions to be taken in the event of fire. Any Fire Certificate in force will normally specify requirements for this.

5.1 Public/Government, Financial and Professional Service

Introduction

1. This part summarizes briefly a number of sub-sectors with some functional similarities and several similarities in the general area of Safety and Health in the work environment. A common functional feature of these services could be labelled **Knowledge Services**. This also illustrate that many of the sub-sectors belong to the fashionable concept of the Knowledge Society. It is a mixture of services provided by the private sector on a free economic market and services provided by local and central government administration (or the Public Sector) on a centrally budget controlled economy (the planned or command economic market) within the frame of a rather open market economy.
2. Typical examples on existing services which natural belongs to this group are:
 - a. Regional government offices (State, Provincial, County etc)
 - b. Central specialized government ministries/departments (e.g. OSH, Public Health, Education, Revenue, Employment)
 - c. Banks and other types of financial services and insurances
 - d. Rental, leasing, property service
 - e. Professional consultancies in e.g. architectural, engineering, business, marketing, accounting, computers
 - f. Lawyers, Legal service, Security, etc
3. From a traditional viewpoint the localities used by the services can be characterized as:
 - a. Front office (an area (receptions) of meetings face to face with customers)
 - b. Back-office (usually traditional office with increasingly use of VDUs)
 - c. Out of office (different form of fieldwork)
4. This structure is a gross generalization and simplification, but still valid to a rather large extent. But for all of the different sub-sectors there are a number of important exceptions. One example is the Customs Department, as a part of the public sector, with a large number of officials working in typical receptions and ordinary offices, but many of its officials are also working in very special high risk conditions and environments (e.g. onboard rather small ships in very messy social and physical conditions). The Fire brigade is claimed to have one of the toughest and hardest working conditions existing. In the private sector, very special working conditions will also be found behind labels as 'Legal Service' and 'Security'.

5. However this structure is changing! Many of the Services in the **Part 5** are exposed to a very fast process of change affecting the work conditions and the health and safety at work. It is a real paradigm shift taking place for many of the sub sectors. Automation by the use of information and communication technology (ICT) is drastically reducing the number of 'face to face' meetings between the service providers and the customers. Instead we can see a very large increase in
- a. 'Call Centres' of different kinds and the personnel – customer communication will mainly be via telephone supported by internet usage. The Call Centres as such will often be out-sourced from the mother company.
 - b. Automated offices, self service, where the customer is using different forms of automates such as Automatic Telling Machines (ATMs) or Automatic Banking Machines (ABM). These forms of predestined electronic automates are increasing very fast, e.g. for ticketing and check-in at airports, currency exchange, purchase of insurances.
 - c. Internet service – eGovernment, eCitizen, eCommerce etc are some examples.
 - d. Mobile phone service – for some special services (mainly incidental shopping, e.g. tickets to cinemas) mobile phone service is becoming popular.

5.2 Public/ Government Sector Service

1. Many different parts of the service sectors are using ordinary offices in combination with some kind of reception areas. The local and central government service, banks and other financial services, insurances, consultancies and administrative services are all examples on this type of service to the public and to other businesses. As mentioned before, these services are currently in a dramatic phase of automation, mainly by the use of internet and intranet. However, in Malaysia today, the public/government sector is in a special situation as there is a marked lack of systematic occupational safety and health activities.
2. The main objectives of the public sector are:
 - Law enforcement – e.g. police, customs, prisons, tax collection, etc.
 - Service to the public – e.g. health, basic education, social security, business support, etc.
 - Service and support to the parliament and the ministries – e.g. evaluations, statistics, investigations, development, etc.

This guideline emphasizes on the service objectives, but large parts are also of relevance for the Law enforcement objective.

3. This part of the guidelines only contains some general ergonomic orientated advises and recommendations. The **Public/Government Sector²** is a very large sub-sector of the total service sector. However, the current knowledge and awareness about OSH within the Public Sector is very limited or sometimes even none existent. Further studies in a Malay context are needed before more extensive guideline can be developed for this very large and diverse sector. Guidelines for very special parts (e.g. the Custom service) of the Public Sector have to be developed within each ministry/department in close cooperation with its safety committee.

The changes currently taking place in the private sector, which also strongly affects the working conditions and the health and safety at work, is also taking place in the public sector but at a slower pace.

² The nomenclature used for the Public Sector (PS) is taken from the UN and covers all parts of local and central government services, excluding military and government service which largely collects its own revenue and has only a limited part from Government budget (eg Board of Telecommunication and other State enterprises, government own industries and semi government organizations).

Good Governance

4. Service is an interrelation between individuals which frequently also demands economic transactions (pay for service). This makes Good Governance in private and public service of particularly importance and relevance. This is difficult problems which can create stress and conflicts in the work environment.

Corporate and Public Good Governance

5. Good Public and Corporative Governance are closely related to the creation of good working conditions. Lack of these important issues will necessarily lead to job related stress and ill health. The personnel will always have some kind of feeling or direct knowledge about irregularities and falsifications taking place in their organisation. This will create severe conflicts of interest. The well trained official will always know what is right and what is wrong. At the same time they have loyalties to managers and colleagues which will be very difficult but still necessary to handle.

Guidelines

The guidelines in 5.3 and 5.4 about office design and service automation are also applicable to the Government sector. Other guidelines are

1. On OSH for Seating at work
2. On OSH for working with Video Display Units (VDUs)
3. On OSH for Standing at work
4. Code of practice on prevention and management of HIV/AIDS at workplace
- 5.3 Automation and the use of New Technology

5.3 Automation and the use of New Technology

1. All the changes taking place in the new service sector will generate a new panorama of work related health and safety problems. A number of studies indicate that this new panorama will increase job related stress and stress related illnesses. 'Burn-out' syndrome is a new type of job related problems, which are increasing fast. On the other hand one could also maintain that the new technology has the potential to remove or at least reduce many health and safety problems at work. The main reduction of accidents we have seen over the last decades in mining and manufacturing is a result of the use of new technology. We might see a similar development in the service sector when we start to understand the wise use of the new ICT facilities.
2. A typical example is "call centres" which is a common name for a large group of often sub-contracted ICT (eg via phone) and web supported services. Call centres creates a serious of new types of work environmental problems. To avoid the more strict labour legislations in the west these Call Centres are being moved from eg EU and US to less developed countries with a reasonable high level of education. Lower standards of the labour laws and less awareness of these problems in combination with much lower wage levels makes these moves highly profitable. However at the same time serious work environmental problems are at the same time imported. To avoid this weakening of the work environment it is necessary to carry out proper studies in eg Malaysia about this new important problem area.

The existing problems in the use of VDUs and other types of computers in workplaces are discussed in the generic part 3.2 and 3.14.

3. *Guidelines for Call Centres:*

- a. Avoid standardized impersonal large mass of 'work boxes'
- b. Allow some degree personalization
- c. Arrange 'round a table' type of team-work
- d. Teams with mixed degree of experiences
- e. Skill, service and stress training
- f. Reward for quality of service and not quantity
- g. Very high demands for acoustic design (no lingering sounds) and use of good headsets
- h. Proper VDU visual conditions and work postures
- i. High usability on all ICT software and hardware

4. *Guideline for Automated Service:*

- a. Make a proper designated front-office for the *automated* service
- b. Avoid problems for the staff by making a proper design for the customers
- c. Important is good lighting and window design – no VDU glare
- d. There has to be an acceptable thermal comfort
- e. Customer standing for short duration tasks (about 3 min)
- f. Customer ought to be seated for long duration task
- g. Personnel giving face to face service has to be highly competent on all types of services provided

5. *Guidelines for Internet and Mobile Services:*

If the service is easy to use for the customers, it will be less problems for the staff, this demands:

- a. All changes have to be updated on the web of as soon as they become available
- b. Critical work functions are Customer service and Help desk, they will be reach via
 - i. e-mail
 - ii. direct person to person easy phone contact
 - iii. Q&A on the net
- c. Feedback regarding problems in customer usability and complains has to be provided to personnel
- d. Usability training for front and back office staff is important

5.4 Ordinary offices

1. One of the most important problems in existing public and private offices is the use of computers and related VDUs and keyboards. Visual problems linked to unsuitable design of lighting and windows cause eye strain and head ache. Heavy work schedules and unsuitable design of office furniture in relation to VDUs and keyboards could result in back problems and muscular strain. In the long term serious medical problems and permanent damages could occur. The use of existing guidelines from DOSH (about VDUs and Seating at Work) and the generic part of this guideline can prevent the occurrence of this type of problems.
2. Another important area is the use and maintenance of ventilation and air-conditioning. To avoid a too high temperature (about 25 centigrade for sedentary work) at workplaces cooling of ventilation air is a necessity to maintain productivity, comfort and good leadership. The existence of the right air-conditioning is not enough. If not properly maintained, air-conditioners might create more problem than prevented. Air-cons might easily become a breeding ground for different microorganisms (incl. fungus) and insects. In this way many different infectious disease and allergic reactions might be spread, incl. sick building syndromes.

In summary the guidelines for

3. Front offices:

- The Guidelines for receptions in Hotels (3.14) can also be used as guidelines for general front offices
- Many front offices are in an intermediate stage with a combination of a limited face to face service and also a part of automated service
- The personnel has to be 'expert generalists'

Main problems are social and psychological due to very high demands (stress!), Irritating and performance hampering noise (discomfort and low productivity) is important problems – see 3.10

4. Back offices:

- Open Offices – suitable for 3 and more persons; it is a flexible solution, but also demanding and unsuitable for tasks demanding high level of concentration
- 'Office Landscapes' – suitable from 15 and up to several 100 (optimal 30-100) persons; demand a very competent interior architect/designer and a large space per person, a creative work environment with good facilities for face to face communication
- Small 'Compartment offices'(1 or 2 persons) – good for work demanding high level of communication or confidential contacts and verbal communication

Problems areas:

- * Usage of VDUs and Keyboard s - see 3.2
- * The Chair – see 3.14 and DOSH guidelines, jobs which could be done seated should be done sitting down
- * Lighting and windows – see 3.14 and 4.6, use of localized light is an important complement to general lighting
- * Thermal comfort – see 3.8 and 4.5

5. *Guidelines for Internet and Mobile Services:*

If the service is easy to use for the customers, it will be less problems for the staff, this demands:

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- c. Feedback regarding problems in customer usability and complaints has to be provided to personnel
- d. Usability training for front and back office staff is important

6.0 Contact Information

JKKP Malaysia (HQ)

Aras 2,3 & 4 Blok D3, Parcel D
Pusat Pentadbiran Kerajaan
62502 Putrajaya
Tel: 03-88865000
Fax: 03-88893381

JKKP Pulau Pinang

Tingkat 3A,
Kompleks Sempilai Jaya
Jalan Sempilai
13700 Seberang Jaya
Pulau Pinang
Tel: 04- 3991144 / 3994106
Fax: 04-3908844

JKKP Johor

Tingkat 9, Menara TJB
Jln Dato' Syed Mohd Mufti
80534 Johor Bharu, Johor
Tel: 07-2243076
Fax: 07-2242667

JKKP Kelantan

Tk 9 Wisma Persekutuan
Jalan Bayam
15534 Kota Bharu, Ktn
Tel: 09-7482875
Fax: 09-746280

JKKP Terengganu

Tk 3 Wisma Persekutuan
Jalan Sultan Ismail
20200 Kuala Terengganu
Terengganu
Tel: 09-6225288

JKKP Sabah

Lot No. D7-4, Ting 7, Blk D
49, Jalan Karamunsing
88000 Kota Kinabalu, Sbh
Tel: 088-235855
Fax: 088-233367

JKKP Kedah/Perlis

Tk 9 Wisma Persekutuan
Jalan Kampung Baru
05534 Alor Setar, Kedah
Tel: 04-7308081
Fax: 04-7329659

JKKP Negeri Sembilan

Tk 11, Wisma Persekutuan
Jalan Datuk Abdul Kadir
70000 Seremban, NS
Tel: 06-7612828
Fax: 06-7643143

JKKP Pahang

Tk3 Wisma Persekutuan
Jalan Gambut
25000 Kuantan, Phg
Tel: 09-5161047
Fax: 09-5161235

JKKP Sarawak

Tingkat 13 & 14
Bang. Somerset Gateway
No 9 Jalan Bukit Mata
93100 Kuching, Sarawak
Tel: 082-242257
Fax: 082-259846

JKKP Selangor

Tk. 7 Wisma Consplant 2
Jalan 16/1
47500 Subang Jaya
Tel: 03-56380340
Fax: 03-56389159

JKKP Perak

Tingkat 3, Bangunan Sri Kinta
Jalan Sultan Idris Shah
30000 Ipoh, Perak
Tel: 05-2549711
Fax: 05-2555219

JKKP Wilayah Persekutuan

Tingkat 17, Menara PERKESO
281 Jalan Ampang
50534 Kuala Lumpur
Tel: 03-42576066
Fax: 03-42572991

JKKP Melaka

Tk2, Wisma Datuk Hj Mohd
Jalan Hang Tuah
75300 Melaka
Tel: 06-2826659
Fax: 06-2826679

