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AUTHORITY

AFS 2000:42

Workplace Design

Provisions of the Swedish National Board of Occupational Safety and Health on Workplace Design and General Recommendations on Implementation of the Provisions.

The Work Environment Authority's Statute Book

List of contents

Provisions of the Swedish National Board of Occupational Safety and Health on Workplace Design

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The following provisions are issued by the Board of Occupational Safety and Health pursuant to Section 18 of the Work Environment Ordinance (SFS 1977:1166).[1]

Scope

Section 1

These Provisions concern the design of workplaces situated in or adjacent to buildings and cabins (Portacabins) or in other places within the area of an activity. They also apply to communication routes and personnel facilities, wherever these are located.

The Provisions do not apply to the design of workplaces

– in means of transport or
– on premises intended for the armed forces and normally used only in situations of war or preparedness.

The Provisions of Sections 92-115 concerning personnel facilities do not apply during exercises or training under field conditions within the armed forces.

In the case of workplaces in the construction and heavy engineering industry and extractive industry, Sections 2-1, 18-35, 37-75, 77-91 and 116-117 apply only in completed facilities and in cabins.

Definitions

Section 2

The following terms are used in these Provisions with the meanings indicated:

Workplace	any place indoors or outdoors where work is done.
Lighting	artificial lighting, but not emergency lighting.
Building	collective term for a building and other structure.

[1] *Cf. Council Directive of 30 November 1989 concerning the minimum safety and health requirements for the workplace (OJ L 393 , 30/12/1989 p. 0001 – 0012, Celex 389 L 0654).*

Cabin	a temporarily positioned hut or carriage fitted out to serve as a personnel facility or work premises. (Also termed: personnel cabin/hut, Portacabin.)
Personnel facility	changing room, drying facility, washing facility, shower facility, toilet, canteen, social area, rest area, room for duty staff, waiting room and sleeping accommodation

Design

The developer's responsibilities

Section 3

The person (the client) on whose behalf, building or civil engineering work is carried out shall, through

– the choice of designers,
– the design of planning briefs,
– co-ordination of planning work and
– other measures necessary for the purpose

make sure that planning is conducted in such a way as to make good work environment conditions possible in connection with the work which it can be foreseen will be carried on in or adjacent to the building. The same applies to the person manufacturing prefabricated buildings.

The designers responsibilities

Section 4

Every person who takes part in the planning shall, within the scope of his assignment and, if necessary, in collaboration with other designers, take such measures as are needed in order for the planning to meet the requirements of Section 3.

General stipulations

Section 5

Buildings and other structures shall as far as is practically possible be positioned in such a way in relation to the surrounding land that transport, ground maintenance, facade work and suchlike can be done with adequate security against ill-health and accidents.

Section 6

Workplaces, work premises and personnel facilities with appurtenant spaces shall have sufficient area and ceiling height, having regard to the activity, and shall be suitably located, designed and equipped.

Section 7

Workplaces, work premises and personnel facilities with appurtenant spaces shall be easily and safely accessible and shall be suitably interconnected.

Section 8

Workplaces, work premises and personnel facilities with appurtenant spaces shall, if necessary, also be accessible to and amenable to use by employees with impaired mobility, vision or hearing.

Section 9

Floors, stairs, loading bays and ramps and the surfacing of outdoor workplaces shall be designed in such a way that the risk of slipping is small and, where necessary, so as to counteract slipping.

Section 10

A special room, separate from other rooms, shall as a rule be provided for a work process entailing a special risk of ill-health or accidents. The same applies concerning a work process entailing a special risk of fire or explosion.

Daylight

Section 11

At permanent workplaces, on work premises and in personnel facilities intended for more than temporary frequentation, there shall normally be adequate daylight and the possibility of an outside view.

Lighting

General rules

Section 12

Lighting shall be planned, installed and maintained and shall be examined and assessed to the extent necessary for the prevention of ill-health and accidents.

Section 13

Lighting shall be adapted to the differing circumstances of the workers and to the visual requirements which the tasks entail. Lighting shall have a distribution and direction suitable to the individual. Glare shall be avoided as far as possible.

Section 14

Lighting and the design of the workplace shall be such that people can move with adequate safety and without unnecessary adjustment difficulties between or in different rooms or work areas with different lighting conditions.

Light sources and lighting installations

Section 15

The colour rendering of a light source shall be suitable for the task. Lighting shall be designed in such a way that warning signs, emergency stop devices and similar are readily perceived.

Section 16

Lighting shall be designed in such a way that disturbing flicker does not occur. Exposure to ultraviolet radiation from lighting must not entail a risk of ill-health.

Section 17

Measures shall be taken to prevent accidents occurring due to moving machine parts, workpieces or suchlike objects appearing to move slowly or be stationary when looked upon in periodically varying light.

Air quality

Section 18

Work premises and personnel facilities shall be arranged in such a way and shall have such ventilation systems for air change and the trapping of air contaminants generated on the premises that the air quality in the frequented zone is satisfactory. Air change shall be arranged in such a way as to limit the spread of air contaminants.

On premises where air contaminants are mainly caused by the presence of personnel, carbon dioxide content can be used as an indicator of whether the air quality is satisfactory. On such premises, a carbon dioxide content of less than 1 000 ppm shall be aimed for.

Ventilation

Section 19

On premises where process ventilation is a prerequisite of the non-occurrence of harmful concentrations of contaminants in the frequented zone, any malfunction of the ventilation system shall be indicated by a control system. If exposure to an air contaminant can endanger life or cause serious injury, the control system shall also include an alarm. The alarm shall be acoustic or visual or, if necessary, both.

Outdoor air

Section 20

Outdoor air shall be supplied in sufficient quantity to work premises and personnel facilities.

Section 21

Outdoor air intakes shall be suitably positioned, having regard to the contaminant content and temperature of the outdoor air and the positioning of the exhaust air outlets.

Supply air

Section 22

The air supplied to work premises and personnel facilities shall be as free from air contaminants as is practically possible. The air contaminant content of the supply air shall be significantly lower than the occupational exposure limit values where such exist.

Section 23

Air shall be supplied in the manner which is suitable in each particular case, and in such a way that uncomfortable draught does not occur. If necessary, the air shall be preheated, cleaned or otherwise treated.

Extract air, return air, circulation air and transferred air

Section 24

In connection with work or a process giving rise to air contaminants containing

– substances included in group A or B in App. 3 to the Provisions of the National Board of Occupational Safety and Health on Occupational Exposure Limit Values, and Measures Against Air Contaminants (AFS 2000:3) or
– biological substances classified in safety class 3 or 4 according to the Provisions of the National Board of Occupational Safety and Health on Biological Agents (AFS 1997:12)

these contaminants may not be returned in return air, transferred air or circulated air.

Section 25

Ventilation systems with return air may be installed only if special investigation has shown them to be suitable.

Section 26

Extract air shall be cleaned before being conducted, as return air, to work premises or personnel facilities. Cleaning devices for return air or circulated air shall have a dependable separating function. It shall be possible for return air to be cut off completely.

If air from a room with process ventilation is used as return air or circulated air, any admission of air pollution due to malfunction in a cleaning device shall be rapidly observable, if necessary with the aid of instruments. The contaminated air shall then be conducted to another cleaning device or directly to the atmosphere, or else the process or handling shall be discontinued.

Section 27

Transferred air may only be supplied to rooms with lower air quality requirements than that of the room from which the air is taken.

Section 28

Contaminants from a process, handling or suchlike may not be conveyed, through return air or transferred air, to rooms where such contaminants are not normally generated.

Maintenance and functional control

Section 29

For ventilation systems there shall be written instructions in Swedish concerning operation and maintenance. Operating and maintenance personnel shall have sufficient knowledge of the ventilation system and shall have access to the instructions. The instructions shall apply solely to the ventilation system in question.

Section 30

Ventilation systems shall be inspected and maintained regularly. Newly installed ventilation systems shall be inspected to verify that they function as intended before being commissioned. Inspection and maintenance shall be documented. The documentation shall be available at the installation.

Thermal climate

Section 31

Indoor workplaces, work premises and personnel facilities shall have a suitable thermal climate. This shall be adapted to the nature of the work, according to whether the work is light or heavy and whether it involves movement or is sedentary.

Workplaces out of doors shall as far as possible be designed in such a way that the workers are protected against severe weather conditions.

Section 32

Heating installations shall as a rule be provided in every room where work is done all the year round. In such workrooms, where a heating device or heating of the entire premises cannot reasonably be required, workplaces with sedentary or other physically less strenuous work shall be positioned in a heated space.

Section 33

If a permanent workplace is situated close to a door or gate leading outside or to a room with a significantly different temperature, there shall normally be protection against uncomfortable draught.

Noise and acoustics

Section 34

Workplaces, work premises and personnel facilities shall be suitably designed and equipped according to their purpose, acoustic properties and sources of noise emission. They shall be planned, arranged and insulated from their

surroundings in such a way that exposure to noise is reduced to the lowest level practically attainable and as few people as possible are exposed to noise.

Section 35

Installations shall be made and maintained in such a way that noise generation and the transmission of noise to workplaces, work premises and personnel facilities will be as low as is practically possible.

Section 36

At the entrance to rooms, spaces or other places where there is a risk of hearing damage, there shall be a clearly visible compulsary sign displaying the symbol for “RISK OF HEARING DAMAGE USE EAR PROTECTORS”.

Electricity

Section 37

Electrical systems shall be designed so as not to cause injury or give rise to ill-health. Permanent workplaces shall not normally be positioned in the immediate vicinity of electrical installations where high current intensities or high voltages occur.

Electrical installations shall be made in such a way that the positioning of power sockets, the encapsulation of materials and suchlike permit good work environment conditions.

Water and drainage installations

Section 38

Floors that need to be flushed or need run-off for other reasons shall normally have a floor drain and a suitable gradient leading to the same. If necessary there shall be a floor pit or gutter with drain. Floor drains shall be accessible for cleaning.

Over floor pits and large gutters where pedestrian traffic occurs there shall be non-slip floor gratings which are easy to lift. There shall also be a device for removing these gratings. The gratings shall be designed so as not to give splash-back when large quantities of liquid are emptied into them.

Section 39

Tapping points for hot and cold water shall be provided where needed for the activities. They shall be positioned and designed with due regard for the risk of burns.

Drinking water shall be provided in a hygienic manner and within a distance which is reasonable, having regard to the nature of the work.

Furnishings and equipment

Section 40

Furnishings and equipment shall be selected according to the workers' different circumstances and the demands of their tasks. A person who works mostly standing or walking shall have the possibility of sitting down.

Section 41

Risks of ill-health and accidents shall be taken into account in the selection and positioning of furnishings and equipment.

Floors, walls and roofs

Section 42

Floors shall be firm and stable and shall have a resiliance appropriate to the activity. They may not have dangerous or unsuitable bumps, holes or slopes.

Section 43

On work premises where special danger occurs if persons or objects become electrostatically charged, the flooring, where necessary, shall be of material which leads off static electricity.

Section 44

The surfaces of floors, walls and ceilings shall be such that they can be refurbished. Floors, walls and ceilings shall be such that they can be cleaned without difficulty to the extent and in the manner which the activity demands.

Windows, doors and gates

Section 45

Windows and skylights shall where necessary have devices or be of a design that permits avoiding excessive effects of sunlight .

Section 46

Windows which can be opened shall be such that they can be operated in a safe manner. When open, they must not be positioned so as to entail a special risk of accidents.

Section 47

Windows shall be made in such a way or shall have such devices that they can be cleaned in a safe and ergonomically suitable manner.

Section 48

Doors and gates shall be suitably provided and arranged in terms of number, positioning, size and design.

Section 49

Swing doors and swing gates shall be transparent or shall have a suitably positioned and designed see-through panel, having regard to the risk of collisions.

Section 50

Gates opening upwards shall be secured against falling back and against inadvertent closure. They shall also be easy to open from inside.

Sliding doors and sliding gates shall be secured against being derailed and falling over.

Section 51

Doors for pedestrians must be provided in the immediate vicinity of any gates intended for vehicle traffic, unless it is safe for pedestrians to pass through. Such doors must be clearly marked and left permanently unobstructed.

Section 52

Where necessary, having regard to traffic conditions, barriers or railings for the protection of pedestrians shall be provided on both sides of gates.

Traffic routes, passageways and corridors

Section 53

Traffic routes for heavy transport shall normally be designed so as to permit wheeled transport.

Section 54

Transport operations between different levels shall be possible by means of a lift or other suitable transport device if the operations are so heavy or frequent that manual lifting, carrying or other manual handling entails a risk of ill-health due to unsuitable physical loads or a risk of accidents.

Section 55

Routes for pedestrian or goods traffic shall be dimensioned in accordance with the number of potential users and the type of activity.

Section 56

If both vehicle and pedestrian traffic occur on traffic routes, sufficient safety clearance shall be provided between pedestrians and vehicle traffic.

Sufficient clearance shall be allowed between vehicle traffic routes and doors, gates, passages for pedestrians, corridors and staircases, so as to avoid any danger to pedestrians.

Pedestrian traffic shall be separated from vehicle traffic on corners. If necessary a traffic mirror shall be provided.

Section 57

For the protection of workers, the traffic routes shall be clearly marked where necessary.

Section 58

Single steps, as well as thresholds in corridors and passageways, shall be avoided.

Stairs and fixed ladders

Section 59

Stairs shall be adequate from a safety viewpoint and shall be dimensioned according to the number of workers and the nature of the activity.

Section 60

Between a door and a staircase leading downwards or a single step, there shall be a landing of adequate size, having regard to the risk of falls.

Section 61

For access to platforms, balconies and suchlike spaces there shall be a fixed access arrangement. A stairway should be the first choice.

A fixed ladder more than 6 metres high shall have a guard for the prevention of falls.

Goods intakes, loading bays and ramps

Section 62

Workplaces and work premises shall where necessary have goods intakes. These shall be positioned and arranged in such a way and maintained in such condition that the handling of goods can proceed in a way which is physically harmless to the persons delivering and receiving goods.

Goods intakes shall be provided with sufficient space for the stationing of goods and load carriers. A loading bay shall be provided where necessary.

Section 63

Loading bays shall be positioned and designed in such a way as to avoid danger to neighbouring traffic and pedestrian traffic.

Section 64

Loading bays shall have sufficient space for work and goods and shall be suited to the nature, scale and equipment of the work. They shall have at least one access route from the ground, normally a flight of steps with a handrail.

At the edge, where there is a risk of vehicles falling down and where considerations of goods handling permit, loading bays shall have safety barriers. These safety barriers shall be at least 0.3 metres high. The barriers shall carry warning markings and shall be constructed so as to prevent vehicles from falling when inadvertently running or sliding into them.

Section 65

Outdoor loading bays adjacent to a building shall normally have a roof affording protection from precipitation and falls of snow. Where necessary they shall have an appropriate pitch for water run-off.

Section 66

If a loading bay is located indoors, there shall when necessary be a device removing vehicle exhausts.

Loading hatches

Section 67

Floor openings shall be avoided as far as possible. Where an opening in the floor does occur, care should be taken not to position it in front of doors and gates, in passageways or traffic routes or near places frequented by any person in the course of work.

Section 68

Load hatches in walls may not be positioned above a door or gate or an unprotected window if there is a risk of falling goods.

Safety devices and emergency equipment

Protection against falls and falling objects

Section 69

Load hatches in walls shall have appropriate devices for protection from falls and falling objects. Outer doors and gates shall, if necessary, be provided with canopies for protection from falls of snow and falling icicles.

Platforms, landings, stairs, balconies, overhead walkways and suchlike shall have guard rails for the prevention of falls. Stairs shall normally have a guard rail and handrails.

Floor openings shall have a guard rail, hatch cover, protective covering or corresponding safety device for the prevention of falls. Glazed areas at roof level shall normally have safety barriers.

Section 70

Open pools, vats and suchlike devices containing a dangerous substance or otherwise entailing a particular danger and whose upper edge is less than 0.8 m above floor level shall be surrounded with a safety barrier or shall have a protective cover.

Section 71

A safety barrier shall normally be at least 1.0 m high. It shall be designed to prevent falls also through or under the barrier.

A guard rail shall usually be fixed. If it is removable, folding or rotatable, it must be easy to return to and secure in the protective position.

A safety barrier shall be dimensioned for the load to which it will presumably be subjected.

Emergency lighting

Section 72

Emergency lighting of adequate intensity shall be provided on work and storage premises where the persons working are specially exposed to risks if the regular lighting fails.

Protection against entrapment

Section 73

Protection against entrapment shall be provided on work and storage premises where the persons working are specially exposed to risks in the event of being shut in.

Doors of cold stores and freezing chambers must be possible to open from the inside. A dependable lighting and signalling device, easily accessible and visible from the inside, shall be provided next to the doors of cold stores or freezing chambers where the temperature is below minus 5°C. Such a device shall be positioned approximately 0.5 m above floor level and shall be usable for signalling to a point from which help can be obtained. It shall be marked “Nödsignal”.

Protection against collision

Section 74

Glazed areas of doors, windows and walls shall either be fitted with a suitable guard or be made in such a way and of such strength that injuries due to cuts can be avoided.

See-through doors, gates and wall sections shall, where necessary, be marked so that they are easily discovered and so that the risk of collision is avoided.

Emergency shower and eyewash device

Section 75

An easily accessible emergency shower shall be provided in connection with activities where there is a risk of drenching with substances capable of harming the skin or easily absorbed percutaneously and where there is a risk of clothing catching fire.

An easily accessible eyewash device shall be provided in connection with activities where there is a risk of substances splashing which are capable of injuring the eyes. The eyewash device shall normally be a fixed installation and capable of supplying temperate water.

Warning signs

Section 76

Warning signs shall be used when risks cannot be avoided or sufficiently limited by means of general technical or organisational precautions.

Risk areas shall always be clearly marked.

Alarm systems and escape routes

Escape routes

Section 77

Escape routes shall be provided as necessitated by the nature of the building, the premises, the workplace and the activity.

In the event of danger occurring, it should be possible for all workplaces and personnel facilities to be evacuated before critical conditions arise.

The number of escape routes and their distribution and capacity shall be adapted to the use, equipment and size of the workplaces and to the largest number of persons for which the premises are intended. As a rule there shall be at least two independent escape routes.

Escape routes shall lead as directly as possible outdoors or to another safe place.

Section 78

The accessibility of escape routes shall be borne in mind when positioning technical devices, furnishings and material.

Escape routes and paths and doors to escape routes shall be kept unobstructed.

Section 79

Doors and gates for evacuation shall normally open outwards in the escape direction.

Sliding doors and revolving doors are not permitted if specifically intended as emergency exists.

Doors to or on an escape route shall be easy to open. They may not be locked or bolted in such a way as to impede evacuation.

Section 80

At workplaces which otherwise can only be evacuated with great difficulty, special measures shall be taken to ensure that the personnel can be evacuated.

Emergency lighting for escape routes

Section 81

In order for evacuation to be safely effected, emergency routes and exits requiring illumination shall be provided with emergency lighting of adequate intensity in case there is a failure in the power supply.

Signage and marking of escape routes

Section 82

Signage and other guidance markings for evacuation shall be provided unless manifestly unnecessary. Guidance markings shall if necessary be illuminated or translucent.

Signs and other markings shall be placed at appropriate points and be made to last.

Section 83

Escape routes shall be marked on the floor if there is a risk that they will otherwise be obstructed. The same applies to paths leading to escape routes.

Section 84

The position of non-automatic fire-fighting equipment shall be indicated by suitably positioned signs.

Evacuation alarm systems

Section 85

Buildings and work premises where fire, escaping gas, oxygen deficiency or suchlike entails a risk of accidents or acute ill-health shall be provided with detectors and alarm devices to the extent necessary, having regard to the size and use of the building and room. Account should also be taken of the equipment present in the building, the physical and chemical properties of the substances and products occurring, the location of the workplaces and the largest number of persons for which the premises are intended.

No alarm device is needed, however, where the risks of accidents or acute ill-health are small or where, for some other reason, an alarm device is manifestly unnecessary for the safety and health of the personnel.

Section 86

Alarm devices shall emit signals which can be apprehended by everyone in danger.

Process signals or other signals occurring shall be of such a kind that they cannot be confused with an alarm signal.

Section 87

It shall be possible for alarm signals to be actuated manually. If necessary there shall be a device which automatically actuates an alarm signal in the event of fire, escaping gas, oxygen deficiency or suchlike.

Section 88

Alarm devices shall be properly maintained and inspected at least quarterly.

Special risks in the event of fire

Section 89

Special steps shall be taken to facilitate the evacuation of buildings and work premises where a fire can develop so rapidly or entail such rapid development of smoke that evacuation will be significantly impeded. An automatic fixed fire-extinguishing device shall be installed if necessary.

Non-automatic fixed fire-fighting equipment shall be easily accessible and simple to use.

Section 90

In spaces where the extinguishing agent from an automatic extinguishing device implies a risk of asphyxiation or ill-health to the personnel, special steps shall be taken to provide protection from such risks.

Evacuation plan

Section 91

An evacuation plan shall be posted in buildings, to the extent necessary and at suitable points. The plan shall indicate escape routes, the procedure for alerting the rescue service and other necessary relief measures and, where relevant, show the position of manual call points for activation of the alarm and of an emergency telephone, as well as an assembly point.

Evacuation plans are not needed, however, for work premises where size, location and openness are such that an evacuation plan is manifestly immaterial to the safety of the personnel in the event of an evacuation.

Personnel facilities

General

Section 92

The number of personnel facilities together with their location, size and furnishing, shall be adapted to

(a) the nature and duration of the work,

(b) the number of workers regularly employed at the worksite who can normally be expected to be using the facilities simultaneously, and

(c) distribution according to sex.

Section 93

Personnel facilities may not contain furnishings or objects notably impairing the use of the facility for its intended purpose. A personnel facility may not be used for an activity which impairs its usefulness as a personnel facility.

Section 94

Employees keeping personal valuables at the worksite shall have access to a space which is or can be provided with a lock.

Wardrobe space

Section 95

Employees shall have access to a space for storing private clothing and, when necessary, work clothing. It shall be possible for this clothing to be stored in such a way that it is not made dirty or damaged and so as to counteract the risk of theft.

Section 96

Employees engaged on work which causes dirt or perspiration shall have access to a changing room. This shall have separate storage places for private clothing and work clothing.

Section 97

If there is a risk of ill-health or discomfort due to the transmission of infection, a health-endangering substance or a strong smell from work clothing to private clothing, there shall be a changing room with separate storage places for private clothing and work clothing. If necessary there shall be separate rooms for private clothing and work clothing. Rooms for such work clothing may not be combined with rooms for other work clothing.

In connection with work for which, in addition to ordinary work clothing, special protective clothing is used on account of infection or some other health hazard, there shall be a special space for the storage of this protective clothing.

Section 98

Changing rooms shall be separate for men and women if they need to use the rooms simultaneously. This, however, does not apply to changing rooms as referred to in Section 96 if there is only one employee of one or the other sex. In a case of this kind, some other suitable place shall be arranged for changing and for the storage of clothing.

Section 99

Changing rooms and other wardrobe spaces shall have sufficient space for changing and the storage of clothing by the number of employees referred there simultaneously. There shall also be seating for as many persons as normally need to be seated simultaneously. A sufficient number of mirrors shall be provided in or near changing rooms and other wardrobe spaces.

Drying facility

Section 100

If work clothing or footwear can easily become wet in the course of work, a possibility of drying them shall be provided in or near the wardrobe space. When necessary, equipment for flushing boots shall be provided near changing rooms.

Shower and washing facilities

Section 101

Wash basins with a sufficient quantity of hot and cold water shall be provided at worksites.

Section 102

At worksites where the work causes dirt or perspiration, there shall be access to a shower. This does not apply, however, at worksites where, having regard to the circumstances, the installation of a shower is not reasonable.

If more than four employees are simultaneously occupied with work as referred to in the foregoing or if the work is an infection hazard or is done with a health-endangering or strong-smelling substance, a wash basin and shower shall be provided in a special wash room adjoining a changing room. There shall be separate changing rooms, wash basins and showers for men and women, if they need to use these facilities simultaneously.

Section 103

The number of wash basins and showers shall be sufficient having regard to the nature of the work and to the time needed for washing. Sufficient space shall be provided at the wash basin. Wash basins and showers shall be provided with cleaning agents and to the requisite extent with towels or drying devices.

Toilets

Section 104

Worksites shall be provided with a sufficient number of toilets for the employees working there simultaneously.

Section 105

Toilets shall be sufficiently large and secluded and shall have lockable doors.

A wash basin shall be provided in or adjacent to the toilet. A toilet shall not normally communicate directly with a canteen.

Canteens

Section 106

Employees shall be able to eat in satisfactory conditions during a meal break or mealtime. They shall normally do so in a staff restaurant, another restaurant, a canteen or a dining space. Some other suitable space will be accepted, however, in the case of pupils during their training

Section 107

Employees bringing their own food shall have access to a canteen or to a place in a staff restaurant. At worksites where not more than four employees work simultaneously, there may instead of a canteen be a separate dining space on the work premises or in a cloakroom with clothes lockers if the work is not dirty, an infection hazard or done using a health-endangering or strong-smelling substance. A heating device, refrigerator, storage space, waste

collection bin, supply of hot and cold water and washing-up facilities shall be provided near a place where employees consume food which they have brought with them. Seating shall have backrests.

Social area

Section 108

Employees shall be able to spend breaks during their work in a suitable place. A special social area shall be arranged if necessary.

Rest area

Section 109

A suitable rest facility for temporary rest, e.g. in the event of nausea or headache, shall be provided or easy to arrange at worksites. This does not apply, however, where only a few employees are occupied simultaneously. At large worksites, the resting point shall as a rule be accommodated in a special sick room.

Section 110

A resting point shall be comfortable, undisturbed and large enough for rest to be taken in a recumbent position. A sick room shall be suitably furnished and equipped.

Room for duty staff

Section 111

A room shall be provided for duty staff. The room shall be as close as is practically possible to the duty staff's main workplace.

Section 112

Rooms for duty staff shall be positioned away from disturbance and shall be of such size and so furnished that employees will obtain the rest they need. They shall take the form of single rooms. A facility for heating and consuming food shall be provided close to rooms for duty staff. A toilet and shower shall be provided near the room.

Waiting rooms

Section 113

At a worksite where employees normally have waiting times of considerable length, a special waiting room shall be provided unless there is some other suitable space available.

The waiting room shall be equipped to the necessary extent with tables and seats with backrests. In or near a waiting room there should be a rack for outdoor clothing and a supply of drinking water. A toilet shall be provided close to the waiting room.

Sleeping accommodation

Section 114

Sleeping accommodation should be provided for transport employees who in the course of their duty travel on a regular, timetabled basis to the same locality and remain there at the time appointed for rest. Such rooms shall be single rooms. They shall be of such a size, shall be so furnished and equipped and so located that employees are able to relax and rest undisturbed.

A dining facility shall be provided close to sleeping accommodation. A toilet and shower shall be provided near the room.

Special requirements concerning personnel cabins

Section 115

Personnel cabins shall have

– at least one window which can be opened,
– equipment for refuelling from outside, if liquid fuel is used for heating and
– equipment facilitating the connection and disconnection of a tractor vehicle if the cabin is intended to be towed by such a vehicle.

Operation and maintenance

Section 116

Workplaces, work premises and personnel facilities with their appurtenant spaces shall be maintained, tidied and cleaned in a satisfactory manner for the prevention of accidents and ill-health. This should be done regularly and in accordance with predetermined routines adapted to the function of the space, the frequency of its use and the activity of the workplace.

The maintenance shall be such that the mechanical strength of the building or structure is not reduced. Technical devices and installations shall be maintained in such a way that they function as intended and with safety unimpaired.

Section 117

Spaces and devices for the use and service of a property and for maintenance work shall be provided and shall be of such size and design that work of these kinds can be done in a physically sparing manner and without in-built risks of ill-health and accidents. The same applies concerning access routes to such spaces.

Building products, installation parts and other technical devices requiring care or normally needing to be renewed during the useful life of the building shall be positioned in such a way that this can be done with adequate security against ill-health and accidents and in an ergonomically appropriate manner.

Entry into force

These Provisions enter into force on 1st July 2001. The Stipulations of Sections 34 and 36, however, do not enter into force until 1st April 2003.

The following Provisions and General Recommendations issued by the National Board of Occupational Safety and Health are repealed as from 1st July 2001:

AFS 1991:8	Lighting
AFS 1993:5	Ventilation and Air Quality
AFS 1993:56	Evacuation of Workers
AFS 1995:3	Work Premises
AFS 1995:4	Design of Buildings and Plants
AFS 1997:6	Personnel Facilities

References made in statutory instruments from the National Board of Occupational Safety and Health to the repealed Provisions shall instead refer to the corresponding parts of the new Provisions.

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General Recommendations of the Swedish National Board of Occupational Safety and Health of the Implementation of the Provisions on Workplace Design

The following General Recommendations are issued by the National Board of Occupational Safety and Health Concerning Implementation of its Provisions (AFS 2000:42) on Workplace Design.

General Recommendations have a different legal status from Provisions. They are not mandatory. Instead they serve to elucidate the meaning of the Provisions (e.g. by explaining suitable ways of meeting the requirements, giving examples of practical solutions and procedures) and to provide recommendations, background information and references.

Background

Suitable physical design of the workplace is an important precondition of good work environment. The aim of these Provisions and the accompanying General Recommendations is to make it possible to foresee and avoid risks of ill-health and accidents which are caused by or can be prevented through the design of the premises. This can apply, for example, to fire and evacuation, adequate space, division into rooms, communications and partitions in the floor plan, traffic routes, installations and surfacing. With careful planning of the work environment, e.g. with regard to light, sound and air, not only can light conditions, the acoustic climate and air quality be improved, but other valuable properties can also be achieved, such as stimulating lighting and colouring, flexibility for change, intelligible configuration, good ergonomic conditions and transport efficiency.

Social changes in recent decades have among other things resulted in many modern jobs being more sedentary than was previously the case. Lack of physical activity is contributing to a number of disorders and pathological states and is now regarded as equal in importance to smoking, elevated blood fat content and high blood pressure. Even moderate physical activity means considerable improvements for an inactive person. Work premises, therefore, can well be designed so as to encourage a certain amount of physical activity.

The work environment need to be included and considered in planning at an early stage, preferably already at the investigative and formulation stage of workplace programming. During the planning phase and before a room is finished, good opportunities exist for creating good working conditions. Subsequent correction of deficiencies with regard to protection from ill-health and accidents, on the other hand, can very often be both time-consuming and expensive. If work premises and personnel facilities have deficiencies, day-to-day work environment work will often be made considerably more difficult.

Special rules on internal control of the work environment exist to ensure that the requirements of the Work Environment Act are satisfied. This implies a duty on the part of the employer to plan, conduct and follow up activities from a work environment viewpoint.

One vital component of internal control is the investigation of working conditions, assessment of the risks of ill-health and accidents at work and the taking of steps which these investigations show to be necessary. Thus the employer needs, for example, to regularly check lighting, air quality, ventilation systems, noise conditions, various forms of furnishing and equipment and the management of operations and maintenance.

The employer controlling a worksite is responsible for safety of permanent devices at the worksite and of other devices supplied there. This also applies in relation to persons other than his own employees, e.g. as regards loading bays for distribution workers employed by the supplier or cleaning rooms and social areas for cleaning staff from outside (See AML, Chap. 3, Section 12).

For the application of these Provisions to agriculture, light industry and suchlike, the following should be observed. The Work Environment Act and its Provisions apply to every activity in which employees do work on an employer's behalf. Thus the Act and Provisions also apply to employed family members and employed reliefs and to everyone working in companies. They also apply to work of a non-permanent nature, such as the supervision of livestock pens or machine buildings. Certain rules, on the other hand, do not apply to non-incorporated one-man or family businesses.

The Work Environment Act is also partly applicable outside working life. Pupils, patients and conscripts are in certain respects equated with employees, e.g. as regards work environment conditions (AML, Chap. 1, Section 3). On school premises, accordingly, these Provisions also apply to work environment conditions for the pupils.

As regards housing it should be particularly mentioned that the Provisions of the Work Environment Act apply to safety and health conditions of all kinds and that the Act also applies to work in such spaces, for example, as refuse storage areas, cleaning rooms, fan rooms and lift machine rooms, even if located on housing premises. Accordingly, for work in spaces of this kind demands can be made on the employer concerning, for example, safety, working space and accessibility (see AML, Chap. 2, Sections 1 and 4). If the spaces do not meet these requirements, the Labour Inspectorate[2] can forbid the employer to carry on work there. A property owner can be forbidden to provide deficient work premises (see AML, Chap. 7, Section 8).

Light, sound and air

Properly designed *lighting* creates a good visual environment, enhances security against accidents and counteracts eye disorders. Lighting also has a very important bearing on job satisfaction. Visual ergonomics at work concerns the interaction between human vision and work. A special point of emphasis here is vision and visual conditions at work: adapt the task and workplace to people's different qualifications and, if necessary, help people to adapt to the demands of the task by using special assistive devices. Work can be adapted, for example, by means of appropriate lighting and a carefully chosen working distance according to the detail size of the visual object.

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[2] *As from 1st January 2001: the Swedish Work Environment Authority.*

Detailed guidance on the planning of workplace lighting will be found in the publication “Belysning inomhus. Riktlinjer och rekommendationer”. In addition to lighting recommendations of a more general nature, the publication also includes a large number of tables giving recommended illuminances for different types of workplaces and work situations. Other publications on lighting, indicated in the sections “Current Rules” and “Literature on Work Environment Conditions”, provide information on various aspects, arranging from visual ergonomics to the mathematical procedure for calculating various lighting factors.

Noise often constitutes a major load on the work environment conditions. In addition to being capable of causing hearing damage, it is very often experienced as annoying and fatiguing. It can impair concentration on a task and thus be experienced as an obstruction at work. In addition, noise can prevent or impede conversation and mask other, desirable sounds. The possibilities of apprehending acoustic warning signals and, for example, the sound of approaching vehicles can also be seriously impaired, and in this way noise can constitute an indirect accident hazard.

Constant, prolonged exposure to noise with an A-weighted sound pressure level exceeding about 85 dB entails a risk of hearing impairment. The louder the noise, the shorter its duration needs to be in order for hearing impairment to occur. Individual sensitivity varies a great deal, however, so that sensitive persons may also risk hearing impairment resulting from prolonged exposure to noise at sound levels below 85 dB(A). Loud noises of short duration can also cause permanent hearing impairment. Impulsive sounds, such as impact noises, can entail a special risk of hearing impairment. Occasional detonations etc., if loud enough, can cause permanent hearing impairment.

It is not possible to state a general relation between noise exposure and subjective disturbance. Even low-level noise can often be experienced as highly annoying. At lower sound levels especially, sensitivity to the disruptive influence of noise can vary considerably from one individual to another, and so it is impossible to state any lower limit below which noise abatement measures are no longer justified. Instead an assessment has to be made of each individual case and based among other things on perceived discomfort, speech masking, current sound level, the frequency and timing of noise exposure and the technical feasibility of limiting noise.

Further rules are contained in the Provisions on Noise issued by the National Board of Occupational Safety and Health.

Air contaminants affect human airways, eyes, skin and internal organs. The concentration of air contaminants at a workplace, therefore, should always be low. Primary measures are to endeavour to use materials and processes emitting the smallest possible quantity of contaminants. This also applies concerning the choice of building materials. Good ventilation and cleaning are two supplementary methods for keeping the concentration of air contaminants down to a low level.

Sick buildings are usually described as buildings where, to a greater extent than is normal, large numbers of people develop such symptoms as

– irritation of the eyes, nose and throat,

– sensation of dryness in mucous membranes and skin,
– skin rash, tiredness, headache and nausea.

These problems may be caused by
– water and moisture damage which can lead to the growth of mould and the emission of volatile chemical degradation products from building materials,
– ventilation problems due to functional inefficiency and lack of maintenance.

Deficient or incorrect cleaning can also have a bearing on the occurrence of sick-building problems. There is a lot that indicates that the problem is due to a combination of several different factors (physical, chemical, biological, medical and psychosocial). Sick-building symptoms therefore need to be viewed in a holistic context and an action plan of suitable measures drawn up.

Evacuation

Fire, escaping gas or oxygen deficiency at a worksite are examples of things which can pose acute risks of ill-health and accidents to persons employed at the worksite.

Developments have led to a growth of these hazards. There are several reasons for this, among them the introduction of new materials and products, increased use of gases and larger volumes of products. Bomb threats and suchlike have also become more common.

Many of the new materials and products increase the risk of ~~a~~ quicker fire spread and the formation of dangerous combustion gases. Combustion gases are dangerous to health and are often mixed up with dark smoke. Smoke quickly reduces visibility and impedes evacuation. Escaping gas presents a risk of poisoning or asphyxiation. In addition to this some gases can combine with air to form explosive mixtures.

The foundations of safe evacuation are: escape routes, an alarm system which gives warning of the danger, and knowledge of the risks and of what action to take when the alarm has been given.

Planning responsibility

The planning and design of the workplace and its outward setting is of importance for good work environment conditions, and not only for persons employed at a permanent worksite. Persons working every day in many different buildings or structures have the same need.

The employer whose personnel carry out work of this kind at a variety of workplaces does not usually have any opportunity of influencing the workplaces' design. This can apply, for example, to postal delivery work, domiciliary care, refuse collection, cleaning services, transport work or rooftop snow clearance.

Then again, it is impossible for the Labour Inspectorate[3] to issue an employer of this kind with an injunction for alterations to the building or structure. On the other hand, the employer can be forbidden to carry on work on these premises until steps have been taken.

The responsibility imposed, under Chap. 3, Section 14 of the Work Environment Act, on developers and planners and the suppliers of prefabricated buildings or structures concern work environment conditions both for persons employed on permanent premises and persons moving from one workplace to another in buildings and structures. It also applies to those who are to erect the building.

To ensure that the requirements of the Work Environment Act are met during the construction phase, special rules on design, planning and construction work are contained in the Provisions and General Recommendations of the National Board of Occupational Safety and Health on Construction and Heavy Engineering Work.

It should be noted that the person ordering or commissioning the work, often referred to as the developer, does not usually have any expert knowledge of design or building. Usually, therefore, the developer engages building consultants (architects, structural engineers, heating and ventilation consultants etc.) and contractors for planning and construction purposes.

It is important that the designer should counteract accidents and ill-health which can be caused by the design, structure or site preparation of the building. For example, most occupational diseases resulting in early retirement (permanent disability pension) are due to musculoskeletal injuries. Work which has to be done in unfavourable work postures, e.g. in cramped spaces, can lead to musculoskeletal injury. Falls to a lower level, which account for some 20% of work fatalities, can for example be due to the work having to be done from a loose ladder or to the absence of guard rails where they were needed.

In cases where the developer is an employer rebuilding his work premises, he is expected to furnish the designers with sufficient information, e.g. by giving them a detailed description of the way in which the undertaking is intended to operate on the new premises.

On the subject of co-operation, Chap. 3, Section 1a of the Work Environment Act lays down in general terms: “Employer and employee shall co-operate to establish a good working environment.” Concerning work facilities, Chap. 6, Section 4 of the Work Environment Act lays down that safety delegates shall take part in the planning of new facilities or the alteration of existing ones, while Chap. 6, Section 9 requires questions concerning the planning of new facilities or the alteration of existing ones to be discussed by the safety committee.

Planning, therefore, needs to be conducted in such a way that different requirements and viewpoints are brought to light and the knowledge, experience and values of the employees can be utilised and factored in. It is

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[3] *As from 1st January 2001: the Swedish Work Environment Authority.*

important that work environment questions should be considered at an early stage, that co-operation with the employees should begin early on and that time should be allowed for discussion and processing. Certain particulars and standpoints need to be introduced into planning already at the feasibility study or programming stage, e.g. particulars of noise levels or the need for separate premises for certain handling operations, as well as the need for communications between different sections. It is important to define functional requirements for buildings and facilities. Without clearly defined functional requirements it is difficult later on to make demands on the supplier of the building if one is not satisfied with its functioning.

The Planning and Building Act (PBL), Chap. 9, Section 5, lays down that a safety delegate, a safety committee or an organisation representing the employees shall be given the opportunity of commenting on certain building measures before work begins.

Rules and authorities

Most of the rules about building are gathered in the Building Statutes. General rules on buildings, structures and building products are contained in the Buildings (Requirements Concerning Technical Properties) Act (SFS 1994:847). General provisions on building are contained in the Planning and Building Act, PBL (SFS 1987:10). These enactments are supplemented by Provisions and Recommendations in the Building Regulations, BBR (BFS 1993:57), of the National Board of Housing, Building and Planning, and in the Design Regulations of the National Board of Housing, Building and Planning, BKR (BFS 1993:58).

Certain rules relating to construction are contained in the Work Environment Act (SFS 1977:1160) and in various detailed Provisions pursuant to that Act in the Statute Book of the National Board of Occupational Safety and Health (AFS).

The requirements contained in building legislation are addressed to the developer and the property owner and are implemented by the Municipal Building Committee in the course of inspections.

The stipulations of work environment legislation are primarily addressed to the employer, who is responsible for compliance with health and safety regulations, and are enforced by the Labour Inspectorate[4] in the course of inspections. The Inspectorate bases its stipulations on the Work Environment Act and on Provisions issued by the National Board of Occupational Safety and Health. In its assessment of individual cases, the Inspectorate may also choose to be guided, for example, by the Building Regulations of the National Board of Housing, Building and Planning (BPR) or by facts obtained from manuals on the subject.

By authority of the Work Environment Act, improvements to work environment conditions can also be stipulated in an existing building, regardless of whether or not any new construction or alteration is intended.

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[4] *As from 1st January 2001: the Swedish Work Environment Authority.*

The statutory instruments on building and work environment conditions are mutually co-ordinated. If work premises are designed so as to meet the stipulations of the Building Regulations, then as a general rule the corresponding stipulations of the work environment regulations are also satisfied, but there are exceptions.

From a work environment viewpoint, work premises shall be assessed with reference to the activity conducted or intended to be conducted there at the time of the assessment. Other and stricter stipulations than for the processing of building permit applications may therefore come into play, e.g. if there has been a change of activity, equipment or installations.

Certain safety issues are governed by other statutory instruments and the instruments themselves enforced by other agencies. Co-ordination may therefore be needed.

Rules on protection from danger caused by electric current are contained in the Electricity Act (SFS 1997:857) and rules on electromagnetic compatibility (EMC) in the EMC Act (SFS 1992:1512) together with implementing regulations. The Swedish National Electrical Safety Board is the authority responsible for these matters. This authority supervises high voltage electrical installations, which are also controlled through the requirement of special authorisation for electrical contractors.

Several rules concerning protection against fire hazards are contained in building legislation and its implementing regulations, in the Rescue Services Act and Rescue Services Ordinance and in the Flammables and Explosives Act and Ordinance (LBE) together with their implementing regulations. In addition, recommendations, directions etc. concerning protection against fire hazards have been issued, for example, by the Swedish Agency for Economic and Regional Growth, the National Inspectorate of Explosives and Flammables, the Swedish Fire Protection Association, the Swedish Insurance Federation and various business organisations.

Questions concerning rescue service legislation are handled at central level by the National Rescue Services Agency and at local level by municipal rescue service committees and rescue services.

Responsibility for the supervision of fire safety devolves primarily on the municipality and its rescue services committee. The Rescue Services Agency is also the supervisory authority under the Flammables and Explosives Act. Its tasks include taking part, as an expert on rescue service questions, in the processing of planning and building matters by the municipal building committee and carrying out fire safety inspections of buildings or structures.

Work environment legislation also includes rules on protection against fire hazards. Chap. 2, Section 4 of the Work Environment Act requires adequate safety precautions shall be taken to prevent injury being caused by falls, falling objects, fire, explosion, electric current or other comparable factors. It is, however, in the nature of things for the supervisory authority to co-operate with rescue services in order to achieve adequate protection of employees in case of fire.

Fire safety inspections are carried out, under the Rescue Services Act (SFS 1986:1102), by special fire safety inspectors appointed by the municipal rescue services committee. Fire safety inspection means inspection to verify that the measures aimed at eliminating risks of fire and of injury resulting from fire have been taken.

The municipal environment and health protection committee is charged with supervising schools and day nurseries, for example, with reference to health protection and hygiene under rules issued by the National Board of Health and Welfare, and of food premises, with reference to the handling of foodstuffs, under rules issued by National Food Administration. Certain personnel facilities are also subject to rules issued by the National Food Administration. These rules may contain different stipulations concerning personnel facilities from those contained in these Provisions, which only indicate minimum requirements from a work environment viewpoint.

Chap. 2, Section 1 of the Work Environment Act lays down that the work environment shall be satisfactory having regard to the nature of the work and social and technical progress in the community. The preparatory works of the Act make it clear that work environment conditions are to be improved in keeping with the opportunities which development affords. At the same time, according to the preparatory works, it is assumed that for implementation purposes a balance will be struck in the matter of necessary and reasonable initiatives.

The question of balancing work environment requirements against other interests can occur, for example, where historic buildings are concerned. Heritage legislation and building legislation (Chap. 3, Sections 12 and 10 of the Planning and Building Act) contain rules on the protection of buildings of outstanding interest. In cases of this kind the implementation of these Provisions and their balancing against what is possible and reasonable should be accomplished by devoting special care to the organisation of the work done on the premises and to the choice of technical solutions, for the avoidance of unnecessary interference with the building. When measures are necessary in order to achieve acceptable work environment, they should be taken in a manner involving the least possible damage to the historic qualities, preferably in consultation with the County Antiquarian and the Labour Inspectorate[5].

[5] *As from 1st January 2001: the Swedish Work Environment Authority.*

Guidance on individual sections

Scope

Guidance on Section 1

Within the scope defined for them, these Provisions apply to the design of workplaces and traffic routes both indoors and out. They include all types of workplaces, including those for teleworking, in both existing and planned new buildings and other structures. They also include appurtenant spaces and such parts of buildings and devices adjoining them, the design of which has a bearing on work environment conditions.

Appurtenant spaces can, for example, include entrances, stairwells, corridors, storerooms, cleaning rooms, refuse storage spaces and control rooms, basements and attics, crawl spaces and culverts. Ancillary spaces of this kind often constitute a workplace for persons employed, for example, on transport operations, cleaning or maintenance and supervision.

Adjacent parts of buildings and structures with a potential bearing on work environment conditions can, for example, include loading bays and platforms, together with stairs, ramps, fixed ladders etc. serving as access devices to buildings or spaces.

Dwelling spaces can also constitute work premises for personnel, e.g. in group housing.

Special Provisions or General Recommendations apply to certain activities, such as nursing in private homes and construction and heavy engineering work and to special subject fields. See Current regulations.

In the Provisions on Design of the Workplace, however, the sections on lighting (12-17) noise (36) and warning signs (76) also apply to construction and heavy engineering work and to workplaces in extractive industries such as mining and quarrying.

Definitions

Guidance on Section 2

Other structures include e.g. bridges, airfields, underground installations, tunnels, quays, sports grounds and radio and telecommunications masts.

Not all the personnel facilities enumerated are needed at every workplace. The facilities needed are determined according to the content of each section of the Provisions and the general principle laid down in Section 92. The school playground counts as a social area for pupils.

A personnel facility may consist either of a complete room or, in certain cases, of part of a room, e.g. a screened-off area. For work at a non-permanent worksite, the personnel facility may also be accommodated, for example, in a cabin, a specially prepared motor vehicle or, as a temporary expedient, in an existing building. If, owing to road or terrain conditions, a cabin cannot be conveyed to within reasonable proximity of the workplace, it may happen as

an exceptional arrangement, mainly in summertime, that the facility consists of a small caravan or suchlike.

Design

The developer's responsibilities

Guidance on Section 3

If planning leads to deficiencies in the finished building, retro-remediation can be very expensive. This makes it important for the developer to choose planners with a knowledge both of building regulations and of work environment regulations. It is equally important to give the planners the opportunity of doing an adequate job, through the definition of assignments, co-ordination and other measures. Even if the developer discharges his responsibility by choosing competent planners and has consistently designed and co-ordinated the assignments, he still needs to follow up the planning work. He will then be able to take steps if there is anything to suggest that the work is not being done satisfactorily.

The liability of manufacturers of prefabricated buildings is confined to the part of the design process which the manufacturer is capable of influencing.

It may be practical for an inexperienced developer to appoint one of the planners to be responsible for the requisite contacts occurring within the design group and to draw up a plan for "clearing" co-ordination measures.

It is normally appropriate for co-ordination of design work to include the following:

– Preparation of a plan for good work environment conditions, in consultation with the planners engaged.
– Follow-up of the plan and, where relevant, reporting back to the developer on the progress of works in relation to the plan.
– Organisation and conduct of co-ordination meetings with those concerned.

It should be noted that the developer remains basically responsible for the co-ordination of design work, whatever the form of procurement where design and contracting are concerned.
Supplementary Provisions on design with respect to work environment conditions in the conduct of building and civil engineering work are contained in Provisions on Building and Civil Engineering Work of the National Board of Occupational Safety and Health.

The planner's responsibilities

Guidance on Section 4

Design work can include measures, for example, for the prevention of injuries resulting from falls, falling objects, loads, pinching, noise, poor lighting, poor air quality, fire and threats and violence.

Co-operation can among other things mean the architect and the various installation designers co-ordinating the design work so that sufficient space will be created for such work as cleaning, servicing, repairs or replacements.

Co-operation between different planners can, for example, mean:

– Co-operation between the architect and the planner concerning a suitable design, so that external work on roofs and facades can be done safely.
– A report by the ventilation consultant on the noise level generated by fan units etc. proposed, so that an appropriate soundproofing design can be selected by the designer.
– Space co-ordination in the design process, using CAD.

General stipulations

Guidance on Section 5

Developed land is often a workplace, for example, for caretakers, groundsmen and porters. Their work environment condition is extensively affected by the way in which buildings and structures are positioned on the site.

There are also other groups whose work environment conditions can be affected. These include, for example, refuse collection workers, newspaper delivery personnel, special transport assistance personnel, ambulance personnel, lorry drivers, delivery vehicle drivers and security personnel. It is primarily the employers of these groups who are responsible for their work environment conditions, but a certain responsibility also devolves on the person controlling the worksite to which they come, though only in cases where the worksite also includes the developed land.

In many jobs the risk of musculoskeletal injuries will be reduced if ground conditions and space permit the use of a barrow or tractor, e.g. for snow clearance or sand-spreading. It is important that the traffic route from a refuse storage area to the street should permit the use of a cart.

Experience has shown that wood, plaster, cladding elements and glass require attention many times during the useful life of a building. Outdoor lighting and other devices positioned on a facade need to be accessible, e.g. for the replacement of bulbs. Space for a mobile crane, a hoist or scaffolding on the ground may be necessary in order, for example, for window cleaning to proceed as safely as possible in the absence of any other arrangement.

It is appropriate for lampposts, ventilation ducts etc. to be positioned on hard standing, use of a grass mowing machine being impossible in the immediate vicinity of such objects. An asphalted or gravel surface next to the facade and flowerbeds accessible for weeding will reduce the risk of musculoskeletal injuries resulting from ground work. The selection and positioning of plants in consultation with an expert can among other things result in fewer injuries on hard standing and less hazardous plant and ground maintenance.

Guidance on Section 6

When deciding on the positioning of a workplace, a room or a building, risks and other influences from the surroundings usually also need to be taken into account. The positioning and alignment of the building should, among other things, be decided with reference to the local climate (wind conditions etc.). Consideration should also be paid to the exclusion of daylight from other buildings and terrain and to ambient noise.

The suitable size and design will depend partly on

- the nature and extent of the activity
- the number of workers and shifts
- ventilation systems
- lighting systems
- furnishing and equipment
- working space
- handling of dangerous substances
- noise-generating activity
- material storage areas
- transport operations and movement
- refuse disposal and cleaning
- utility spaces
- disabled access
- maintenance work
- distribution according to sex.

Suitably sized work premises will mean sufficient space for work tables and machinery, for the operation, supervision and maintenance, for storage of materials, for passage and transport and safety from pinching etc.

A clearance of 0.6 m is usually sufficient to prevent pinching, e.g. between a moving machine part and a wall, pillar or suchlike.

The design of the facilities also decides communication possibilities and the view commanded of premises and communications. These possibilities are important for the human need of social participation and orientation. For good visual conditions at work, it is important for the workplace to be arranged in such a way that the field of vision is not obstructed by furnishing, equipment or other objects.

It is especially important that the size and design of premises should be decided according to musculoskeletal requirements, so as to afford room for work postures and working movements which are not strenuous and which can be relieved and varied. At the same time, it is essential that the physical activity included in a job should not be excessively limited. Carefully considered positioning and design of meeting points for discussion and intellectual activity, as well as social areas, can help to make people more mobile.

Care of bedridden patients or the transfer of patients, for example, between bed and wheelchair or to a toilet, normally requires at least 0.8 m clearance on both sides of the bed or toilet.

Premises also need as a rule to be designed and proportioned for cleaning work, e.g. leaving adequate room for manoeuvre. Suitable design for cleaning work normally means providing sufficient room for the use of a cleaning trolley. Clear floor spaces facilitate cleaning. In sanitary accommodation, floor cleaning is made easier by the toilet and wash basin being mounted on the wall.

Certain activities, e.g. in shops or caring institutions, entail special risks of threats or violence to personnel. These risks can be reduced by suitable arrangement and design of premises, e.g. doors and locking systems to exclude unauthorised persons, a floor plan providing a clear view of the premises, entrances and visitors, safe distances and escape routes, suitable routes for the transport of valuables and, at an exit, an outward view and lighting making it possible for the area surrounding the exit to be monitored from inside.

Low ceiling height can make it difficult to arrange satisfactory ventilation and lighting and can adversely affect daylighting. A low ceiling height, for example, in a goods reception department can cause employees to use incorrect work postures, resulting in musculoskeletal injuries.

The volume of air needed per person is not specifically regulated but is decided by the occurrence of air contaminants coupled with current stipulations concerning adequate, draught-free ventilation.

The height of a room is normally calculated from floor to ceiling and to the underside of girders, ventilation ducts etc., unless their effect on the height of the room can be accepted without inconvenience.

The ceiling height sufficient at a workplace or in a workroom will depend partly on the work machinery, lifting devices and other technical devices used in the undertaking. It is important to remember that supervision and maintenance also demand a certain ceiling height.

A ceiling height of 2.7 m is generally sufficient for work premises. On premises where only a small number of persons are employed, a ceiling height of 2.4 m can often suffice. A lower ceiling height may sometimes be sufficient in small parts of the premises, though generally not less than 2.1 m in a part of the premises where work is done and standing height is needed. A lower ceiling height may sometimes be sufficient in spaces where people only work occasionally, e.g. machine rooms, small cold stores and freezing chambers, installation spaces, refuse storage spaces, culverts, communication spaces, control cabs and suchlike, though generally not less than 2.1 m.

It is inappropriate for stairs to have less than 2.0 m cealing heaight.

A ceiling height of 2.4 m is usually sufficient for personnel facilities, though large staff canteens most often need 2.7 m.

It is important that spaces for utilities and ducts in foundations and attics should afford sufficient space for work and movement and for both installation and subsequent work. The basic principle should be for the working space to be not less than 0.6 x 0.9 x 2.1 m in order for work to be possible in a reasonably acceptable manner. Handling of materials and equipment may

augment the space requirement. So too can other factors, e.g. the need for footholds, clothing, dirt and grime on walls etc.

Guidance on Section 7

Appurtenant spaces referred to here include, for example, personnel facilities, storage facilities and cleaning spaces, corridors, stairs and lifts, fan rooms, lift machine rooms and other service installation rooms.

It is important that communications between workplaces and between and within work premises should be safe, convenient and straightforward. Suitable communications are a prerequisite of rational, safe work. Accessibility and communications are decided by the positioning, design and configuration of the premises and by their relative positioning and connections. If frequent movements and transports are foreseeable between different premises, those premises should be grouped together and provided with a direct link. It is important that personnel facilities, and especially rest rooms and toilets, should be within close reach of work premises. This is very much the case where younger school children are concerned. A school playground in a neighbouring park does not usually measure up to the requirement of this section.

It is important that traffic routes should be planned so as to be safe for pedestrians and vehicles and so that employees working near them will not be exposed to accident risks by the traffic.

Problems concerning movement and transport outdoors can occur, for example, at motels. A windproof canopy roof of sufficient width and with the ground levelled for cleaning and laundry trolleys usually suffices in this context as a climate-protected link between the guest rooms in the same building.

A satisfactory access route to a service installation room is safe and convenient and permits the transport of such tools and materials as are used. An access route normally needs to be permanent. For ascent there should normally be a staircase with handrails. Access routes and doors of fan rooms should be of full height.

Access routes to spaces for installations, and especially lift machine rooms, are also dealt with in the Building Regulations of the National Board of Housing, Building and Planning (BBR).

Guidance on Section 8

The accessibility requirement is limited to situations of need, which means that a departure may be necessary for a certain room, part of a room or individual workplace, where justified by the nature of the work.

When work premises are made accessible to persons with functional impairment, it is important that personnel facilities, e.g. a canteen, toilet, wardrobe space and wash basin, should also be accessible to them.

Disabled access can normally be considered to have been provided if the room is accessible to a person in a wheelchair. Special attention needs to be paid here to obstructive differences in height, but also to the provision of adequate clearance in doorways and passages and to the possibility of

opening doors from a wheelchair. Even small differences in height – thresholds, for example – may constitute obstacles.

Measures for making a room accessible to persons with impaired vision include paying special attention to the risks presented by obstacles and differences in level, e.g. by marking steps, by providing simple and clear communications between rooms to facilitate orientation, by choosing suitable flooring and contrasting colours, and by providing sufficient, dazzle-free lighting.

Adjustments for persons with hearing impairment include adequately short reverberation times in workrooms and personnel facilities, a low background noise level, flooring to minimise the occurrence of annoying sounds, and the installation of audio loops in classrooms.

The accessibility and design of facilities are among the factors influencing the ability of employees to remain in or return to working life and are thus an important part of the employer's task of adapting working conditions to the work capacity and functional impairment of individuals. Job modification and rehabilitation aspects therefore need to be taken into account already at the facility planning stage. This can be done, for example, in connection with general disabled access planning. See the Provisions of the National Board of Occupational Safety and Health on Job Adaptation and Rehabilitation.

Guidance on Section 9

In workrooms and personnel facilities where the risk of slipping is especially great, the floor normally needs to be coated with slip-resistant material, primarily in pedestrian areas but if necessary overall. The risk of slipping is especially great, for example, where there is spillage of water or fatty substances, as on certain food manufacturing and retailing premises.

At present there are no handy methods of measurement for on-site determination of slip risks. Instead an assessment has to be made.

In the selection of flooring materials, slip-resistance and convenient cleaning may sometimes appear to be contradictory requirements. On food premises, for example, spillage of water and fatty substances calls for a slip-resistant floor, while on the other hand food hygiene demands careful cleaning. There are, however, cleaning methods, even for rough flooring, which satisfy the requirements of both convenient and highly efficient cleaning.

It is important that workplaces and social areas outdoors should be designed and managed so as to minimise the risk of slips and falls. Where there is a risk of slipping during the winter season, work areas and traffic routes need to be cleared and sanded.

Guidance on Section 10

Inconveniences which can entail a special risk of ill-health and for which a separate room may therefore be justified include, for example, noise, vibrations, heat, cold, radiation, dust, chip formation, smoke, fog, gas, vapour and noisome or dangerous chemical microbiological agents.

In the first instance, nuisances should be avoided by selecting less hazardous substances and processes. The purpose of segregating a hazardous process is to avert injuries by preventing the nuisance from affecting more people than necessary. In exceptional cases, preventive measures of other kinds may constitute an alternative to segregation. They may also be needed as a supplementary expedient. Measures of this kind include, for example, process ventilation, screening-off, a separate room for personnel or, as a last resort, personal protective equipment.

Equipment and components which can often be placed in a special room because of noise problems include, for example, fans, pumps, hydraulic units, transformers and compressors. Their positioning, however, needs to be planned with regard to the noise exposure of service staff. If several units are placed in the same room, it may be appropriate for steps to be taken so that all units in the room can be turned off simultaneously for servicing.

Rules on the design of work premises where flammable and explosive goods are handled are contained in the Provisions of the National Inspectorate of Explosives and Flammables.

Daylight

Guidance on Section 11

Access to daylight and an outdoor view is an important part of a good work environment. Abundant daylight and a generous outdoor view should therefore be aimed for. Every part of the activity which can be carried on in daylight should be placed in a room with windows.

Apart from illumination, daylight has an intrinsic value. It benefits health by supplying a physiologically necessary stimulus for human circadian and annual rhythms, orientation in time and space and natural perception of the different colours and shapes of the room and objects in it.

Access to daylight depends partly on the design, orientation, size and vertical positioning of windows. In workrooms with a depth not exceeding 6-8 m, wall windows can most often admit sufficient daylight if their glazed area equals about 10% of the floor space. A larger glazed area may be needed, for example, if the daylight is blocked by other buildings. Other solutions may need to be considered for high or deep rooms.

Secondary light, received through windows from another, directly lit room, can sometimes afford adequate daylight.

In certain cases daylight is out of the question owing to the nature of the activity. Situations where daylight can usually be excluded partly or wholly include, for example: premises for photographic work, mine workshops, power stations below ground, basement storage facilities, servicing premises for underground installations, if the servicing premises necessarily adjoin the installation, freezing chambers and cold stores, shopping centres with large floor areas and premises where adequate product quality is only attainable with a small window area, e.g. as a means of maintaining constant air temperature and humidity on the premises.

In certain cases, access to daylight and an outside view is of minor importance and can be dispensed with. This applies, for example, to such personnel facilities as changing rooms, drying rooms, wash basins and showers and toilets.

In windowless work rooms, special care must be devoted to artificial lighting, ventilation, fittings and colouring. In cases of this kind it is especially important that rooms for rest breaks and other intermissions should have windows.

In addition to being a source of daylight, windows provide an opportunity for looking out. View windows provide contact with the surrounding, so as to supply information for orientation, experience of weather and the season of the year, variety to counteract fatiguing monotony and relief from the feeling of being shut in. This latter feeling is especially liable to occur in small rooms and rooms with low ceilings.

The term “view windows” normally refers to windows set in the wall and affording an outdoor view. Sometimes wall windows positioned high up, or skylights, can also provide valuable contact with the outside world.

If a direct outside view is not possible, the possibility of looking out over a daylit room is usually appreciated.

Lighting

General rules

Guidance on Section 12

The lighting needs of a worksite can be satisfied by means of daylight, artificial lighting or a combination of both.

Daylight varies considerably according to the season of the year, the time of day and weather conditions. This can make it difficult or impossible to achieve good task lighting with daylight only. Daylight is normally supplemented by means of artificial lighting, in such a way that lighting installations are designed regardless of daylight.

In the planning of lighting installations and in the subsequent assessment of lighting, the following factors may need to be taken into account, depending on the type of work involved: lighting intensity, luminance distribution, direction of the light, contrast, dazzling, colour reproduction and light colour.

The examination and assessment of lighting can involve measuring lighting intensity or luminance and also subjectively evaluating other lighting factors. Obvious shortcomings such as dazzling, poor contrast, unsuitable incidence of light, disruptive shadow formation, poor colour reproduction and flicker can be established by observation, without any need for measuring instruments.

Inadequate or excessively strong lighting, incorrect light incidence, reflections and shadows augment the risk of accidents and can, for example, give rise to eye disorders and musculoskeletal injuries.

Satisfactory light conditions are needed, not only at the workplace but also in neighbouring spaces and areas which people frequent or which they pass

through in the course of the working day or at the beginning or end of work, such as staircases, passageways and roads. The need of lighting for service and cleaning staff must also be taken into account.

Particular accident risks may be present at outdoor workplaces and temporary worksites, e.g. construction sites, mining areas and traffic and transport routes. On construction sites, where working conditions are changing all the time, it is important that the lighting installation should be continuously overhauled and the positioning of light fittings adapted to changes in working conditions.

It is appropriate for lighting to be planned and proportioned in such a way that it will remain sufficient in spite of a certain normal dirtying of the lighting installation and with allowance for the ageing of light sources. A new lighting installation, therefore, needs to be proportioned for a greater lighting intensity than the figure which tables recommend for the task. Lighting should also be planned with reference to the colour scheme of the room.

It may also be appropriate for light fittings to be designed and installed in such a way that dirt and corrosion can be avoided as far as possible at the same time as cleaning and bulb replacement are facilitated and can be safely effected.

To reduce the cost of changing light sources, they can often be replaced a group at a time in large installations. This should be done and predetermined at suitably chosen times. The maintenance plan should also draw attention to the importance of choosing the right colour of light when changing the light source.

Light sources and fittings should be cleaned regularly. Regular cleaning of the workplace surfaces also has an important bearing on lighting conditions there.

Guidance on Section 13

Good task lighting, as the name implies, serves primarily to supply the light needed for the task in hand. The light requirement is determined partly by individual visual capacity and the nature of the task, detail size and contrast and requirements of precision and speed. Visual capacity deteriorates with advancing age: the lens of the eye slowly becomes clouded, at the same time as the vision cells degenerate. Among other things, this results in an older person needing more light than a younger one. Lens clouding also makes the eye more sensitive to dazzling luminances in the field of vision. Changes of this kind can start to appear already between the ages of 40 and 45.

To meet the requirements of Section 13, the artificial lighting may need to be designed as different kinds of general lighting or as a combination of general lighting and task lighting. The purpose of general lighting is to afford sufficient illumination within both the inner field of vision (focusing on the object regarded) and in the outer and peripheral field of vision. For the avoidance of direct dazzling, light sources should be shaded.

General lighting, designed to supply fairly evenly distributed illumination will not, however, always ensure that each individual workplace receives the correct lighting. In certain cases this can be rectified by designing the general

lighting to focus mainly on the individual workplaces. This localised general lighting is achieved by means of specially directed and distributed light fittings adapted to the lighting requirements of the individual workplaces in terms of the direction, intensity and distribution of lighting. If the installation is made in such a way that the fittings can easily be moved and can be individually turned on and off or otherwise regulated, this will enhance the possibilities of adapting lighting conditions to the work in hand.

At large outdoor workplaces where the lighting takes the form of light sources on tall masts, dazzling can easily occur when work is done looking upwards in the direction of the light source, e.g. during loading and unloading. In addition, the high light source luminances in relation to the surrounding darkness may cause contrast dazzling. In order for an installation of this kind to be satisfactory, the masts must if possible be positioned so as not to intrude on the field of vision when people are working. In addition, it may be advisable to use screened-off fittings of an asymmetrical type.

With task lighting close to the object of vision, it is easy to achieve correct luminance distribution in the different parts of the inner field of vision and to avoid distracting shadows and reflections. The individual can adapt the lighting to his or her needs by moving, turning or otherwise regulating the fixture.

At temporary workplaces, e.g. for roadwork and forestry work, task lighting often has to be arranged using mobile fittings, festoon lights or floodlamps mounted on mobile plant. Small movable lamps, such as flashlights and head lights, can in certain cases, e.g. in shunting yards, be used for necessary task lighting. Due to the serious accident risks at temporary workplaces, it is important that disruptive dazzling and shadow formation should as far as possible be prevented.

Guidance on Section 14

Powerful and sudden changes of luminance in a workroom or in a work area are a cause of inconvenience because the eye needs a certain amount of time to adjust to different luminance conditions. Problems may thus arise in connection with rapid movement from a well-lit place to one which is less well illuminated, or vice versa, as for example when a truck is driven from a well-lit workshop to a moderately lit warehouse or from a faintly lit building, painted in dark colours, out into a sunlit yard. To limit these accommodation difficulties, the transition between premises or areas with great differences of luminance can be combined with a gradual change of luminance conditions.

In restaurants where there is a considerable difference in lighting conditions between customer area and kitchen etc., it is important to provide a gentle transition between the different premises in terms of lighting conditions.

Light sources and lighting installations

Guidance on Section 15

Light sources with different colour reproduction capacities can accentuate or weaken colour contrast, which in turn has a very important bearing on the quality of vision. Working in light with inferior colour reproduction can be fatiguing and mentally strenuous. If the work demands outstandingly accurate colour assessment, it is especially important that the light source should have the appropriate colour temperature and that its colour reproduction index (Ra) should exceed 90. Demands of this kind can, for example, be made concerning certain workplaces in paint factories, in the printing trade, in textile manufacturing, in hospitals and in laboratories.

When fluorescent tubes are used as a light source for visually less demanding tasks than those referred to above, their colour reproduction index should exceed 80. In cases where other types of discharge lamps are to be used, those with the highest possible colour reproduction index are preferable. In all cases, the colour temperature of the light source should be closely adapted to the tasks in hand.

Monochrome light, e.g. from low pressure sodium lamps, lacks colour reproduction capacity, which can make it hard to see warning signs and emergency stops. In such cases, this type of lighting should be supplemented by task lighting for the devices which have to be clearly visible.

Guidance on Section 16

If the light varies periodically, the lighting may be perceived as flickering. Flicker is characterised by its frequency and by the magnitude of luminance variation during the period time. Fluorescent tubes contain phosphor. This has a certain afterglow which equalises the variations of light. Most often, therefore, the light emitted from a fluorescent tube in good working order is subject to only moderate variations, which does not normally cause any annoyance. Research in recent years has shown, however, that certain persons can be adversely affected by variations in the intensity of light, both visible (flicker) and invisible. In certain cases, moreover, low-frequency flicker with wide variations of luminance can trigger epileptic fits in patients prone to epilepsy. Flicker can be avoided by using, for example, high-frequency control devices.

Over-exposure to UV radiation can cause acute injury to unprotected skin and eyes. Exposure – above all, presumably, of a prolonged nature – can also entail a risk of subsequent injury such as cancer and cataract. The exposure levels and exposure time needed in order for the risk of late injuries to increase significantly are not known, and so there may be cause for UV exposure to be kept as low as possible. One should avoid exposing oneself to levels producing acute injury, e.g. skin inflammation. The Swedish Radiation Protection Authority has published General Recommendations on benchmark exposure limit values for ultraviolet radiation (SSI FS 1990:1). Those benchmarks have been chosen with a view to the avoidance of acute injury.

Ordinary filament lamps do not emit UV radiation, but certain types of fluorescent tubes can emit UV radiation in small quantities and sensitive persons may possibly be adversely affected under very extreme conditions. Halogen lamps can emit relatively higher levels of UV radiation than fluorescent tubes, and it may thus be advisable for a disc of some transparent material to be positioned in front of the light source as a barrier to UV radiation. Ordinary glass and several translucent plastic materials are effective barriers to UV radiation. Most halogen lamps nowadays are coated with a toughened glass material which partly reduces UV radiation at the source. Light sources intended for generating UV radiation occur in certain fields of working life. In such cases, extra vigilance is needed concerning the risks involved.

Guidance on Section 17

In periodically variable lighting under special conditions, a periodic movement by a machine part which is so rapid that it is normally imperceptible can be perceived as a slow movement or convey the false impression of being stationary. This stroboscopic effect, as it is termed, can occur if the frequency of light variation or a multiple of the same equals or approximates to the motion frequency of the object. Misjudgement of the machine's movement entails a risk of accidents. The light variations giving rise to the stroboscopic effect need not necessarily be perceived as flicker. The stroboscopic effect is avoided, for example, by using high frequency ballasts.

Air quality

Guidance on Section 18

Indoor air can contain up to several hundred different air pollution components. As a rule, the concentration of each substance is low in relation to the occupational exposure limit values defined by the National Board of Occupational Safety and Health. Simultaneous exposure to many substances often produces combined effects which are either additive or else mutually reinforcing ("synergism"). This latter applies particularly to irritation of the mucous membranes and to olfactory impressions, but satisfactory information is lacking for defining benchmarks for mixtures of air contaminants in low concentrations.

The activities in a workroom sometimes demand special eliminatory measures to keep air contaminants down to an acceptable level. This can, for example, mean replacing chemicals used in production, making changes of processing technique, modifying machinery or installing process ventilation. Rules concerning preventive measures to make the concentration of air contaminants in the breathing zone as low as is practically possible, together with exposure limit values for a maximum acceptable average concentration of an air contaminant in inhaled air, are contained in the Provisions of the National Board of Occupational Safety and Health on Occupational Exposure Limit Values and Measures Against Air Contaminants.

Ventilation is one way of keeping the concentration of air contaminants down to a low level so as to achieve satisfactory air quality in a workroom. Cleaning is another way of keeping down the concentration of particles, because dust

acts as a particle reservoir from which new particles are constantly being stirred up. The need for ventilation depends on personnel load, radon content, the material of which buildings, interiors and apparatus are constructed, and the work or processes involved. It should be noted that the Provisions concerning the functioning of ventilation systems apply when people are present on the premises. Rooms and parts of rooms can often be divided into spaces which are more frequently used, “frequented zones”, and parts which are used less often. The need for climate control is of course greater in the frequented zones. In large factory buildings, for example, the frequented zone normally consists of the spaces surrounding the workplaces.

Spaces should be ventilated as efficiently as possible. It is important that supply air and extract air terminal devices should be positioned in such a way that short circuiting will not occur between supply air and extract air. The air change efficiency should be at least 40 per cent. A ventilation system with assisted exhaust and supply is often necessary in order to achieve satisfactory air quality, temperature, velocity, purity and humidity. Fan assisted exhaust ventilation should be provided in personnel facilities in cabins away from permanent worksites if a power supply is available. Often the ventilation then takes the form of exhaust air fans providing an air change rate of 1-3 room volumes per hour. In cabins with non-mechanical ventilation, airing by means of a skylight may be advisable.

Ventilation systems should always be designed in such a way that air contaminants are disposed of as near to the source as possible. Where extremely toxic or dangerous substances are handled, total encapsulation is often the sole possibility. In cases of this kind, Class III safety cabinets – “glove boxes” – are used. It is more common for a process to be partly encapsulated, enabling the operator to control the process either directly or through sashes. Fume cupboards, safety cabinets (Classes I, II) and spray booths are examples of this kind. The best arrangement is if the process or handling operation can be entirely encapsulated. Failing this, local extraction devices or hoods can be used.

The air flow rate for an encapsulation is determined on the basis of the air velocity needed in any apertures. The air velocity needs to be reasonably uniform for the entire aperture, in order to achieve acceptable efficiency. Consequently, the air flow rate requirement for encapsulation would depend on the size of the apertures and average velocity through them. It is important that the average velocity in the apertures should be adapted to the mode of generation of the contaminants, the toxicity of the contamination and the size of the encapsulation and that the air movements outside the encapsulation do not disturb the function.

When a process or handling operation cannot be encapsulated, a trapping-type local extraction device can be used. It is extremely important that the extraction device should be placed as close as possible to the point where the contaminant is generated, because local extraction devices always have a short radius of action outside the extraction aperture.

The propagation velocity of the contaminant has to be taken into account so as to determine a high enough trapping velocity. The propagation velocity is affected, for example, by the velocity of the ambient air, which in turn depends on a host of factors, e.g.:

– Thermal air streams from cold or hot surfaces, processes etc.
– Machine movements.
– Transport and conveyance of materials, e.g. reloading onto conveyors, filling or bottling of materials etc.
– Human movement.
– Installation design.
– The design of the building – gates, windows etc.

Local extraction devices of the receptor hood type can be used when the contaminants migrate to the hood spontaneously, i.e. do not need to be trapped. A receptor hood need only be proportioned to remove the contaminated air stream reaching it.

The commonest application for receptor hoods is above hot processes or handling operations. In hot processes it is important for the hood to be appreciably larger than the heated area, because the rising air current mingles continuously with the surrounding air and expands. Receptor hoods should not be used where personnel need to lean or bend forwards between process and hood in the course of their duties. If there are disruptive air currents in the surroundings, leakage can easily occur round the edges of the hood, and so it is important to check the surrounding air velocities and also to create sufficient air movements inwards from the edges of the hood, so that contaminants will not escape.

Provisions on ventilation for various processes and handling operations are contained in several of the Provisions issued by the National Board of Occupational Safety and Health.

A variety of metabolic products are emitted by human beings. Many of these are odoriferous compounds. At the same time, carbon dioxide is emitted through exhalation. This is a substance whose concentration can be measured easily and which can be used as an indicator of personal load and ventilation. In this way information can be obtained on which to base an assessment of the air quality on non-industrial work premises. The carbon dioxide content is not to be viewed as an average per day, nor as a ceiling value which may never be exceeded. A concentration in excess of 1 000 ppm indicates that the air quality is not satisfactory. Outdoors the concentration is normally 300-400 ppm.

In addition to increasing the flow of outdoor air, organisational measures can also be taken to reduce carbon dioxide content. Measures of this kind include, for example, reducing the number of persons in a room or reducing the duration of working sessions and airing the premises in between.

When checking the air quality by measuring the carbon dioxide content, it is important to:

– select a representative number of rooms with a normal number of persons,
– select equipment specific to carbon dioxide, measure continuously and record the values,
– monitor the measurements for the entire period,
– position the measuring probe at breathing height and not less than 2 m away from the nearest person,
– carry out measurement for the normal duration of the activity (a working day, a lesson or some other period) or until the carbon dioxide content stops rising or greatly exceeds 1 000 ppm,
– measure the outdoor concentration of carbon dioxide on one or other occasion, and
– document other factors capable of affecting the measurements obtained, e.g. personal load, airing, temperature, etc.

A carbon dioxide concentration of less than 1 000 ppm, however, is no guarantee that the air quality is to be considered satisfactory, because perception of air quality is also affected by other factors, e.g. temperature and cleaning standard.

Moisture in the structure of the building can lead to both chemical degradation and mould growth, which in turn may be a cause of bad air. If structurally related health disorders are suspected, the cause of them shall be made clear and then remedied. See also above, page 28, concerning *sick buildings.*

Ventilation

Guidance on Section 19

The design of the control system will depend on the air contaminants which the process ventilation is intended to remove. Except where manifestly unnecessary, it should be possible for a malfunction in the process ventilation to be rapidly observable from a permanently fitted instrument, e.g. a flow gauge. Rules concerning control systems in fume cupboards used for chemical laboratory work are contained in the Provisions on Laboratory Work with Chemicals.

Outdoor air

Guidance on Section 20

Human oxygen uptake or carbon dioxide emission is not normally decisive for the outdoor air requirement. On premises where human beings are the main source of contamination, it is the removal of smells which normally decides the scale of the ventilation requirement. Other criteria are temperature and humidity. Premises frequented more than temporarily by human beings may need an outdoor air flow of not less than 7 l/s per person for sedentary work. Higher air flow rates may be needed for higher levels of activity. To allow for pollution from non-human sources, an addition of at least 0.35 l/s and m² floor area should be made. Air contaminants and heat generated by processes or handling operations normally call for higher air flow rates.

A suitable air flow rate for dining spaces and for changing rooms and wash basin areas in industry is generally at least 5 l/s and m² floor area. For a wardrobe space and wash basin areas in offices, shops and suchlike, this air flow can be suitably obtained as transferred air from a corridor or suchlike space.

General values for the lowest acceptable air flow rates in workrooms where a process or handling operation contaminates the local air are impossible to give. Contaminant production, the design of the premises and the ventilation principle are important points of departure for determining the air flow rates needed.

Swedish Standard SS 83 53 13 gives examples of ventilation connections for clothes' lockers.

Suitable extract air flows for certain spaces are indicated in the guidance on Sections 24-26.

Guidance on Section 21

Outdoor air is supplied to premises to dilute the contaminants generated indoors and to replace contaminated indoor air. It is therefore essential for this outdoor air to be as pure as possible.

In a more contaminated environment, such as a city centre, the outdoor air intake should be positioned on a roof or facing an inner courtyard and at such a height that contaminants from the ground will not be admitted. In environments of this kind the outdoor air normally needs to be filtered.

It is important for the outdoor air intake to be positioned in such a way that short-circuiting, e.g. from the exhaust air flues of ventilation systems and the vent systems of waste-water pipes should be avoided. Cooling towers should also be taken into account, since there is a risk of legionella bacteria spreading if aerosol from a cooling tower is drawn into ventilation systems.

Temperature conditions are also important. Outdoor air intakes should be positioned where the air admitted is as cold as possible and is not heated, for example, by black roofs or sun-warmed facades.

Recommendations on air intakes and exhaust outlets are contained, for example, in *Klassindelade inneklimatsystem (Classified indoor climate systems)*, *publikation* R1 published by Svenska Inneklimatinstitutet (The Swedish Indoor Climate Institute).

Supply air

Guidance on Section 22

It is a common fallacy that the occupational exposure limit values defined by the National Board of Occupational Safety and Health can be used as criteria of an acceptable quality of supply air. The Board's exposure limit values are a yardstick of the maximum concentration of air contaminants acceptable in the inhaled air at a workplace. They are not applicable as a yardstick of the acceptable level of supply air pollution.

The stipulation that the concentration of air contaminants in the supply air must be appreciably lower than the occupational exposure limit values means that the concentration of air contaminants should be on a level with the detection limit of the substances concerned. In certain cases this is not possible. The concentrations of carbon dioxide (CO_2) and carbon monoxide (CO) in supply air, however, should not exceed 1/10 of the current exposure limit value. In the case of other substances for which an occupational exposure limit value has been defined, concentration in supply air should not exceed 1/20 of the current exposure limit value.

Guidance on Section 23

To achieve the aim of keeping the concentration of contaminants down to an acceptable level, the supply air system can be designed according to two main principles:

– Mixing air supply.
– Displacement air supply.

In mixing systems, the intention is to mix the air as rapidly as possible, so that any contaminants will be diluted down to an acceptable level. Mixing systems are less sensitive than displacement systems to interference.

Displacement air supply means the supply air “displacing” contaminated air in the frequented zone and in this way continuously supplying the workplaces with clean air. This system requires sub-temperature supply air and heat sources in the room.

In cases where a large quantity of contaminants develops in a room, it is often advisable to avoid mixing the air too much. True, the concentrations of contaminants are reduced, but at the cost of contaminant diffusion in the room. Mixing systems can be used on clean premises to create an even climate. The two ventilation principles are unsuitable for combined use.

The following criteria should be satisfied if reliance is to be placed exclusively on ventilation diluting the contaminants in the room or displacing contaminated air:

– Contaminants are produced in small quantities and spread at a reasonably steady speed.
– In normal work, the pollution source and the employee’s breathing zone are far apart.
– The contaminants are of low toxicity.
– The extract air does not have to be purified before being discharged into the atmosphere as exhaust air.

The supply air may need to be preheated during the cold season of the year, so as not to cause draught problems. The problem of draught should above all be considered in the frequented zones of the work premises. Experience has shown that air velocities below 0.15-0.2 m/s, depending for example on the time of year, are perceived by most people as an absence of draught.

On premises of certain kinds it may be necessary for the ventilation system to operate continuously and not to be turned off when there is no activity going on. This applies, for example, to buildings with heavy emissions from the building material or when there is a risk of impurities spreading through the ducting to rooms where they are not normally generated. In a new building or one which has been renovated inside, the ventilation should be kept running continuously for the first year. Only then can it perhaps be reduced when the premises are not in use. After a period of reduced flow rate, the ventilation system should be operated at normal air flow long enough for the room volume to be changed at least once before the room is used again. In summertime, however, it may be appropriate to use the chillier night air for cooling the premises.

If flex time is practised at most workplaces, the ventilation systems will have to be adapted accordingly, so as to achieve sufficient air change within the agreed flex time frame.

The supply air may need to be filtered, partly to protect the installations and also to obtain cleaner supply air. Dirt accumulating in the installations can impair the quality of the supply air and the efficiency of the installations themselves.

Extract air, return air, circulated air and transferred air

Guidance on Sections 24-26

The term “process ventilation” normally refers to both fixed and mobile cleaning devices. Return air and circulated air supply from local extraction devices are dealt with in greater detail in various Provisions issued by the National Board of Occupational Safety and Health.

Investigation, as provided in Section 25, of the installation of return air should show:

– How the requisite air quality is achieved.
– How the dependability of the system is maintained.

Documentation of the investigation should be kept in the operation and maintenance instructions, as provided in Section 29.

With heat recovery systems in which leakage or the technology as such causes a certain amount of air to be returned (e.g. through rotary heat exchangers), the same effect can be obtained as with return air systems. This is an important fact to bear in mind when designing the ventilation system.

In order to determine the performance required of a cleaning device, it is often necessary to analyse the pollution situation at the workplace. The technique of cleansing air of gaseous contaminants is less well-developed and documented than the technique of separating solid contaminants. Sometimes a test installation may be needed in the environment concerned in order to decide whether the cleaning device meets the requirements defined for it.

On premises where smoking occurs, the extract air flow rate normally needs to be at least 20 l/s and person. Rooms specifically intended for smoking

should have separate extract air if the design of the ventilation system entails a risk of smoke spreading to smoke-free premises.

The following may be suitable extract air flows for the facilities in question:

Toilets:	15 l/s and toilet.
Cleaning space:	3 l/s and m² floor area, but not less than 15 l/s.
Showers:	15 l/s and shower. If the shower room has no windows, it is appropriate for the ventilation to be adjustable to 30 l/s and shower.

Guidance on Section 27

Acceptable transferred air supply can be instanced with air transferred from office premises to toilets and cleaning facilities. For wardrobe spaces etc., see the guidance on Section 20.

If the ventilation is put out of action, the air may travel in the wrong direction through an air transfer connection. In order, therefore, for transfer air to be serviceable, for example, from offices to a garage, it is important that the air transfer connection should close automatically in the event of a malfunction.

Maintenance and functional control

Guidance on Section 29

Operating and maintenance instructions should be framed according to the design and size of systems. Operating and maintenance instructions should be available when ventilation systems are commissioned and should contain the following:

Operating instructions

– Description of the building, activities and ventilation system.
– Description of the functional principles and positioning of the installations. It is important that the working of the systems should be described as lucidly as possible, and accordingly it is an advantage if a flow chart can be drawn up, clearly indicating how the installation is to be handled, as well as documents showing the locations of gauging and inspection points, inspection panels etc.
– Data concerning air quantities, technical data etc.
– Particulars of operating times.
– Information about current safety regulations (operating switch, emergency override etc.).
– Description of measures to be taken in the event of a failure.
– Drawings of the ready-built ventilation system.

Maintenance instructions

– Particulars of timetabled maintenance routines for different parts of the ventilation system (filter replacement, cleaning of ducts etc.). This point should also include the fire safety function.

– Design data. Design is based on certain definite preconditions, a knowledge of which may be necessary, for example, for inspection purposes. Data of this kind include personal load, contaminant production, heat production and the outdoor and indoor design climates.
– Fault location chart.

The operating and maintenance instructions are above all intended for whoever is responsible for the maintenance of the ventilation system. It is a good idea also to compile simpler user information, so that all employees will acquire a knowledge of the ventilation on the work premises. In a room where the number of persons anticipated determines the size of the ventilation it may, for example, be appropriate to put up a notice showing the number of persons the ventilation system is designed for.

Guidance on Section 30

To facilitate inspection of the ventilation system, it should be fitted with the requisite number of inspection doors.

An example of functional control will be found in the handbook H23 “Funktionskontroll av ventilationsinstallationer” (Functional control of ventilation installations) of the National Board of Occupational Safety and Health.

In order for operation and maintenance to proceed correctly, it is advisable to make one person responsible for these matters and to give that person the requisite information and instruction.

Hitherto, the operation and maintenance of ventilation systems has not always worked satisfactorily. The Government has therefore issued a Ventilation Systems (Functional Control) Ordinance, SFS 1991:1273. The National Board of Housing, Building and Planning has issued implementing Provisions and General Recommendations indicating among other things which buildings the control includes and intervals for recurrent inspection. Recurrent inspections are, for example, to be carried out on pre-school premises and in schools, caring service premises and offices. Inspection intervals vary between two and nine years, depending on the building and ventilation system. Buildings exempted from these inspections include certain outbuildings, industrial buildings and certain buildings intended for the total defence system.

On work premises, both the regulations of the National Board of Housing, Building and Planning and those of the National Board of Occupational Safety and Health apply. Only Provisions of the National Board of Occupational Safety and Health apply, however, to buildings exempted by the National Board of Housing, Building and Planning.

The intervals indicated for work premises in the Provisions of the National Board of Housing, Building and Planning also meet the requirements defined by the National Board of Occupational Safety and Health. Where other work premises – mainly production facilities – are concerned, the intervals between inspections need to be adapted to the nature of the activities, but it is reasonable that ventilation should be checked no less frequently than in the

offices of production facilities. A suitable interval between inspections, therefore, is, at most, three years.

Special ventilation control interval requirements for certain kinds of industrial facility have been defined by the National Board of Occupational Safety and Health in the following Provisions:

AFS 1982:20 Restaurants and Other Catering Establishments	Once/year
AFS 1983:11 Anaesthetic Gases (replaced by AFS 2001:7)	4 times/year in extraction devices
AFS 1990:9 Synthetic Inorganic Fibres	Twice/year
AFS 1992:16 Quartz	Twice/year
AFS 1992:17 Lead	Twice/year
AFS 1997:10 Laboratory Work with Chemicals	Once/year

Thermal climate

Guidance on Section 31

Human perception of thermal climate depends on several climatic factors, *viz* air temperature, mean radiant temperature, air velocity and air humidity. Clothing and physical activity are also factors influencing perception of climate.

Climate zones

Depending on temperature, the climate can be divided into three zones: cold, moderate climate and heat. These climate zones give rise to such different climatic problems that there is no single method which can be used for assessing all three climate zones. The moderate climate zone roughly comprises the air temperature interval 10-30°C. Unlike extremes of climate, this zone imposes only moderate, if any, strain on the body.

The climate zones of cold and heat can be instanced with freezing chambers and glassworks respectively. The Provisions of the National Board of Occupational Safety and Health on Work in Intense Heat contain rules for work indoors or outdoors which can entail a risk of harmful effects from heat.

Climate and health

The task of climate is to create the right conditions for thermal balance in the body and also to prevent ill-health being caused, for example, by local chilling.

Small deviations below the ideal temperature impair muscular function, especially dexterity, which in turn can affect work performance and the risk of accidents.

At elevated temperatures (within the moderate climate), work performance and working pace can be reduced as a result of the employee reducing his or her level of activity in order to achieve thermal balance. Concentration, alertness and judgement are also gradually affected, which can lead to an increase in risk behaviour.

Measurement

Methods and measurements for assessing both general and local climatic influence in the moderate climate zone are set forth in the standard Moderate Thermal Environments – Determination of the PMV and PPD Indices and Specifications of the Conditions for Thermal Comfort, SS-EN ISO 7730. This standard describes a method for determining the anticipated perception of climate by a group of persons with given clothing and activity (PMV, predicted mean vote). The PMV value indicates, on a scale between -3 (cold) and +3 (hot), how the persons in the room are expected, on average, to experience it. The PMV value can then be used for calculating the PPD value (predicted percentage dissatisfied). The PPD value of a room should be under 10%.

For simple measurement of the perceived temperature, various composite temperature concepts are employed which take into account both air temperature and the influence of radiation. The most common concept is that of operative temperature, which in draught-free environments is the average of air temperature and mean radiant temperature. Another temperature concept is that of directive operative temperature, i.e. operative temperature calculated in a certain direction. This is mainly used at the planning and design stage.

Draught

Cold draught imply a risk of exposed parts of the body being locally chilled. Large window areas or windows with a high coefficient of thermal transmittance augment the risk of draught. A heating device should be positioned so as to avoid cold draught from windows or suchlike. In roof lanterns and toplights, steps should be taken to prevent condensation and cold draught.

High air velocities in a room can be created, not only by cold draught but also by the ventilation system or by cold floors and walls and an uneven distribution of temperature in the room. High air velocities can also occur when a door is open to a neighbouring room with a different temperature or pressure.

Experience has shown that air velocities below 0.15-0.2 m/s, depending for example on the time of year, are perceived by most people as an absence of draught.

Air humidity

Air humidity makes little difference to subjective experience of the thermal climate. Its effect on discomfort and health status is more difficult to assess. On office premises with winter temperatures of about 20°C, experience has shown that a low moisture content is usually accepted. If the air temperature is raised by 2° or more, not infrequently there will be discomfort and complaints about dry air. Attention ought therefore to be concentrated primarily on temperature conditions. It is only in exceptional cases that direct measures should be taken to control the air humidity.

If there are complaints about dry air, it may also be appropriate to review cleaning routines and examine the flooring material, so as to avoid problems connected with dust and static electricity.

High air humidity facilitates the growth of mould etc. It also facilitates the emission of gases from materials and equipment.

Suitable climate

On premises with large internal heat loads, e.g. from machinery or solar irradiation, the supply air may need to be cooled. Depending on the nature of the problem, it may also be appropriate to screen off the sunlight or to screen off warm surfaces as a means of reducing the temperature.

Fixed workplaces outdoors, e.g. ecocyclic work, should be arranged in such a way that personnel are not exposed to wind, because cold air at high velocity can very quickly remove large quantities of heat from the body.

If the air temperature during light, sedentary work deviates permanently from 20-24°C in winter and 20-26°C in summer, the thermal climate should be investigated more closely. Since it is not only air temperature that influences the thermal climate, it may be appropriate to determine PMV and PPD as per SS-EN ISO 7730. An assessment can then be made of the preconditions for thermal comfort and of the need for remedial measures.

No special steps need normally be taken during a short heat wave with roughly the same temperature indoors and out. If, on the other hand, the work is of such a kind that increased risk behaviour can mean accidents, steps should be taken.

Where sedentary work is concerned, it is especially important to consider such local factors as draught and temperature differences. In order for the thermal climate to be perceived as satisfactory, the air temperature difference between head and ankle during sedentary work should be less than 3°C.

The air temperature in personnel facilities should be at least 20°C. For work on refrigerated premises or cold work outdoors, it is particularly important to organise breaks in heated spaces.

Guidance on Section 32

The heat capacity requirement should be calculated so that in the frequented zone of work premises an air temperature can be maintained of at least

(a) 20°C for sedentary, physically less strenuous work,

(b) 14-15°C for mobile or physically more strenuous work.

Suitable methods for calculating heat capacity requirement are given in Swedish Standard SS 02 43 10. If work is mainly done in part of the premises, heating can be confined to that part. Premises of this kind include, for example, a sawmill building with heated cabs.

On certain premises, considerations of production technique may demand a different temperature from that indicated above, e.g. on certain food manufacturing premises or on premises where furnace work is done.

Guidance on Section 33

An air curtain, windbreak and weather seals are among devices for excluding draught.

Noise and acoustics

Guidance on Section 34

Great care has to be devoted to the planning of acoustics, and it is important that any noise sources should be observed, together with ways of minimising the hazards they entail, at an early stage of the planning process. It is equally essential for the acoustic environment to be planned according to the audiological requirements which the work entails. There is very often an advantage to be gained from engaging special expertise in connection with acoustic planning.

It is also important to observe technical developments with regard to noise abatement and to apply up-to-date abatement methods. Noise limitation at source is generally the most economical and effective method. There may also be an advantage to be gained from segregating noisy and silent activities, either by allotting them separate premises or by dividing premises into separate spaces with effective soundproofing and sound-absorbent walls or screens. For insulation from the surroundings, both air-borne sound, impact sound and structure-borne sound need to be taken into account.

Recommended values for air-borne sound insulation and impact sound pressure level for certain types of premises are to be found in the Building Regulations of the National Board of Housing, Building and Planning (BFS 1993:57).

In office and laboratory environments, for example, noise from permanent installations and from apparatus and computer equipment can be experienced as a significant nuisance. It is important, therefore, that equipment of this kind can also be positioned where it will cause a minimum of disturbance.

The acoustic climate can be improved by making ceilings and walls sound-absorbent, thereby limiting sound transmission and lowering the sound level. Increased absorption, however, does not appreciably affect the sound level in the immediate vicinity of a noise source.

The Provisions of the National Board of Occupational Safety and Health on Noise give occupational exposure limit values for noise referring to the risk of hearing impairment, and also figures which can furnish guidance, for example, in connection with acoustic planning and design and the procurement of new equipment.

In addition to noise from machinery, it is important also to consider that the human voice can be a noise source, as for example in the case of children at play in day nurseries and out-of-school centres. Extraneous talk in an office environment can also constitute a nuisance, especially in open-plan offices, and it is therefore imperative that special care should be devoted to the acoustic design of such offices.

The room acoustics have a particularly important bearing on the functioning of facilities – classrooms, for example – intended for verbal communication. Premises of this kind therefore need to have an appropriate reverberation time and generally to be designed for easy apprehension of speech.

Guidance on Section 35

Rules concerning the maximum permissible sound level from installations on health care premises, in out-of-school centres, day nurseries etc., in rooms intended for sleep and rest, and in school classrooms, are contained in the Building Regulations of the National Board of Housing, Building and Planning (BFS 1993:57).

The transmission of noise to other parts of the building can be limited by mounting vibrating machinery and equipment – fans, lift machinery, motors and compressors, for example – on spring-loaded elements, often combined with heavy foundations.

Mechanical ventilation systems often generate noise. Even low ventilation noise levels have proved to be annoying and can impair performance in connection with tasks requiring concentration. Measures to achieve a low level of noise in ventilation systems can, for example, include choosing the right type of fan and silencer, the design of fan inlets, fan mounting, the type of control, the design and positioning of dampers and the design and dimensioning of air terminal devices and ducting. Low air velocities, gentle curves and gradual area changes should be aimed for, as a means of limiting sound generation. It should also be borne in mind that infrasound can be generated in ventilation installations where large quantities of air are set in motion.

Electricity

Guidance on Section 37

Provisions on electrical safety are contained in the High Voltage Provisions of the Swedish National Electrical Safety Board, ELSÄK-FS 1999:5.

The National Board of Occupational Safety and Health, together with other national authorities, has formulated “The Precautionary Principle for National Authorities Concerning Low-Frequency Electrical and Magnetic Fields” (1998, ADI 477). In it the following caution principle is stated: If steps generally reducing exposure can be taken at reasonable cost and with reasonable consequences in other respects, an effort should be made to reduce fields greatly deviating from what can be considered normal in the environment concerned. In the case of new electrical installations and buildings, an effort should already be made at the planning stage to design and position these in such a way as to limit exposure. The precautionary principle is not a generally binding rule in itself but a recommendation and, as such, optional. The purpose of subsection one of Section 37 is for the principles indicated in the caution principle (see the quotation above) to be applied to the type of case indicated by the wording of this Section. In normal cases it is for the most part easy to avoid siting permanent workplaces close to electrical installations with high current intensities or high voltages.

The purpose of the second subsection of Section 37 is for the positioning and design of power sockets etc. to be considered from a work environment viewpoint. If, for example, a power plug has to be frequently inserted and withdrawn, both plug and socket must be positioned and designed in such a way that this can be done in an appropriate manner from the work environment viewpoint. This must never mean that stipulations contained in ELSÄK-FS 1999:5 are not complied with.

Water and drainage installations

Guidance on Section 38

A floor drain may be needed, for example, when the floor is cleaned by flushing or as a means of avoiding dangerous accumulations of spillage water, melt water or condensation. The roller conveyor of a commercial dishwasher, for example, is one place where water spillage is a normal occurrence. A floor drain is normally needed at a tapping point, e.g. in a cleaning room and refuse storage room and where machinery or cooking vessels are emptied. Consideration should also be given to equipping an emergency shower with a floor drain, so that the shower can be tested regularly and for the avoidance of water damage from prolonged flushing. A floor drain should not be positioned where people stand working.

1:50-1:100 is a suitable slope round a floor drain. If the floor is very carefully laid, without any backfall, the slope can sometimes be confined to the surface nearest the drain.

Guidance on Section 39

The word “activities” refers both to the principal activity and to activities connected with it, such as cleaning and personal hygiene. The hot water system for showers should be designed so as to avoid the risk of legionella bacteria growing and spreading. A high temperature in the water heater, circulating hot water and short water pipes will reduce the risk of bacterial growth. Stipulations for tap water systems are contained in the Building Regulations of the National Board of Housing, Building and Planning.

In places where a floor or some other object is flushed or where large vessels are filled with water, it should be possible for a hose to be connected to a tapping point, e.g. with a snap coupling.

A reasonable distance to drinking water, according to the nature of the work, means, for example, that allowance has to be made for the degree of perspiration which the work entails. Furnace work is one instance where drinking water may be needed at the workplace or in its immediate vicinity.

Stipulations concerning the quality of drinking water are contained in the Provisions on Drinking Water issued by the National Food Administration, SLV FS 1989:30.

Furnishings and equipment

Guidance on Section 40

A dishwasher is one example of equipment normally needing to be positioned at a convenient working height.

Working heights in day nurseries, out-of-school centres, pre-school classes and schools should be made suitable for both adults and pupils/children. Every children's department of a day nursery, therefore, should also have adult-sized tables and chairs.

In schools the dining room counter for food collection, the tray return point, computer workplaces and safety equipment, for example, should also be adapted to suit the youngest children.

Checkout work and hairdressing are examples of work which it should be possible to do in both sitting and standing positions. Hairdressing salons should have a work chair for jobs which can be done sitting or half-sitting.

Guidance on Section 41

Prolonged sitting can lead to ill-health. This can be counteracted by furnishings and equipment designed or positioned in such a way as to invite movement and variety. Computer work is one example of a sedentary occupation. A work table or balance table which can be raised and lowered electrically may be a suitable kind of equipment.

Furnishings and equipment should be chosen and positioned so as to entail the least possible exposure to air contaminants. Equipment emitting, for example, heat, contaminants or disruptive noise (printers and copying machines) should not be positioned in the same rooms as permanent workplaces.

Floors, walls and ceilings

Guidance on Section 42

Certain activities – truck traffic, for example – call for hard flooring. For other activities it may be suitable to choose flooring with the right resilience for reducing the strain on the feet, legs and back.

It is important for flooring material to be adapted to the mechanical and chemical influences to which it is subjected. Uneven floors entail a risk of tripping and add to the difficulty of cleaning.

Sloping floors entail a heightened risk of slipping and tripping when walking and of trolleys or other equipment being inadvertently set in motion. It is advisable for the floor round individual permanent workplaces to have no slope (i.e. to be horizontal or "flat") for the avoidance of unsuitable work postures.

Differences of floor level should be avoided as far as possible in the same room and between different rooms on the same storey. If a difference in level is unavoidable, a ramp between the two levels is preferable to steps.

The slope of a ramp should not exceed 1:12 and the difference in height between landings should not exceed 0.5 m.

Guidance on Section 43

Activities where electrostatic charging of objects or persons can be hazardous include, for example, the pouring of highly flammable liquids, the charging of lead batteries, electrostatic spray painting, certain laboratory operations and work using explosive anaesthetic gases. Measures to prevent this include, for example, semi-conductive floors and antistatic shoes for the prevention of igniting sparks from electrostatic discharges. Recommendations concerning protection from static electricity by earthing or equipotential bonding are contained in Swedish Standard SS 421 08 22 (1).

Guidance on Section 44

Properties such as material, surface and jointing affect the ease with which surfacing can be cleaned. Colouring can assist with the adjustment of cleaning to actual needs and can facilitate the cleaning itself. It is especially important that floors should be easy to clean. The risk of slipping also needs to be taken into account in the selection of flooring materials.

It is important to choose surfacing of such kinds that cleaning can be done using methods and cleaning agents which entail the least possible risk, for example, of musculoskeletal injuries, allergies, eczema, etc. to the cleaning staff.

When selecting surface coatings for floors, walls and ceilings, it is important to consider the risk of disorders – allergies, for example – which the materials in themselves can present to persons frequenting the premises.

Certain methods of floor cleaning can entail technical requirements concerning other building elements. High-pressure spray cleaning, for example, normally calls for extra impervious and durable wall materials and for the adequate protection of power sockets, switches and other electrical equipment.

Windows, doors and gates

Guidance on Section 45

Solar irradiation can cause inconvenience in the form of heat and dazzling, especially with large glazed areas. Screening measures include, for example, facade screens, awnings, blinds, heat-reflecting glass and curtains. External screening, e.g. an awning, normally has the best effect.

Screening arrangements should be made variable according to needs, so as to avoid unnecessary reductions of daylight. Arrangements such as fixed, i.e. non-variable, sunscreens should be avoided.

Roof lanterns and skylights should be positioned in such a way that direct solar radiation is avoided as far as possible. Roof domes may need to be partly screened off.

Guidance on Section 46

It is important that devices for the operation of windows and skylights can be reached from a safe position and in a safe work posture, and that control rods and suchlike should be safe. One potential danger of open windows, for example, is that they may not be observed by passers by or else encroach on working space. Open windows with low sills can entail a risk of falls, especially where the youngest pupils are concerned.

Guidance on Section 47

It is important that there should be enough room next to windows for window cleaners and room for assistive devices and scaffolding if any, both indoors and out.

This Provision means that it must be possible for the work to be done with a maximum of safety for both window cleaners and other persons present. For safe cleaning and maintenance, it is advisable that windows that can be opened should open inwards.

Outward-opening windows, fixed windows and sections of glazing cleaned from the outside are examples of situations where special devices may be needed for safe cleaning. Devices of this kind include, for example, a gangway, anchorings for a safety device or personal fall protection equipment.

Glass roofing is another instance where special devices are normally needed in order for cleaning to be done safely, both inside and out.

It is important that the risk of falls should also be considered with regard to inward-opening windows positioned low down, i.e. with a low sill or none at all.

Guidance on Section 48

Suitable doors and gates provide good, communications that are easy to grasp, are safe and convenient to pass through, afford access for trolleys and wheelchairs and do not involve any risk of persons getting shut in.

A door on a traffic route should be easy to fasten in an open position for safe, convenient passage with a trolley or load.

It is important that doors should be positioned and designed in such a way that they will not cause crush injuries when closed or by striking against other doors. The crush force should be less than 150 N.

Doors between workroom and corridor, a pedestrian route or any other busy passage should be hung so as to open into the workroom, for the avoidance of collisions. Special rules exist concerning doors on escape routes.

Fan room doors should be hung so as to open against any positive air pressure, i.e. into the fan room if it has positive pressure and outwards if the pressure inside the fan room is negative. A large difference in air pressure may call for a special pressure equalisation device.

If doors have to have thresholds, it is important that these should be low. On a traffic route there should be no thresholds, or else the thresholds should be low and present no obstacle to wheeled transport. A threshold height

exceeding 25 mm in a pedestrian doorway can be difficult for a trolley or wheelchair to negotiate and may also constitute a trip hazard.

Provisions on mechanically operated doors are contained in the Building Regulations (BBR) of the National Board of Housing, Building and Planning.

A pedestrian door normally needs to have a clear width of at least 0.7 m. Greater width is normally necessary for a person carrying a load, a cleaning trolley or a wheelchair. Often 1.0 m is advisable, and 0.8 m is normally the minimum requirement. A clear width of 0.8 m for a pedestrian door is normally acceptable on an escape route. A free width of 0.8 m corresponds to standard door frame K 9. For passage by a loading pallet on a pallet jack, a free door width of at least 1.0-1.2 m is normally necessary, and for a pallet on a truck at least 1.4-1.6 m is normally needed.

A pedestrian doorway normally needs to have a clear height of at least 2.0 m.

Guidance on Section 51

A pedestrian door next to a gate makes it easier for pedestrians to pass safely without being endangered by vehicle traffic. Pedestrian doors set in larger door leaves have proved to be a potential accident hazard.

Transport routes, passageways and corridors

Guidance on Section 53

Transport routes normally need to permit the use of wheeled transport aids, so-called wheeled handling, so as to avoid unsuitable work postures, e.g. during the transfer of patients in medical care or for distribution work. Transport routes should be made flat, straight and short. It is important that space should be provided both for transport aids and for personnel, so that work can proceed in an ergonomically correct manner.

In addition to transport operations for the main activity, convenient transport opportunities also have to be provided, for example, for cleaning and laundry trolleys, refuse, mail, copying paper etc.

Guidance on Section 54

The purpose of a lift or lifting device is to prevent ill-health resulting from unsuitable loads and accidents associated with lifting and carrying on stairs. It is especially important that transport aids should be provided for heavy and bulky objects. Where lighter loads are concerned, their number, frequency and size may also justify the use of a transport device instead of stairs.

It is important that a lift or other transport device should have sufficient capacity and speed, so that it will actually be used.

Stairs are normally unsuitable as a transport route, due to the physical strain which they impose. For safety reasons, spiral stairs are unsuitable for transport operations of all kinds, even those involving only light loads.

Small differences in height can often be bridged by means of a ramp. A lift is normally needed between storeys. Other differences in height, smaller than

those between storeys, may also warrant the provision of a lift or other transport device.

Guidance on Section 55

A pedestrian passage generally needs to be at least 0.7 m wide. With pedestrian traffic in both directions, a width of at least 1.2 m is generally needed. A principal route usually needs to be wider still. Escape routes are proportioned in accordance with special rules.

Transport routes for one-way traffic usually need to be at least 0.6 m wider or, for traffic in both directions, 0.9 m wider than the vehicles using them, load included. A width of at least 0.8 m is normally necessary for the passage of a cleaning trolley or cleaning machine.

Wheelchair passage normally requires at least 0.8 m. For turning a wheelchair, at least 1.3 m is normally needed. These measurements refer to a small wheelchair. A wheelchair ramp should have a slope not exceeding 1:12 and a vertical distance of not more than 0.5 m between landings.

A clear height of at least 2.1 m is generally appropriate for pedestrian and transport routes. A headroom of at least 0.2 m is usually needed above the highest vehicle occurring, load included.

Separate girders, pipes and other vertically and horizontally projecting elements which are not readily noticeable should be provided with a warning sign for the avoidance of collisions.

Guidance on Section 56

Sufficient safety clearance depends, for example, on the amount of traffic, the type of vehicle, speed, load and extent of view, and need to be determined according to the circumstances of the individual case.

Where, for safety reasons, pedestrian traffic needs to be seperated from vehicles, e.g. on corners, the separation ought preferably be effected by means of a rail or some comparable protective device, and where necessary this should carry a warning sign.

Guidance on Section 57

A traffic route normally needs to be marked with continuous boundary lines.

Guidance on Section 58

For the avoidance of unsuitable work postures in connection with transport operations, the option of wheeled handling is, in principle, needed on every storey. Obstructive steps and thresholds, therefore, should not occur. Both heavy transport operations and, for example, passage with cleaning trolleys need to be facilitated.

On pedestrian routes, the risk of tripping is another reason for the avoidance of single steps. Small differences in level and thresholds should also be avoided so as to facilitate transport operations and reduce the risk of tripping.

If single steps cannot be avoided, the stairs ought normally to have at least three steps. Steps of this kind in a corridor should be provided with warning signs and lighting and, as a rule, ramps for trolleys, wheelchairs etc.

A small difference in level is best bridged with a ramp instead of steps.

Stairs and fixed ladders

Guidance on Section 59

In order for stairs to be easy and safe to use, the gradient, the design of the treads and other measurements need to be closely adapted to the way in which the stairs will be used.

Stairs conforming to Swedish Standard SIS 91 11 01, Stairs – stair components – Basic sizes, are usually suitable.

A suitable minimum run is usually 0.25 m, and the maximum rise compatible with this is 0.175 m, giving an appropriate maximum gradient of about 35°.

Stairs with more than 18 rises ought preferably to be divided into two or more flights with landings in between.

It is important that there should be adequate clear height on stairs.

Stairs with more than three rises normally need to have a guard rail and handrail. The handrail is best positioned at a height of 0.9 m, measured from the nosing. A handrail provides support but also serves to arrest a fall. Handrails should be provided on both sides of the stairs. Wide stairs may need to be divided by a central handrail.

All transitions between floor and stairs need to be readily noticeable, to reduce the risk of accidents. In certain cases, therefore, the uppermost and bottom steps may need to be specially marked.

If there is a window near stairs, it is important that the risk of falls through the window should be averted.

For stairs and companion ways outdoors, it is appropriate that steps and landings should be made of metal grating or suchlike, to reduce the accumulation of water and ice formation.

A spiral staircase is considered safer than a straight one, because the constant change of direction forces people to pay attention to the steps, walk slowly and hold on to the handrail. For the same reason, though, a spiral staircase is unsuitable for anyone with a load to carry. Normally, therefore, from a safety viewpoint, a spiral staircase should be used only if it is little used and is never used for carrying goods.

A staircase should normally be at least 0.8 m wide. For a straight staircase constituting a main communication route or liable to be used for carrying a stretcher, the suitable width is at least 1.2 m.

Between 0.8 and 1.0 m is usually a suitable width for a spiral staircase. It should not be less than 0.8 m wide, so as to afford adequate space, and not

more than 1.0 m, so that the handrails can be reached from the walking position.

Guidance on Section 60

A descending staircase or steps immediately after a door entails a risk of falls. The floor level, therefore, should be the same on both sides of the door, and the landing needs to be big enough for a pedestrian to be able to pause at the top of the stairs and open the door safely when ascending.

The depth of the landing should normally equal the width of the stairs.

Guidance on Section 61

A ladder here is equated with a companion way or other steep access arrangements.

As a safeguard against falls, for example, the ladder can be fitted with hoop guard or personal fall protection equipment with a controlled sliding lock on a fixed anchoring line or rail can be used. In order for hoop guard to protect against falls without otherwise being in the way, the distance between ladder and guard normally needs to be about 0.65 m.

Examples of suitable hoop guard design for ladders will be found in Swedish Standard SS 83 13 40.

A ladder more than 10 m high ought preferably to have a landing. Beyond this, landings should be spaced not more than 6 m apart.

Regulations concerning fixed access arrangements to roofs and chimneys are also contained in the Building Regulations (BBR) of the National Board of Housing, Building and Planning.

Goods intakes, loading bays and ramps

Guidance on Section 62

A goods intake can, for example, take the form of a dock for vehicles, a loading bay, stacking space for goods and transport routes.

The goods intake requirement can vary, depending on the quantity and weight of the goods. Depending on needs, the appropriate solution may, for example, be a large dock, a loading bay shared between several work premises, unloading by truck at ground level or, for small quantities, goods reception through the ordinary entrance to the premises. Combinations are also possible, e.g. a combination of loading bay and unloading at ground level.

Goods intakes must normally permit wheeled handling of goods and the requisite use of lifting aids.

Goods intakes should have sufficient capacity for manual handling to be limited and for unnecessary movement of goods to be avoided. It is important that there should be sufficient stacking room for normal arrivals and departures of goods, returnable packagings, wrapping and refuse.

Goods intakes should be proportioned and designed for the requisite handling aids and in such a way that manual lifting and handling can be done with favourable work postures, e.g. not above shoulder height or below knee level.

Goods intakes should be positioned close to stores, a lift etc., so as to limit transport distances. The docking arrangements should be such that the vehicle stands horizontally and a ramp or suchlike for moving goods between the vehicle and the dock has no more than a slight incline.

Recommendations concerning work environment conditions etc. in goods receptions for lorry deliveries are contained in Swedish Standard SS 84 10 05, Designing for Deliveries (2nd Ed., 1991) and in the manual “Att angöra en brygga” published by Industriplanering, CTH, 1984.

Guidance on Section 63

Efficient access routes, manoeuvring space and parking spaces for vehicles are important for the avoidance of traffic risks in the vicinity of the loading bay. Between parked vehicles, a pedestrian access route not less than 0.7 m. wide should exist between the boundary lines of adjacent parking spaces.

It is important for loading bays and access routes to be adapted to the type of vehicle delivering the goods, e.g. for the avoidance of manual handling when a vehicle is unable to park against the loading bay.

Guidance on Section 64

The dimensions of the loading bay should be adapted to the dimensions and quantity of the goods, returned goods and wrapping to be handled and provisionally stacked. Space should also be reserved for the manoeuvring of vehicles and equipment.

It is appropriate for at least one point in the loading bay to have a ramp or lifting table and for the edge of the bay, ramp and lifting table to be provided with warning signs.

In addition to stairs, an access route can, for example, take the form of a companionway or ramp. A ramp should not have a steeper incline than 1:10. Steps at a loading bay should be positioned and designed with due regard for the risk of vehicle impacts.

It is important that a safety barrier should be designed so as to prevent the risk of falls or tripping.

Guidance on Section 65

It is important that a protective roof should be positioned at such a height that goods vehicles can park as intended.

Guidance on 66

At outdoor loading bays and other goods receptions, communication with work premises should be designed in such a way that vehicle exhausts are excluded.

Safety devices and emergency equipment

Protection against falls and falling objects

Guidance on Section 69

The door of a load hatch in a wall should open inwards or take the form of a sliding door. Safety devices in the opening can take the form of a gate or barrier with a protective height of at least 1.0 m or of a grab rail on each side of the opening, roughly 1.5 m above floor level.

The best form of protection against falls, normally, is a guard rail. Other protective devices for special kinds of work, such as window cleaning, include, for example, a detachable protective device or a personal fall protection system. The risk of falls is judged according to the size of the unguarded aperture and the drop. A guard rail is usually needed if the drop exceeds 0.5 m. A guard rail on stairs should be at least 0.9 m high.

A place intended for the loading and unloading of road and rail vehicles from the side should be safeguarded against falls, e.g. by means of removable posts with chains in between.

A floor opening to a goods chute can be difficult to provide with a protective cover or guard rail. If so, a horizontal protective screen can instead be positioned about 0.6 m above the floor opening.

A safety frame can be suspended about 1.5 m above the floor to prevent people passing beneath the load hatch.

A hatch cover or protective cover opened manually ought normally to have lifting handles. It is appropriate for a heavier cover to be opened with a winch or some other lifting device which is self-inhibiting. The cover may also need to be provided with a hook-up device. It is important that lifting handles etc. should be designed so that people will not trip over them.

Guidance on Section 71

For the prevention of falls beneath or through a guard rail, the rail normally needs to have an toe board at least 0.1 m high and to be double or afford corresponding protection. The term “double” as used here means the guard rail having two rails positioned, respectively, at the top edge and at half the height.

Emergency lighting

Guidance on Section 72

Emergency lighting can be necessary, for example, in chemical industry, in chemical and biological laboratories and in freezers.

Protection against entrapment

Guidance to Section 73

A suitable precaution against people being shut in is for the door to be made easy to open from the inside as well as from outside. This is especially important to remember in the case of rooms with a dangerous environment, e.g. intense heat, intense cold or oxygen deficiency.

Emergency shower and eyewash device

Guidance on Section 75

Guidance on the positioning and design of an eyewash device and emergency shower is contained in the Provisions of the National Board of Occupational Safety and Health on First Aid and Crisis Support and in the Provisions on Laboratory Work with Chemicals.

Warning signs

Guidance on Section 76

A glazed area at roof level is one example of an area needing to be marked.

The rules on warning signs are contained in the Provisions of the National Board of Occupational Safety and Health on Safety Signs and Warning Signals at Workplaces, and rules concerning warning signs for the avoidance of electrical hazards are contained in the High Voltage Provisions of the Swedish National Electrical Safety Board, ELSÄK-FS 1999:5.

Alarm systems and escape routes

Escape routes

Guidance on Section 77

It is especially important at the planning stage to consider the consequences of a fire, escaping gas or some other incident in a place which is difficult to evacuate.

The measures need to be taken can vary considerably and depend on many different factors, e.g. the nature and extent of the activities, the size, design and location of the building and room, the response time of the rescue services, whether a fire can develop and spread rapidly and whether escaping gas can mean a risk of explosion.

The situation for employees can be affected by the number of “non-employees” on the premises, e.g. in a hospital, department store or restaurant. The “non-employees” are often poorly acquainted with the premises and, for various reasons, may need help in getting out if the building has to be evacuated. Children are a specific group for evacuation purposes.

The point in time at which conditions become critical will depend among other things on heat radiation, air temperature, smoke layer level and the concentration of toxic gases.

The term “escape route” is used in these Provisions as defined for fire prevention purposes in Plan- och byggtermer 1994, published by the Swedish Centre of Terminology. The term as used there refers to the route from a fire cell to the open air or to another safe place.

“Another safe place” can mean a rescue chamber.

Evacuation issues are also dealt with in other Provisions issued by the National Board of Occupational Safety and Health. See Current Regulations.

Guidance on Section 78

The wording of Section 78 concerning the accessibility of escape routes and keeping them unobstructed refers not only to physical objects on the actual escape route but also to other things present along the escape route, capable of impeding evacuation, e.g. readily ignitable material such as paper and cloth generating smoke and heat in the event of a fire, or gas pipes which, if fractured, will make evacuation impossible.

Guidance on Section 80

A workplace as referred to in Section 80 can, for example, take the form of a space between shelves and stacks in a high-bay warehouse, the cab of an overhead crane or certain types of machine room. Other examples are spaces in which only work of a temporary nature usually occurs, in connection with overhaul, cleaning or repairs, e.g. a culvert, storage tank or transformer room.

Measures to be taken may, for example, include the following:

– organizing truck transport between rows of shelving or stacks in a high-bay warehouse in such a way that a truck driver or other persons will not run the risk of being shut in,
– providing the cab of an overhead crane with equipment to facilitate emergency egress, and
– permitting work in a certain space only if another person is present within sight or hearing distance or if personal contact is maintained by radio.

Emergency lighting for escape routes

Guidance on Section 81

The aim should be for emergency light fixtures to be positioned low down. On the floor of the pedestrian route, the emergency lighting should have a light intensity of at least 1 lux at its weakest point. Higher intensities may be justified in places, e.g. on stairs.

The design of emergency lighting is dealt with in current building regulations from the National Board of Housing, Building and Planning, which indicate the need for general lighting and for the illumination of guiding marks.

There is also a CEN standard for emergency lighting, EN-SS 1838, dealing with different types of emergency lighting and also with evacuation signs.

Signage and marking of escape routes

Guidance on Section 82

Signs and other guiding marks for evacuation normally need to be provided at the door to and on an escape route and in order to show the direction of escape routes and how to reach them. On an escape route, signs may be particularly necessary where there is a risk of error, e.g. at a change of direction or at a junction.

Regulations on the design of signs marking an escape route are contained in the Provisions of the National Board of Occupational Safety and Health on Safety Signs and Warning Signals at Workplaces.

Guidance on Section 83

One instance when an escape route or the path to an escape route may need to have its outer edges marked is when the handling, stacking or movement of materials, products or wrapping or the parking of trucks may involve a risk of the escape route being partly or wholly obstructed.

A line marking the outer edge of the escape route facilitates evacuation, especially when smoke is emitted from a fire and visibility is impaired. Visibility being better at floor level, it is appropriate for the markings to be made directly on the floor or else low down on the wall.

Evacuation alarm systems

Guidance on Section 85

Work premises as referred to in Section 85(1) include, for example:

– Large and complicated work premises where a fire, escape of gas, oxygen deficiency or suchlike can occur without being noticed quickly enough by everyone present.
– Work premises where an open fire or some other ignition source is used in the course of activity, and which also contains a flammable substance of such a kind and in such a quantity that a fire can occur which constitutes a health or accident hazard. Note that under Section 13 of the Flammables and Explosives Act (SFS 1988:1145) the handling of flammable or explosive products on such work premises is prohibited.
– Work premises where a fire can spread rapidly or generate dangerous fumes, e.g. a high-bay warehouse or a facility for the production or storage of plastic, paint or paper.
– Work premises for the production and handling of gas of such a kind and in such quantity that a dangerous escape of gas can occur.
– Work premises situated below ground, as from the second storey below ground level.
– An insulated room, e.g. a freezer.
– Work premises where oxygen deficiency can occur, e.g. in connection with the open storage of reducing agents such as sulphides and sulphites.

Small offices, day nurseries and suchlike are examples of work premises referred to in Section 85(2).

Guidance on Section 86

An alarm signal may also need to be apprehended in a space which is soundproofed or has a high ambient sound level and in a space frequented temporarily by personnel, such as a personnel facility and a normally unoccupied storage facility.

It is important that the alarm signal for evacuation should be clearly identifiable. It may take the form of an acoustic or visual signal or, if necessary, of both, e.g. when there are persons with impaired vision or hearing present at the workplace.

A fire-warning signal may need to be different from a signal warning, for example, of escaping gas or oxygen deficiency, one reason being that the measures needing to be taken vary according to the type of incident.

In the event of a power failure, the alarm installation should be capable of remaining in working order for at least 60 minutes.

Guidance on Section 87

The type of alarm device needed will depend on the risk situation which can arise. Very often a simple device is sufficient, e.g. manual call point, signal line and signalling device.

An evacuation alarm triggered automatically by a detector may be needed if a fire or escaping gas can mean acute danger to personnel, e.g. because a fire can easily develop and spread rapidly, because fumes from the fire quickly impede visibility or because escaping gas can quickly cause asphyxiation or poisoning.

If there is an automatic fire alarm connected to a rescue service, this and the evacuation alarm referred to in the Provisions can be co-ordinated where appropriate.

An alarm signal must not always lead to immediate evacuation. In certain cases a simple, rapid contingency programme can reduce or eliminate the risks which could otherwise have arisen.

Guidance on Section 88

In certain cases an alarm device may need to be inspected more often than quarterly, e.g. where the environment is corrosive or where tampering is liable to occur.

Special risks in the event of fire

Guidance on Section 89

Special steps to facilitate evacuation may be of a technical and of an organisational nature. Technical measures such as an automatic fixed extinguishing device to facilitate evacuation may be needed if, for example, large quantities of plastic, paint or paper are handled in the activity. An additional escape route or routes or some other structural measure may provide equivalent protection. Organisational measures in the form of a fire safety organisation and extra training for the personnel may be other ways of achieving this end. Rules on this subject are contained in the Provisions of the National Board of Occupational Safety and Health on Systematic Work Environment Management.

When choosing the method to be taken, it is important to carefully evaluate the advantages and disadvantages of the various options in relation to the fire risk and personal safety. The municipal rescue service must be consulted in these matters.

An automatic fixed extinguishing device can be various types of sprinkler system with varying capacities for extinguishing or limiting the fire. These systems provide either local, partial or complete protection. The time from the

commencement of a fire to the activation of extinguishing measures should be carefully considered, because different extinguishing systems have different activation times.

With an efficient, properly adapted sprinkler installation, however, the extinguishing process should begin quickly, thus increasing the possibility of extinguishing or limiting the fire and, accordingly, the safe evacuation of the building.

The longer the response time of the rescue service, the more important will the measures, both technical and organisational, taken inside the building or work premises be, and they are particularly important for personal safety if the fire is expected to spread rapidly and extensively.

Guidelines for automatic water sprinkler installations have been published by the Swedish Insurance Federation (previously through FSAB) in RUS 120:4, Regler för automatisk vattensprinkleranläggning.[1]

Guidance on Section 90

A space as referred to in Section 90 can have an automatic extinguishing device with carbon dioxide or some other suitable extinguishing agent. An installation of this kind is used in special cases, e.g. for a technical device where a fire can occur in a flammable product, in a space for a high voltage electrical installation or for a computer centre. Guidelines on fixed carbon dioxide installations are published by the Swedish Insurance Federation (previously through FSAB) in RUS 115, Regler för koldioxidsläckanläggning.[1)]

The discharge of this kind of extinguishing agent should take place with a certain delay after the alarm, so that evacuation can take place before there is any acute risk of injury. The Swedish Insurance Federation has also issued rules for inert extinguishing gases, RUS 500.[1)] Other measures are warning signs and instructions for work in a space where a carbon dioxide or other suitable extinguishing installation is present and for turning off this kind of extinguishing agent when work is being done on the extinguishing installation.

Evacuation plan

Guidance on Section 91

It is often appropriate to post at least one evacuation plan on every storey.

A common assembly point can with advantage be arranged for personnel who work together. This increases the possibilities of checking that everyone is present.

A specimen evacuation plan will be found in Swedish Standard SS 2875.

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[1] *A revised edition of the guidelines is planned for publication by the Swedish Fire Protection Association after 1st January 2001.*

Personnel facilities

General

Personnel facilities can in certain cases be shared by two or more undertakings. If several small firms are operating within the same building or within a limited area, there is nothing to prevent the employers providing communal personnel facilities, so long as the Provisions are complied with. When personnel facilities are shared by several employers, this can necessitate special agreements concerning rules of conduct, cleaning etc.

Where the main activity is run by one employer and only a few people are employed by someone else, it may happen that everyone uses the same personnel facilities. At a bus terminal, for example, it can be practical for kiosk staff also to use the personnel facilities which are mainly intended for terminal employees.

Work away from a permanent worksite can vary considerably in character and duration. Whatever the working conditions, it is essential that personnel facilities be made as good as possible. The possibilities of transferring cabins etc. and of connecting electricity, water and drainage, however, vary from one case to another. It is of course easier to arrange personnel facilities of a relatively high standard in places where work continues for a long time and the worksite has a good road connection than in cases where these requirements are lacking.

Note that the erection of huts for construction workers may in some cases be dependent on a building permit from a municipal building committee, owing to stipulations regarding evacuation and other safety matters. Police permission is required for the positioning of huts in a public space, e.g. on a pavement.

Guidance on Section 92

a) The requirement that the positioning of personnel facilities be adapted to the nature of the work means among other things that it is generally acceptable for employees outdoors to have a longer distance to go to personnel facilities than employees indoors. Moving within an extensive area is often part of the job, e.g. for a dockworker or park groundsman. On the other hand, an extensive worksite may, owing to the number of employees, need to have more personnel facilities than are indicated in the various sections of these Provisions and the guidance on them.

The fact of persons undergoing training or education being equated with employees for the purposes of these Provisions does not mean that this category will in every respect and in all training or educational activities have the same need of personnel facilities as employees in the undertaking. Apart from the variations of work environment normally existing between different types of activity and workplace, there are also great variations within the education system regarding both the nature and duration of education and the confinement of pupils to the teaching premises. The conditions applying, above all, to post-secondary students with a few lectures every week or with a limited amount of timetabled attendance are different from those applying to employees of universities and colleges. Ways in which personnel facilities for

workplaces away from a permanent worksite can be arranged are instanced in the table on page 75.

b) When calculating the number of employees who may come to use a personnel facility, there are several factors to be considered. One of them is the working hours at the worksite. For shift work, for example, it may be sufficient for the personnel facilities to be geared to the number of persons per shift, if the teams do not normally need to use them simultaneously. Note, however, that every employee needs an individual clothes locker or some other suitable arrangement when the Provisions require separate spaces for private clothing and work clothing. If the shifts go off duty and on duty in the changing rooms, this Provision means that the rooms must be large enough for both shifts.

If personnel with a different employer are active at a worksite, this too can have a bearing on the size and number of personnel facilities. The question then is how often and how long non-employees work at the worksite. Their working hours are also relevant. Certain personnel facilities can often be needed for cleaning staff who are not employed by the employer using their services. At large worksites where maintenance of machinery and buildings is carried on continuously by personnel not employed at the worksite, personnel facilities are also needed for this group.

If, for example, security staff are employed at different hours from the regular personnel, extra personnel facilities for the security staff at the surveillance point can often be dispensed with.

c) The Equal Opportunities Act (SFS 1991:433) contains rules on measures to make working conditions suitable for both women and men.

Table (to accompany Section 92 a)

Examples of ways in which personnel facilities can be arranged at workplaces away from permanent worksites.

Conditions	Example of work	Personnel facilities
1. Work in the same place for a considerable length of time where it is reasonable to arrange electricity and water supply and drainage.	Building work. In certain cases, roadwork and civil engineering on large workplaces.	Personnel cabins (Portacabins). Temporarily allotted space in a building (e.g. during alterations or repairs and refurbishments).
2. Work in various places where the connection of water and drainage is not a reasonable proposition.	Building work on small workplaces. Forestry work. Line work. Certain kinds of roadwork. Work at a great distance from permanent personnel facilities (in certain cases, farm work and horticultural work).	Personnel cabins (Portacabins) adapted for movement on inferior roads or off-road. In exceptional cases, mainly during the summer season, a small caravan or suchlike.
3. Work requiring employees to cover long distances during the day, sometimes off-road.	Ambulatory work (service and stand-by work etc.).	A vehicle fitted out with a dining space, washing facilities and perhaps some kind of portable toilet. Personnel facilities at other worksites or suchlike.

Guidance on Section 93

The functioning of the personnel facility can be significantly impaired, for example, by machinery, computers, copying machines or materials being placed there. It is specifically prescribed that a chain saw room shall be provided for the care and storage of chain saws and fuel and shall be kept separate from personnel facilities. See the Provisions of the National Board of Occupational Safety and Health on the Use of Chain Saws and Bush Saws.

One example of a situation where other activity does not impair use as a personnel facility is the use of a staff canteen for teaching or meetings at times when it is not being used for its main purpose.

Guidance on Section 94

A space for valuables can, for example, take the form of a locker, a clothes locker, a desk, hutch or lockable room. Examples of suitable measurements for storage lockers are to be found in Swedish Standard SS 83 53 12 “Furnishing and Fittings – Lockers – Dimensions”.

In schools, arrangements for the storage of valuables can vary, depending on school by-laws and the pupils’ need of safe storage for valuables.

Wardrobe space

Guidance on Section 95

The measures needed for the prevention of dirt, damage and theft from storage have to be considered ad hoc, depending for example on the nature of the activity, the size and location of the worksite, the frequentation of the worksite by persons other than the employees and other local conditions. In connection with clean work, e.g. in offices, a cloakroom or a clothes locker in the workroom may be a suitable storage place for personal clothing.

In a school, arrangements for the storage of the children’s outdoor clothing can vary, depending among other things on the pupils’ age. Outdoor clothing can be stored next to the classrooms, e.g. in the corridor, in pupils’ lockers or in a cloakroom.

If the location of a cloakroom is such that the employees cannot remain indoors when proceeding to their workplace, hooks or suchlike for outdoor clothing are often needed in or near the workroom.

In a cabin for personnel, each employee generally needs a clothes locker for personal clothing and a cupboard or locker for work clothing. Corresponding storage spaces are normally also needed in those parts of the building which are used as personnel facilities during repair and maintenance work.

Examples of suitable clothes lockers are to be found in Swedish Standard SS 83 53 13 “Furnishing and Fittings – Clothes Lockers – Dimensions”. Where work so requires, a locker or cupboard may need to be 40 cm wide to accommodate bulky clothing.

Other arrangements can be opted for, such as providing extra lockers of a narrower type if they meet the functional requirement of affording adequate and suitable storage. A solution needs to be adapted to the space requirements of each individual case, which can vary according to task and season of the year, but must also facilitate the maintenance of a rational stock of cabins.

In vehicles, small caravans and suchlike, clothes storage can often be arranged by some other suitable means instead of clothes lockers.

Guidance on Section 96

Activities where changing rooms are needed because the work is dirty or causes perspiration or emits a strong smell include, for example, workshops, mines, bakeries, restaurant kitchens, joinery workshops, masons' yards, steelworks and foundries.

Special storage places for private clothing and work clothing can be arranged in a variety of ways. Personal or civilian clothing used in connection with dirty, noisome or sudorific work is equated in this respect with work clothing. Segregation can be achieved, for example, with two clothes lockers, one clothes locker with a partition or a clothes locker for private clothing and an open clothes compartment for work clothing. Clothes locker ventilation is desirable, especially for work clothing.

Clothes storage spaces in agriculture can, for example, be positioned in a space in a home made available to the employee by the employer.

Guidance on Section 97

Work in wastewater treatment plants is one example of work where a changing room and separate storage places, e.g. separate clothes lockers, can be needed.

Activities where separate changing rooms may be needed for private clothing and work clothing include, for example, laboratory work with infectious organisms and paint spraying with isocyanates.

Clothes lockers are not always necessary, though for the most part they are the preferred arrangement, if there are separate changing rooms for work clothing and personal clothing.

Work for which special protective clothing is needed includes, for example, work with experimental animals presenting an infection risk, asbestos, thermosetting plastic components or certain pesticides. See also the various Provisions of the National Board of Occupational Safety and Health on these types of work.

Guidance on Section 98

One way of pooling space resources while still meeting the requirement of segregation between men and women is by staggering working hours.

A disabled toilet or the anteroom of a shower is one example of a suitable space for changing at a worksite where one of the sexes is represented by one employee only. Clothes storage can then be suitably arranged in a clothes locker near the space where changing occurs. At small worksites, work can be organised in such a way that employees of different sexes take turns with changing in the Portacabin.

Another expedient may be to refer an individual employee to, say, a spacious toilet for changing.

Guidance on Section 99

For the sake of flexibility, hygiene and job satisfaction, it may, for example, be an advantage to have several small changing rooms instead of one large one.

Examples of suitable spaces for clothes storage are given Swedish Standard SS 83 53 13 “Furnishing and Fittings – Clothes Lockers – Dimensions”.

Suitable width and depth measurements for seating are usually 40x30 cm, with a height of 40-45 cm. A clothes locker with a bench, as per SS 83 53 13, is a practical arrangement.

It is appropriate that wastepaper baskets should also be provided and, where necessary, draining mats and power sockets. It is convenient for persons in wheelchairs if the bar of a hat rack is 1.2 m above floor level.

Drying facility

Guidance on Section 100

Drying facilities include, for example:

(a) A heating and ventilation device for clothes lockers.

(b) A drying cabinet.

(c) A drying room.

Clothes will dry more rapidly if hangers, bars and grid shelving are provided. See also Swedish Standard SS 83 53 13, point 3.

Worksites where a flushing device for boots may be necessary include, for example, wastewater treatment plants, farms and market gardens. Schools with training programmes for these activities may also need boot flushing and drying facilities.

The drying of clothes can be arranged in various ways. Lockers for work clothing can be fitted with a heating coil, but a drying cabinet is preferable or, at larger worksites, a special drying room. It is important that ventilation and heating should be of such a kind that clothing will dry overnight or in a shorter time.

Shower and washing facilities

Guidance on Section 101

It is appropriate for shower and washing facilities to be positioned adjacent to a wardrobe space. If work is dirty or sudorific, at least one wash basin is usually needed for every five workers or fraction thereof.

Water at room temperature can, in exceptional cases, suffice if the work is not sudorific or particularly dirty and if at the same time there are practical difficulties involved in supplying hot water, as can be the case, for example, in vehicles and small caravans or suchlike.

Special stipulations apply concerning hygiene in certain cases, e.g. in connection with work involving asbestos, oil, pesticides and several other dangerous substances or, for example, for medical or food hygiene reasons. See the Provisions of the National Board of Occupational Safety and Health on the hazardous substance concerned.

Guidance on Section 102

Activities for which a shower need not as a general rule be provided include small take-aways, e.g. hot dog kiosks.

At small worksites, work can be organised in such a way that workers of different sexes take turns in using the facility.

Guidance on Section 103

The following numbers of wash basins are necessary as a rule:

(a) At offices or suchlike, at least one wash basin for every 15 workers or fraction thereof.

(b) At a worksite where the work is dirty or sudorific, at least one wash basin for every five workers or fraction thereof.

(c) At a worksite where the work involves an infection hazard or is due with a strong-smelling or health-endangering substance, additional wash basins are often advisable.

If there are more than four wash basins in a wash room, a shower can usually also be counted as a “wash basin”.

This Provision means, for example, that offices need not be provided with wash basins over and above those which, under Section 105, have to be provided in toilets etc. The same applies in education if the instruction is purely theoretical.

For dirty work, it may often be appropriate for the washing facility to take the form of a wash trough.

As a rule, one shower is needed for every 20 persons or fraction thereof. A larger number of showers is appropriate if the work is so dirty or sudorific that most workers can be expected to shower when work is over.

It is essential that one of the showers in each special wash room should be completely screened off and have a changing cabin. It is appropriate for the shower to have a rough floor or a non-slip mat and to be fitted with grab rails and a foot stirrup. Suitable dimensions for a shower unit are, for example, 0.9x0.9 m.

Organic solvents such as white spirit and turpentine are unsuitable for skin cleaning. See also the Provisions of the National Board of Occupational Safety and Health on Oils.

Work where skin lotion may need to be provided includes, for example, hairdressing, work with thermosetting plastic components and certain jobs in the caring sector.

For hand washing only, disposable towels are suitable.

It is important that the water heater, if there is one, should have sufficient capacity.

The local authority (municipality) may need to be contacted for instructions concerning the disposal of waste water.

Toilets

Guidance on Section 104

This Provision does not mean that it is necessary for separate toilets to be provided for men and women.

The suitable number of toilets is normally one for every 15 workers or fraction thereof. For post-secondary students, the requirement is normally put at one toilet for every 50 seats in lecture rooms. If there is a urinal, the number of toilets for male workers can be reduced to one for every 20 or fraction thereof.

The toilets referred to in this section are intended for the employees at the worksite. The number indicated in this guidance is computed solely with reference to the number of employees. Cleaning routines also are computed solely with reference to the employees. At certain worksites with high levels of occupancy by the general public, e.g. railway stations, terminals, airports, shops, hospitals and service institutions of different kinds, toilets may also be needed for the general public. These Provisions do not include any rules concerning the number of such toilets needed.

It is unsuitable as a rule for the general public to be given access to staff toilets. This is especially important where there is a manifest risk of infection or serious contamination. One situation where the requirement of access to a toilet can be departed from in exceptional cases is when work at the place in question is of brief and temporary duration and is carried on separately from human settlement or from areas frequented by other persons.

Guidance on Section 105

In the case of a toilet where changing of clothes must be possible (see also the Guidance on Section 98), it is usually more appropriate for the toilet itself to be generously proportioned than for it to be provided with a small anteroom. A suitable size for toilets of this kind is, for example, 1.3x1.4 m or 1.0x1.7 m.

In schools and at large workplaces, 2.2x2.2 m is a suitable size for a disabled toilet.

A toilet normally needs to be provided with toilet paper, towels – preferably of paper – a paper disposal basket, mugs for drinking water, a clothes hook, a mirror and a disposal bin for sanitary towels etc.

This Provision implies that the door of the toilet with no anteroom must not normally be positioned, for example, in a dining space.

Canteens

Guidance on Section 106

When planning dining spaces, it is important that the best possible provision be made for the need to relax away from work. For example, it is often appropriate for teachers' dining spaces to be separated from the pupils' and that a dining space for employees with service-related duties, e.g. in retail trade, should be positioned so that they can eat undisturbed.

If employees are referred to a restaurant other than a staff restaurant of their own, the employer needs as a rule to ascertain in advance that the restaurant has sufficient capacity and suitable opening times.

When dimensioning a dining space, consideration needs to be paid, for example, to the number of employees at the worksite, the extent to which they intend eating there, whether they eat by turns, and other circumstances which may depend on local conditions.

A rule of thumb for dimensioning a canteen is that roughly 1.2 m² floor space is needed per seat, main entrances included, kitchen or kitchen equipment not included. It is important at the planning stage to ensure that there is enough room at a serving counter and that intersecting traffic is prevented as far as possible.

If the workplace has no windows, it is particularly essential for the canteen to have them. At a workplace which has no access to daylight and where, for some practical reason, it is not feasible to provide a canteen with windows, it is appropriate instead to try to improve the environment, for example by means of generous spaces, careful furnishing and lighting, colouring etc.

It is appropriate for tables and other equipment to have surfaces which are easily washable.

In a motor vehicle, the canteen may consist of seating with a tabletop or suchlike. A school dining hall at a reasonable distance from the workplace can be used by pupils during their training.

Guidance on Section 107

This section means that, even if there is a staff restaurant or, for example, an agreement with another restaurant or a voucher system, a space still has to be provided, e.g. in a canteen, dining space or part of a staff restaurant, where the employees can eat food which they have brought with them.

A heating device for lunch boxes and suchlike can, for example, take the form of a warming cupboard or a microwave oven. A microwave heats single portions rapidly, making it easier for the employees to obtain warm, properly balanced food. It may also be appropriate to provide a hotplate, e.g. for making coffee.

It may be a practical arrangement for the refrigerator to be equipped with a freezer compartment for the storage of deep-frozen portion packagings.

A rest area can also be used as a canteen. Cf. the third paragraph of the guidance on Section 108. Solutions can vary according to local conditions. In schools, for example, a cafeteria, the school dining hall or the kitchen and dining section of the hostel can be used by pupils bringing their own food.

Social area

Guidance on Section 108

Concerning breaks, see the Working Hours Act (SFS 1982:673). Breaks are most often spent at the workplace.

A special rest area or some other suitable space may be needed, for example, when the workplace has an extreme temperature and/or a harmful noise level. It may also be needed when the employees are unable to relax from work, e.g. because the actual workplace – a checkout, for example – is frequented by the general public. Teachers are another professional category normally in need of a rest area separate from the teaching facilities. It is often appropriate for a social area to be provided, even if the workplace is not characterised by extremes of temperature or noise.

Canteens or staff dining rooms are examples of other spaces which can be used during breaks. A social area can also be arranged by screening off a suitable place. For pupils in school, the playground is an important social area, weather permitting.

It is generally best for the social area to be close to the workplace and to have windows. Closeness to the workplace, however, is often more important than the provision of windows. A windowless area needs as a rule to be designed with special care regarding the furnishing, lighting and colour scheme.

Rest area

Guidance on Section 109

A rest facility may if necessary be provided in a cloak room or some other suitable space. In the first instance, though, it should be a facility in its own right.

A rest facility is easy to organize, for example, when the dining area of a Portacabin is fitted out in such a way that space can be prepared for lying down in. A rest facility in a Portacabin can be dispensed with when a suitable rest area is otherwise available, for example in a building at the worksite.

A special sick room may be needed, for example, when more than 50 people are regularly occupied simultaneously within a single area, e.g. in one or more adjoining buildings. In schools, use can be made, for example, of a rest room adjoining pupil welfare facilities.

It is appropriate for the rest room to be modified for the convenience of persons with functional impairment. It is an advantage if the room can be located in quiet surroundings.

Guidance on Section 110

Suitable furnishing in most cases comprises a bed with pillow and blanket, a table, chair, bedside lamp, clothes hook and mirror. It is an advantage if colours and materials impart an atmosphere of tranquillity to the room. Medical equipment can very well be kept in or next to a rest room.

It is an advantage if a toilet – preferably a disabled toilet with shower – is available next to the room or near it. Otherwise it is appropriate for the room itself to have a wash basin.

An Occupied signal and an alarm device are suitable items to be included in the rest room equipment. An alarm device can, for example, take the form of an alarm signal transmitted to a service unit or it can take the form of a telephone.

Room for duty staff

Guidance on Section 111

The Working Hours Act defines on-call hours as time when an employee is at the employer's disposal at the worksite in order to carry out work if necessary.

Guidance on Section 112

It is appropriate for furnishing to comprise a bed, bedding, a wardrobe or clothes locker, chair, table, ceiling and bed lamps and mirror.

Waiting room

Guidance on Section 113

A worksite as referred to in this Section can exist, for example, in transport and communications and in harbours.

Another suitable space which can be used as a waiting room is, for example, a canteen or social area, if this does not inconvenience persons having a meal break or coffee break.

At a rough estimate, the space requirement for a waiting room can be put at approximately 1 m² floor space per person.

Sleeping accommodation

Guidance on Section 114

The employees referred to here are train crews, other railway personnel and bus drivers. Accommodation, e.g. in connection with heavy engineering work, does not count as sleeping accommodation for the purpose of these Provisions.

Furnishing can appropriately comprise a bed, wardrobe or clothes locker, linen cupboard, chair, table, ceiling light and bed lamp. Equipment may comprise bed linen, a waking device and a mirror. An eating facility can be provided in a canteen or in sleeping accommodation with a pantry or kitchenette. A suitably located restaurant or suchlike with suitable opening times can also be used.

A hotel room or staff room meeting the requirements of this Section can also be used as sleeping accommodation.

Special requirements concerning personnel cabins

Guidance on Section 115

Windows may need to be openable for occasional airing and also, in certain cases, for use as an escape route. In a Portacabin with several different spaces, it may be appropriate for each space to have a window which can be opened.

As a precaution against burglary, windows may also need to be provided with shutters or bars. If so, it is important to make sure that anti-intruder fixtures do not obstruct a possible escape route.

To supply adequate daylight to Portacabins, a suitable minimum value for the window area is 10% of the floor area.

Operation and maintenance

Guidance on Section 116

Maintenance work here is also taken to include inspection, overhaul, routine care and the change of replacement materials.

This Provision refers primarily to maintenance with regard to mechanical strength, safety and hygiene. It is also appropriate from a job satisfaction viewpoint that the surfaces of floors, walls and ceilings should be properly looked after. It is also the purpose of maintenance to ensure that things will work as intended.

From a work environment viewpoint, the purpose of tidying and cleaning is among other things to counteract the risks of accidents and ill-health. On tidy premises there is less risk of tripping and slipping, of fire breaking out in accumulated dust and spillage and absorbing health-endangering substances through inhalation or skin contact.

A tidy environment is also important for the prevention and alleviation of allergic disorders, for example, and for reducing the risk of infections spreading. Cleaning combines with good ventilation to maintain a low concentration of dust in the air.

Cleaning routines are best defined in a cleaning programme describing how often and by what methods different rooms, surfaces and furnishing details are to be cleaned. It may be appropriate for the cleaning programme to distinguish between daily, weekly, monthly and major cleaning. Certain spaces may need to be cleaned several times daily.

It is important for cleaning methods and routines to be adapted to the function of the premises and the nature of the activities. It is also important to choose methods exposing the cleaning personnel to the least possible risk.

Recommendations on cleaning are contained in the manual “Städboken”, published by the Work Environment Authority and the National Board of Health and Welfare in 2001.

Guidance on Section 117

Spaces for property management and service comprise fan rooms, cleaning facilities and refuse storage facilities.

Cleaning arrangements can, for example, include power sockets, hot and cold water taps, slop sink, floor drain and recharging point for cleaning machines. Spaces needed may include, for example, cleaning spaces for the storage of equipment, cleaning trolley, cleaning materials and disposables. Normally a cleaning space is best provided in the form of a separate cleaning room.

A cleaning space normally needs to be provided on each storey, for the avoidance of unnecessary loads when moving necessary equipment.

It is important that a convenient route, with no steps and with low thresholds and adequate door openings, should be provided for a cleaning trolley.

A cleaning space should among other things be planned in such a way that work above shoulder height and below knee level will be avoided. A slop sink

should be positioned where it can provide support for a bucket, preferably with the upper edge of the sink about 0.6 m and the spout of the tap about 1.1 m above floor level. Good ventilation is important in a cleaning space, e.g. in order for cleaning equipment to dry, and so is good lighting.

In addition to a cleaning room, a central store is usually needed, e.g. for supplies, cleaning agent, equipment and machinery. Often other premises are also needed for cleaning. In large buildings it is often appropriate for these to be gathered into a cleaning centre, which can include premises for storing materials, trolleys, equipment, machinery, battery charging, laundry, offices and a staff room. Refuse storage rooms and traffic routes must normally permit wheeled handling. A refuse storage room normally needs to be accessible from indoors and to be positioned close to a lift, to facilitate transport operations.

A refuse storage room should be designed for easy cleaning. Accordingly, it often needs to have a floor drain and a water supply.

When planning a refuse storage room, consideration must be paid to waste separation and to separate storage for recycling. Normally space also needs to be provided for bulk waste and for returnable packaging.

Refrigerated storage may be needed for noisome and decomposing waste, e.g. from food manufacturing or retailing premises, and also for hazardous waste.

It is important that maintenance and servicing of devices can be performed in such a way that unsuitable work postures and working movements are avoided. The avoidance of work above shoulder height and below knee level is especially important.

Various maintenance requirements, e.g. in fan rooms and lift machine rooms, need to be taken into account and consideration paid to future maintenance work already when the facilities are being planned, e.g. as regards access and traffic routes, adequate space for work, lighting, power sockets, indoor stairs, fixed ladders and work platforms, anchorings, lifting hooks etc.

Good access is also important and so is the provision of adequate working space, both vertically and horizontally, at installations which may need to be repaired, replaced or accessed for some other reason. Installations of this kind include, for example, heating boilers, radiators, tube fittings, valves, refrigerators, washing machines and dishwashers, toilets and wash basins.

Guidance on entry into force

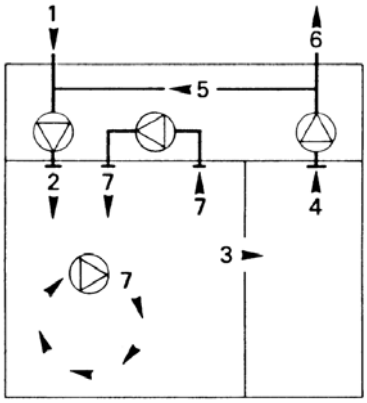
The reason for Sections 34 and 36 not entering into force until 1st April 2003 is that the corresponding stipulations are currently contained in the Ordinance of the National Board of Occupational Safety and Health containing Provisions on Noise (AFS 1992:10). Those Provisions are to be revised, and the regulations now referred to will then be removed and superseded by Sections 34 and 36 in the Provisions on Design of the Workplace. For the avoidance of unnecessary duplication in the meantime, the entry into force of Sections 34 and 36 has now been postponed pending the said revision.

Glossary of terms

For other terms used, reference is made to TNC 95.

Ventilation

Outdoor air	Air outdoors or coming from outdoors.
Supply air	Air supplied to a room. Supply air can take the form of outdoor air, return air or transferred air.
Transferred air	Air transferred from room to room.
Extract air	Air removed from a room.
Return air	Extract air returned to a group of rooms.
Circulated air	Air circulating in a room or extract air returned to the room it was taken from.
Exhaust air	Extract air released into the atmosphere.



1. Outdoor air
2. Supply air
3. Transferred air
4. Extract air
5. Return air
6. Exhaust air
7. Circulated air

Source: TNC 89

Detection limit	The smallest quantity of a substance detectable by means of a measuring instrument.
Air-exchange efficiency	Indicates how efficiently air is changed in a room with no local sources of contamination. It is calculated as the ratio between the nominal time constant of the room and twice the average age of the air (the air change time) in the room. A high airexchange efficiency means that the whole room is ventilated. Air-exchange efficiency can at most reach 0.5 (50%) with complete mixing and 1.0 (100%) with complete piston ventilation.

Ventilation efficiency	Shows how efficiently (rapidly) a local contaminant is removed from the premises. Ventilation efficiency is the ratio between the contamination content of the extract air and the average concentration of contaminants in the room. With complete mixing, the ventilation efficiency is 1.
Specific air flow	The air change rate i.e. the number of room volumes per hour (previous term: air changes per hour).

Lighting

General lighting	Lighting generally obtained from uniformly distributed luminaries in a workroom or work area.
Artificial lighting	Light of other than natural origin.
Lighting factors	Collective term for various factors such as illuminance, luminance, glare, the direction of light, contrast, light colour and colour rendering.
Lighting intensity	The relation between the flow of light falling on a surface and the size of that surface (lumen/m²). Stated in lux (lux=lm/m²).
Colour temperature	Stated in kelvin (K). A low colour temperature gives a warm-coloured light, while a high temperature is perceived as resembling daylight. 3 000 K – warm-coloured light. 4 000 K – white, neutral light. 5 000 K – daylight.
Colour rendering index	Indicates the capacity of the light source for correctly reproducing colours, related to its colour temperature. Denoted Ra, it is expressed on a scale of 0-100. A high number means that the light source has a very good colour rendering capacity.
Contrast	Relative difference between the luminances of different parts of a visual object and its background luminance in the field of vision.
Luminous flux	The quantity of light emitted from a light source. The radiation flow from the light source (which can be stated, for example, in watt) is “valued” according to the sensitivity of the human eye to light at different wavelengths. Stated in lumen (lm).
Localised general lighting	General lighting specially designed to particular tasks, e.g. through positioning of luminaires to meet the lighting requirements at individual workplaces.
Luminance	The intensity per unit of area in the light emitted or reflected from a surface. Stated in candelas per square metre (cd/m²). The perceived brightness of the surface depends on the adaptation of the eye and the luminance of the surface.
Peripheral field of vision	The surroundings outside the outer field of vision.
Task lighting	Lighting obtained from a luminaire specially arranged for the task at the individual workplaces.
Visual object	The object looked at during the work process

Noise and acoustics

A-weighted sound pressure level	Weighted average of the sound pressure level within the audible frequency range, measured with weighting filter A. Stated in decibels (dB).
Noise	Unwanted sound.
Decibel (dB)	Unit of logarithmic quantities e.g. for sound pressure level.
dB(A)	Unit of sound level measured with weighting filter A.
Reverberation	Lingering sound reflections in a room which eventually fade away after the sound source has ceased to act.
Reverberation time	The time it takes for the sound pressure level to fall by 60 dB after a sound source has ceased to act.
Impulsive sound	A brief sound of less than one second's duration with a frequency-weighted peak level exceeding the sound level in a short interval round the impulsive sound by more than 15 dB.
Infrasound	Sound at frequencies of up to 22 Hz.
Sound-absorbent material	Material capable of absorbing acoustic energy. Reduces the intensity of reflected sound.
Sound absorption	Reduction of acoustic energy through the energy absorption of a substance.
Sound pressure	The difference between instantaneous pressure at a point in an acoustic field and the static pressure. (The magnitude of pressure variations in the sound.) Determines the strength of sound.
Sound pressure level	Logarithmic measure of the strength of sound, based on the sound pressure in relation to a reference value. Stated in decibels (dB).
Sound insulation	Reduction of sound transmission.
Airborne sound insulation	Reduction of airborne sound transmission.
Sound level	An abbreviated form of "weighted sound pressure level". Stated in dB(A) when an A-weighting filter is used.
Impact sound	Sound occurring in neighbouring rooms as a result of footsteps on roof and floor joists, stairs or suchlike.

Impact sound insulation	Reduction of impact noise.
Impact sound pressure level	A quantity indicating impact sound insulation. Indicates the sound pressure level in a certain room when a standardised impact sound apparatus impacts on the floor in a neighbouring space.
Structure-borne sound	Sound transmitted through the carcass of a building.
Weighting filter	A filter adapting the measuring instrument to the frequency-dependent sensitivity of the ear. The two commonest filters are called A and C filters. The A filter gives greater attenuation at low frequencies and little attenuation at high frequencies. The C filter gives little attenuation at both low and high frequencies.
Other terms	
Daylight	Visible part of global radiation.
Direct sunlight	The portion of extra-terrestrial solar radiation reaching the earth's surface in the form of a parallel beam after selective weakening in the atmosphere.
Global radiation	The sum total of direct solar radiation and diffuse solar radiation.
Diffuse solar radiation	The portion of solar radiation reaching the earth's surface after being diffused by atmospheric molecules, aerosols, cloud particles or other particles.