Health care and safety minimum requirements

Introduction

In work area, managing, checking, an operative activity will be made mainly by the prime contractor's own employees, physical building is carried out by sub-contractors (they are on contractual relationship). Sub-contractors themselves are responsible for organizing their employees' labour safety. The prime contractor is required to coordinate sub-contractors' activity, working in work area from labour safety point of view, so that people working and staying there (and potential visitors) may not be in danger. For the execution of this requirement, employer (marked by the parties in the contract) is responsible, in the deficiency of condition like this, the prime contractor, or if there is not anybody like this, then the responsible person is, on whose area working is going on.

In the course of facility implementation process it is necessary to accomplish tasks following from regional organization, to create and run safe and healthy work conditions and it is necessary to take into consideration the prevention of the environmental risking of an adjacent area of work area.
In the course of building works the prime contractor and sub-contractors are required to keep the effective measures, laws and the regulations of the Construction Industrial Safety Regulation, and provisions published by the competent authorities and have them kept.
During implementation and demolition works more deathly and serious work accidents occur than average year by year. These accidents could be prevented with no exception, if the ones, who work, and their employers all knew and applied regulations and solutions concerning their activity.

ABB's Project Manager Team list and their availability.

See: Project Information Board

Prevention of accidents, serious accidents in building work areas

During implementation and demolition works more deathly and serious work accidents occur year by year. These accidents could be prevented with no exception, if the ones, who work and their employers all knew and applied the regulations and solutions concerning the activity. We summarized the most important provisions, regulations, and applying them we could achieve improvement of work conditions and safety of the ones employed in construction implementation, run by ABB.

It turns out examining accident statistics of past years that in case of deathly work accidents happening in building work areas, in most of the cases the very significant factor is the negligence and elimination of rules of working at high altitude, namely the deficiency of technical or individual protection against fall. General experience is that leaders and employees know the fundamental rules, but these rules are not observed. In the majority of the

cases, device, and devices, which can prevent accidents were available on the site but, it was not used, or they were not applied.

ABB will pay emphasized attention (because of reasons mentioned above) to form protection against falling, to its continuity, or to provide individual safety devices and to request their regular usage.

In the course of directing work process, with organizational measures (with the coordination of sub-contractors' work) or with emphasized information flow between the responsible directing employees we wish to reduce the number of accidents. Additional decrease of accidents in building work area can be expected because not only on managerial level, but work areas will be checked by workplace leaders and we request regular labour safety trainings.

Cooperation

In the course of foundation enforcement of labour safety requirements is the task of participants and they have to work together.

Planning and implementation of workplace, facility can be only carried out, observing requirements defined in the rules concerning labour safety. Designers, constructors collaborating in the foundation, have to make a declaration whether this occurred. (labour safety XCIII. act. of year 1993 (furthermore: Hungarian Labour Safety Act) paragraph 19)

Organization

In building work area, based on the contract, the prime contractor ensures the necessary water- and electricity accessibility for sub-contractors. In work area mobile container toilets will be placed. The place of sub-contractors' containers will be arranged in the course of preparatory works, with the building project manager of ABB.

Fence is built on the border of work area, and the site will be guarded by security.

Explosive devices on site

Industrial areas in Hungary were priority targets during World War II, and due to this fact industrial areas are still full of live munitions and explosive devices. In course of earthworks finding devices like them can be expected at any time. If explosive devices are found, work must be stopped immediately and everyone must be removed from working area. Place of explosives must be enclosed and Mine Disposal Dept. must be called. Work can be continued after deactivation. Moving explosives is strictly prohibited! After finding explosives ABB Site Manager must be notified immediately and it must be recorded in construction log.

The map of the Contstuction Site

See: Project Information Board

The existing public utilities of building work area

Public utility map - if available - is on Projekct Information Board / in Project file.

Crossing public utility on the building site, accession dots of the public utilities will be explored with manual research in the course of building operations.

Safety and health care coordinator

Since 1st, May 2004 it has been effective that designers and constructors have to perform coordinator tasks. In the deficiency of this, safety and health care co-coordinator has to be employed or trusted (labour protection qualification is necessary!). (4 2002. (II. 20.) SzCsM-EüM order (furthermore: R.) on the minimal labour protection requirements of building workplaces and of the ones to be accomplished in the course of building processes.)

ABB project the safety and health care coordinator's availability is on the Project Information Board. Sub-contractors are needed to hire their own safety and health care coordinator, and it is necessary to report the coordinator's person to ABB.

Tasks of coordinators in connection with making of implementation plan:

- coordinates and supervises the realization of requirements defined in R, paragraph 6.
- checks the safety and health care plan technically;
- compiles documentation in which on the basis of building, and building technology specifics, expedient requirements of safety and health are fixed to ensure the safety of construction works;
- harmonizes the realization of general basic principles of prevention and safety, particularly:
- in the course of implementation plans completion defines working phases which can be done simultaneously, or which can be done after each other only, and defines work stages,
- defines the expected implementation time span of the different working phases, and work stages.

Tasks of coordinators in the course of implementation:

- Harmonising the realization of defined requirements so that employer and independent entrepreneurs who personally perform work would carry out the ones defined in the safety and health care and achieve the followings:
    - avoidance of dangers,
    - assessment of non-avoidable dangers,
    - priority of collective protection vs. individual protection,
    - making sure that employees are supplied with suitable instructions
    - making sure that employee can be hired for only that job, which meets one's physiological conditions

- one's employment does not influence health, corporal integrity harmfully, and does not jeopardize others' health or corporal integrity, and employee proved to be suitable to perform work from mental, physical, and hygienic point of view.

- In justified case, making supplement to the safety and health care plan, to make sure it will continuously contain the requirements of healthy and safe work occurring due to changing circumstances or the fact that construction goes on, makes progress.
- Compiles documentation in which on the basis of building and building technology specifics, expedient requirements of health and safety are fixed for the interest of potential later works.
- Collaborates in coordinating work phases, which can be done simultaneously, or the ones, which can be done only after each other, and harmonizing work stages.
- harmonizes check of workflows.
- takes necessary steps so that only authorized people could enter building work area.

The coordinators' commission, their employment does not affect the responsibility of investor, designer, constructor (employer), the responsible technical leader, and the technical inspector defined in rules concerning labour safety. Employer has to take the coordinator's proposals into consideration. If employer is a natural person in the building workplace, - who himself performs skilled building labour or building fitting work, (private entrepreneur) – he himself has to keep rules concerning labour safety, and furthermore has to take the coordinator's proposals into consideration.

Safety and health care plan

It is required to make safety and health plan by authorities, and this present document was made to fulfill this. This means that constructor may start building work then only, if the safety and health care plan – a constituting part of the implementation plan - is ready.

In this plan all health care and safety requirements have to be defined considering peculiarities of the given building workplace. This plan has to contain at least the following requirements concerning increasingly dangerous work and work conditions done in building workplace.

- Employee is jeopardized of burying as a result of soil slip, with immersion on a swampy area, with falling off working at high altitude place.
- Working with dangerous substances, or exposed to biological factors or working in an environment where biological monitoring, aptitude examinations on a regular basis are regulated.
- Working in work areas exposed to radiation defined in other law.
- High-voltage work done near cables.
- Working in a work area exposed to a risk of electromagnetic radiation emitted by cordless telecommunication building,

- Working conditions that entail danger of drowning,
- In a ditch, work done in tunnel, underground work,
- Work done by drivers of vehicles carrying aerial cables,
- In caisson, work done in overpressure,
- Work connected to usage of explosives,
- Work connected to assembly or decomposition of heavy, prefabricated elements.

Duty of registration

Before forming building workplace, constructor has to report specific data to the competent inspectorate of National Labour and Labour Protection Chief Inspectorate based on the location of building workplace, in that case, if implementation time is over 30 days, and at least 20 employees perform work there, or if planned work is over 500 days.

Constructor has to place updated data of report on the site, visibly well to everyone.

The duty of registration has to be accomplished with the following data content:

DATA SHEET about THE INVESTMENT

1. Sending date of notification:

2. Accurate address of the building operation site:

3.Names and addresses of constructors:

4. The function of the building:

5. Name and address of the responsible designer:

6. Names and addresses of the contractors:

Number	Name	Constructor	Address
1			
2			
3			
4			

7. Names and addresses of responsible for the building- work management:

8. Planned time of the starting of the construction works:

9. Planned time span of the construction works:

10. Estimated maximum number of persons working on the building site:

11. Names and availability of safety and health care coordinators:

The announcement handed in:

(These data based on the Hungarian measures before starting of construction work is needed to report to the competent regional inspectorate - The Hungarian Labour Inspectorate is a central agency

under the control of the minister of employment /fővárosi, ill. megyei Kormányhivatalok Foglalkoztatási Főosztályának Munkavédelmi Ellenőrzési Osztálya/)

Project Safety Planning General

A project safety plan shall have been prepared early on in the project. It shall have identified all the site specific issues in consultation with the customer during the pre-contract phase to enable ABB to ensure that all the necessary resources required to ensure adequate standards of H&S are maintained throughout the project.

The purpose of the H&S plan is to ensure that throughout the project lifecycle the following risk exposures are eliminated, reduced or controlled to an adequate standard.

- Safety of the structure(s) when completed, i.e. its buildability or operability, will it be safe to operate on completion;
- Safety of those who will execute the project including the construction workers, testers, commissioning engineers etc;
- Safety of those persons who might be affected by the project activities during its execution e.g. host employer's employees, public, neighbours etc.;
- Impact on the environment, including pollution risks and noise and vibration or nuisance, (e.g. dust or fume) from the works;
- Potential for any business interruption as a result of any major potential safety failure;
- Assurance that the final product or system will deliver the safety and reliability required, including servicing, maintenance and repair & eventually decommissioning.

Risk assessment

Risk assessment is quite simply a process where hazards are identified and then the risks assessed and thereafter control measures implemented in line with the controls.

Risk Reduction

Achieved through

- Engineering means e.g. separation, screening, enclosure guarding
- Isolation/reduction by limiting access thereby reducing numbers of people exposed e.g. authorised persons.
- Substitution of the dangerous by the less dangerous

Risk Assessment

Risk assessments shall have been prepared prior to site mobilisation in respect of each of the work packages being executed on site. These should be identified in the pre-tender H&S plan issued to sub-contractors who will be undertaking the work. They in turn will need to amplify these and incorporate the control measures or precautions into the method statements. Risk assessments should be reviewed as the project progresses.

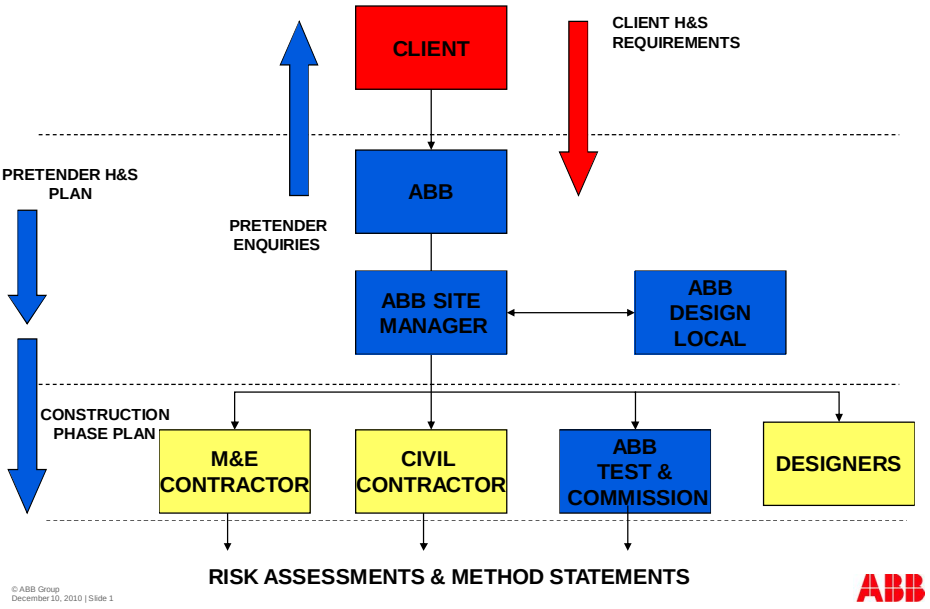
An example of a risk assessment for working at height on a transmission pole is given overleaf.

Factors for Consideration in a Risk Assessment

- details of the activity or task
- who might be at risk , employees, contractors or the public. Enhanced controls may well be required where the public is at risk.
- establish the hazards associated with each activity and score them according to the likely consequences assuming no controls in place
- then consider how probable or how likely is it that some harm or injury may arise based on no controls.

- the resultant risk factor will determine if it is high medium or low.
- define the control measures that are proposed (physical, system or human).
- if the application of the control measures reduces the consequences then revise the hazard rating.
- likewise revise the likelihood and then determine the new risk rating with the controls in place.

if effective it should demonstrate that with the controls in place and applied the risk is now as low as is reasonably practicable.



Informing employees performing work or the ones staying in the building work area

Employers have to inform employees about the steps relating to safety and health of people doing work in the building workplace. All employers (prime contractor, sub-contractor, etc.) are responsible for passing and exchanging information regarding to safety and health care information of their own employees working on their own work area and of people working for other employers affecting their own employees.

Regulations related to responsible technical leaders

The 51/ 2000. (VIII. 9.) FVM GM KöViM regulation defines labour safety tasks for the responsible technical leader and here only some elements are highlighted.

If construction implementation activity is based on main- or sub-contractor contracts, the responsible technical leader of prime contractor is responsible for the professionalism of implementation and for coordination of sub-contractors' activity. To keep and check measures concerning building-, fitting work, labour safety, fire protection, environmental protection regulations is the duty of the responsible technical leader.

If there is no prime contractor, responsible technical leaders of single constructors are responsible for work directed by them. In concern of labour safety, in the deficiency of the collaboration of investor, checking is required.

The commission of the responsible technical leader does not exempt the employer doing implementation to hire a safety and health care coordinator.

Registration requirements:

- construction phase H&S plan in respect of the work packages being undertaken;
- risk assessment for the works being undertaken to be supplied by ABB exporting country and also contractors;
- method statements or equivalent for activities being undertaken on site;
- danderous material and list,
- copies of relevant safety data sheets;
- accident and incident register/record;
- inspection reports in respect of plant and equipment;
- emergency procedures including telephone of emergency services;
- H&S statistics to include man hours worked;
- list of subcontractors,
- Construction e-log-book
- training records in respect of key equipment e.g. cranes, fork lift trucks etc.
- site rules
- site inspection checklists

Example of information required in a typical inspection report

1 Date and time of inspection

2 Site address

3 Exact location and description of the workplace including any plant or equipment inspected.

4 Description of any non compliances or matters on concern in respect of H&S to the persons using the workplace, plant or equipment

5 Can the work continue to be done safely? if no then prohibit its use and record name of person informed. Also place sign informing all

persons that it is out of use.

6 Action required to remedy the defect or shortcoming.

7 Details of any other action that may be required

8 Name of person of making the report

9 Signed and dated

Example of inspection:

		Compliant	*Non Compliant*	*NA*
1	Civil work - construction			
	Barricade is hight adequate			
	Barricade angle is adequate			
	Wholes in the ground are completely covered or blocked			

	Wall openings are protected / blocked			
2	Safety signs			
	Adequade and sufficient signs are in place for construction			
	Project documentaiton is easily available at the site			
3	Lifting works			
	All lifting equipment were inspected before and during use			
	Lifting capacity is shown in all pieces of lifting equipment			
	There is a safe area segregated			
	All workers involved are properly authorized			
	There is authorized worker leading the activities			
4	Work with electricity			
	All electrical installation (equipments, wiring, plugs) is adequate			
	There are no exposed wiring at all			
	There is ground available for all extensions and equipments			
	There is appropriate lighting (protected if necessary)			
	There are not workers exposed to live energy			
5	Civil work - Excavations			
	All excavation is performed by authorized workers			
	There are adequate in and out access stairs/ladders available			
	Removed land is correctly protected against dismounting			
6	Work in heights			
	All work in heights is performed by authorized personnel			
	All workers performing work in heights are properly authorized			
	All PPE in use are according to required standards			
	Procedures are followed according by law			
7	Ladders			
	All ladders are compliant to local regulation			
	Stairs are of appropriate size and distances			
	Stairs are in adequate conditions to prevent slippage			
	Ladders are firmly positioned during use			
	Ladder positioning follow local regulation			
8	Fire protection			
	There is enough fire protection equipment in place			
	Flammable chemicals are adequately stored and contained			
	Access to fire protection equipments are not blocked			
	Flammable chemicals are labeled according to local laws			

	Hot work and painting are perfomed at safe distances			
9	Housekeeping			
	All waste is maintained in adequate containers			
	Aisles, corridors are kept clear			
	Working material is properly stored			
	Whole area is well organized			
10	Special authorizations			
	Work in heights			
	Confined space			
	Work with electricity			
	Pressurized gases			
	Painting			
	Hot work			
	Chemical products			
11	PPE			
	PPE is in use according to defined			
	PPE's are well maintained and stored			
	All PPE's in use are in adequate conditions			
	PPE's are used according to manufacturer recommendation			
	PPE's fully comply with local laws			
12	Chemical products			
	Only authorized workers are manipulating chemicals			
	Chemicals are stored in adequate containers			
	MSDS's are available for all chemicals at the site			
	All containers are adequately labeled			
	All chemicals have secondary containment			
	All pressurized cylinders are properly stored			
	All generated waste is adequately disposed			
13	Scaffolds and Platforms			
	Scaffolds bases are fixed			
	Scaffolds materials are in proper conditions			
	Scaffolds have ladder as part of structure			
	Platforms in scaffolds cover the whole base span			
	Full guarding exist at the working level			
	Platforms have adequate toe boards			
	Scaffolds are supported directly on the ground			
14	Tools			

All tools are in adequate conditions for use			
Tools are maintained according to manufacturer design			
Tools are properly stored			

The most important safety requirements of construction-installation works

Entry to the construction area

- identity card has to be shown (any identification document with photo is applicable) and be checked in at the security
- The security is authorized to check alcoholic state of their own or exterior employees. Intoxicated person may not be let in.
- Entering and leaving the site, it has to make it possible for security guards (on request), to check vehicles and bags.
- The security has to make the declaration mentioned below sign by every single person entering building work area:

The visitors and guests entrance

The visitors and guests should be declaration by sign before step to the construction area. The declarations is necessary to sign once a time this documentations under the project. The individual safety devices provide by receiver.

DECLARATION

Before starting my work in the construction implementation work area carrying out by XXXXX , I received all regulations concerning building work area orally or be given training on it and I was also informed about the sanctions can be imposed in case of irregular work. I understood the content of the training and information, I accept it and I observe it. I enter the building work area on my own responsibility, I acknowledge that in a case of potential accident I may not turn to ABB. with claim compensation, and sub-contractors are given actual working information by their employer.

Employer:				Number.:	Page.:
No.	Date	Name	Scope of activies	Signatures	

Crossing the building area

- After entry, it is necessary to reach the designated area of implementation as soon as possible.
- In the building work area apart from actual working place, it is prohibited to enter buildings and to stay there.
- Inner roads have to be used for traffic, which can be pavements, designated walking roads, or roads may be suitable for vehicles. If roads are not segregated between vehicles and pedestrians, then everybody has to keep the followings in addition to traffic regulations on roads:
    - The maximum speed of motor vehicles inside building work area is 5km/hours.
    - Pedestrian has to be 'given a way' all the time.

Order, cleanliness

- To throw away any kind of waste on the building site is prohibited, it has to be placed in a bin provided for this purpose by employer.
- Smoking is prohibited on the building site! On the building site smoking is only allowed in designated smoking areas.
- Contamination (caused by working activity) is needed to prevent, if it happens so, it has to be stopped.
- Dangerous substances leaked onto the roads from machines or vehicles are necessary to clean up promptly, it is necessary to treat them as hazardous waste. Mud, dirt on roads - caused by transportation, building activity - have to be cleaned up continuously.
- Building materials, waste, machines can be only stored in designated places.

Employees' suitability

In building-implementation workplace only those persons can be employed who are suitable for performing work defined in other particular measures. (valid medical aptitude test is at their disposal), they attended Labour Safety and Fire Protection training and they can justify it. All sub-contractors have to present a report or a copy of it to labour safety engineer commissioned by ABB.

- Only that person can do work alone, who is prepared for this and employer checked his suitability.
- Only that person may drive or handle vehicles, machines or other appliances, who meets requirements defined in a particular measure (6 1980 ÉVM-KPM order). (driving license of Heavy Machine, and different exams and licenses for different machines)
- In the building area speed limit is (5 km/ h) and it is necessary to observe.
- In building work area, or during working hours drinking alcohol is strictly prohibited!
- In case of spot breathalyzer- test, if anybody found alcoholic, has to be banned from implementation area immediately.

General rules to be observed in the course of working

- Those staying for any reasons in building work area have to wear helmet (safety helmet), visibly jacket and protection clothing and footwear! applicable to the working activity. Only those are exempt from wearing protection helmet, who do work in inner workplace, do office work, are not jeopardized by falling objects.
- In the course of any construction work work conditions of health and safety are not only checked by employer but representatives of ABB as well. In case of irregular work, employer is warned in writing by representatives of ABB. After one warning the offender's entry access can be suspended and ABB can request the employer of the offender to terminate his work.
- Building work, - if the law does not take some other action, - can be only carried out based on legally binding and executable building permit, furthermore on approved - with a licensing clause enclosed- plans and other documents, and on technical execution plan.
- It is necessary to enclosure building area to make sure it is guarded and unauthorized person cannot get in there.
- Signs of the cautionary boards deposited at the gateway concerns everybody, who stay in building area.
- If in building workplace different employers have work done simultaneously, then all employers separately entrusts the directing person. Their cooperation in the course of working activities done simultaneously to prevent any hazard has to be accomplished on the basis of their contract or in the deficiency of this, on the Labour Safety Law.
- In building area only those ground machines, hoists are allowed to work, which are checked from safety technological point of view.
- Every ground machine is needed to be checked from safety technological point of view every 5 years. It is required to have installation document, machine book and certificate.
- Hoists on the basis of the operating group number, have to be checked structurally and the checking report of it has to be available.
- The entrepreneur or the operator of machine has to present valid documentation to the prime contractor or his representative.
- Prime contractor has the right to stop the work if sub-contractor does not observe rules and to ban sub-contractor out of building area.
- It is necessary to supply building workplaces with enough drinking water, in the deficiency of this, with some other kind of non-alcoholic drink. (Bottled mineral water, mineral water enriched with carbonic acid, soda.)
- It is necessary to assign smoking place.
- In building area working time from Monday to Friday is from 07:00 - 19:00. Differing work schedule can be done (weekend or night working), only having checked it with the construction management beforehand and having it approved by them.

- Getting in the work area is allowed after submission and registration of employees' list. In the finishing phase of building, entry is only allowed with a personal entry card.
- To drive in building area may be with the permit of the project manager.
- In building area motor vehicles may be only in case of working, storing machines or materials. The name and phone number of the firm have to be kept on the motor vehicle just in case.
- In work areas, in the neighbourhood of preparatory workbuildings, order has to be maintained all times.

Cleansing and lavatories

- If work requires extra work clothes or protective wear, it is necessary to ensure suitable dressing room considering age and sex.
- Dressing room has to be a suitable size, and it is necessary to ensure a cupboard to store protective wear, or individual safety device.
- If 10 or more employees do work simultaneously, then employer has to ensure a room where hands can be washed.
- Near workplaces, resting places, dressing rooms and showers, lavatories have to be ensured for employees, supplied with enough number of washbasins.

Resting places

- Where the safety or health of employess require or the place of work is distant, resting place (easily accessible) has to be provided.
- Resting place has to be a suitable size for the staff number, to be supplied with tables, chairs and benches, which can be easily cleaned.
- From 15,October, to April, 15 of any year it is necessary to ensure warming rooms.

Designation area for smoking

The requirements contains 1993. XCIII. Law § 38.

The smoking area defined the landlord while variable field construction activities.

The smoking depend on the working condition and construction type on the open air.

Working in cold, in heat, the provision of protective drink

To prevent adverse effects of climate environment it is necessary to take work organisational steps. 5-10- minute break is needed to insert in every hour, if workplace temperature in closed area is more than 24 Celsius degrees, and in workplaces considered to be cold. A workplace is considered to be cold if daily expected average temperature in outdoor workplaces does not reach 4 Celsius degrees, or in closed workplaces, if temperature does not reach 10 degrees Celsius during longer period than 50% of working hours.

If workplace climate exceeds 24 Celsius degrees (indoor and outdoor workplaces), employees have to be provided with protective drink on request but at least every 30 minutes. The liquid loss has to be replaced with drinking water (14-16 Celsius degree). The same temperature of flavoured, non-alcoholic drinks are also suitable, sugar content of them cannot be more than 4 weight percentages of the beverage and cannot be flavoured with artificial sweetener. In cold workplaces employees have to be supplied with tea (50 Celsius degrees). To flavour tea, sugar or suitable sweetener have to be available.

For tea or protective drink enough number of cups or glasses has to be provided on the basis of staff number. Making of tea and protective drink, its storage and service need to meet public health requirements.

Provision of skin cleansers, skin care and skin protecting materials

Skin cleansers, skin care and skin protecting materials are required to use for those, who work on the site:

- with oils,
- with fats,
- with paint,
- with fuels,
- with organic solvents,
- with strong contamination,

materials mentioned above have to be provided by employer.

Traffic, transport, material transport

In building workplaces in case of defining the location of workplace, the availability of it has to be taken into essential consideration therefore traffic roads have to be defined, have to be marked, have to make them right for traffic fulfilling the following requirements.

Roads leading to workplaces must be even, wide enough, devoid of slip and trip and having the proper capacity of carrying transportation on them.

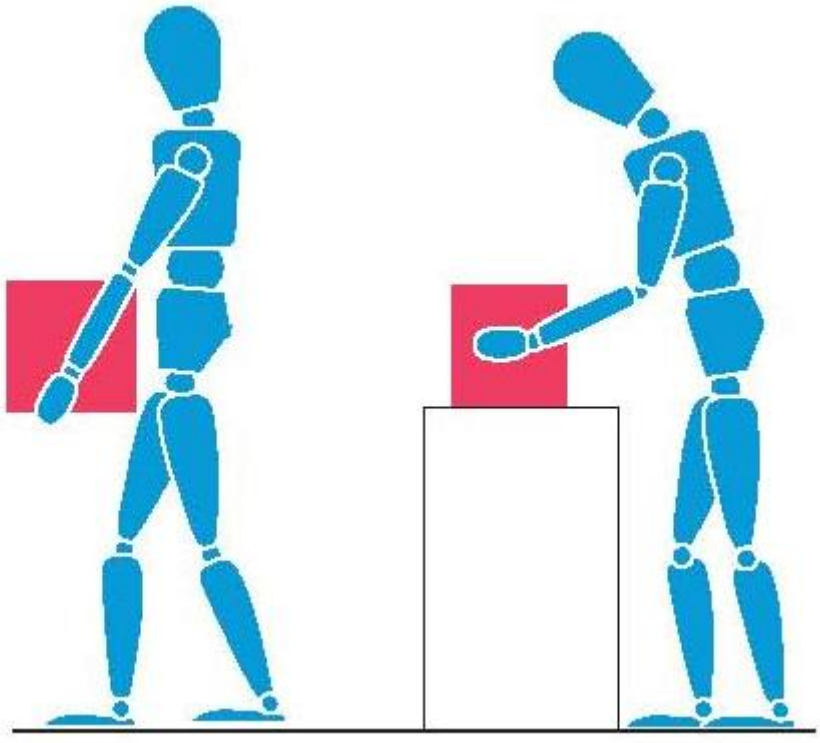
- It is necessary to set traffic roads in a way so that they would be protected properly from falling objects and materials.
- Traffic roads have to be free of garbage, debris, and building material because transportation and traffic can be only allowed on a route, which is free of obstacles.
- On a route, which is not visible properly, transportation route has to be marked well and it is necessary to mark pedestrian and material transportation route and they have to be segregated from each other.

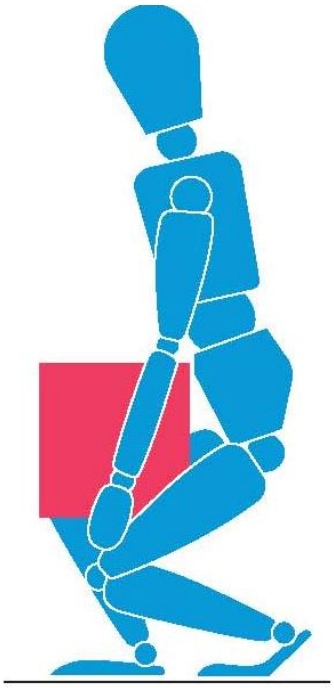
- It is necessary to scale pedestrian and material transport roads on the basis of users and specifics of activities.

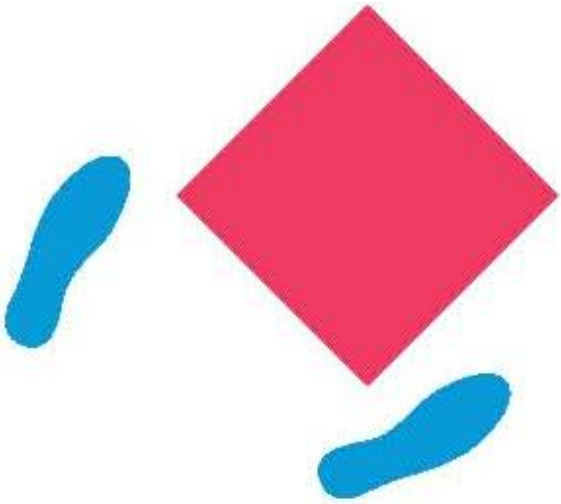
- If conveyance is used on traffic road, then it is required to form safety distance or to install protection for pedestrians.
- It is necessary to leave suitable distance between roads being used for traffic, gates, door and passages serving for pedestrians, staircases and corridors.
- Traffic roads of vehicles and conveyances are needed to form to be at least 1m from doors, gates, passages and stairs.
- Roads of building workplaces are needed to check and to maintain.
- If it is necessary to bridge different levels getting to the location of working place, then it is required to pay extra attention to accomplish requirements of safe traffic because the risk of falling off high altitude may occur.
- Before hiring employees for regular loading and transportation work, they have to be sent for a preliminary medical examination and the doctor has to be informed - in details – what kind of loading or transportation work employee will be hired for.
- It is necessary to train employees doing material transport activity of the most important risks and how to avoid risks.
- Loading work must be done by employees only, who are hired for this.
- In case of collective manual material transport, material transport participants have to be assigned, one main employee must be put in charge, supply route, commands and signs must be discussed with participants doing material transport.
- Employee has to keep proper distance between fix objects and objects to be delivered!
- Employee may not be between objects delivered and a fix object or between device and wall!
- Inflammable or any hazardous materials have to be transported in proper container.
- Individual safety device (safety helmet, mask, safety goggles, safety gloves, safety footwear) should be worn all the time based on specifics (physical, chemical, etc.) of material to be transported.
- Standards of material transport have to be kept: man over age 18 may lift and carry maximum 50 kg. The transportation distance up to 50 kg on plain ground is 90 m, in case of 10 %

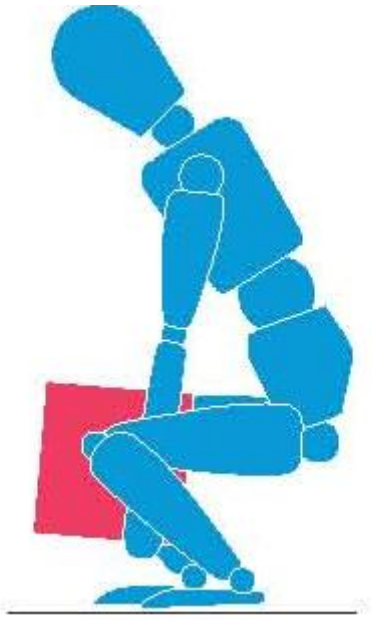
elevation it is 30 m. Burdens less than 50 kg can be transported proportionally to bigger distance. On stairs at maximum 3 m of altitude, 50 kg burdens can be transported. Up to a higher altitude not even a man aged 18 may carry anything else but his manual tools.

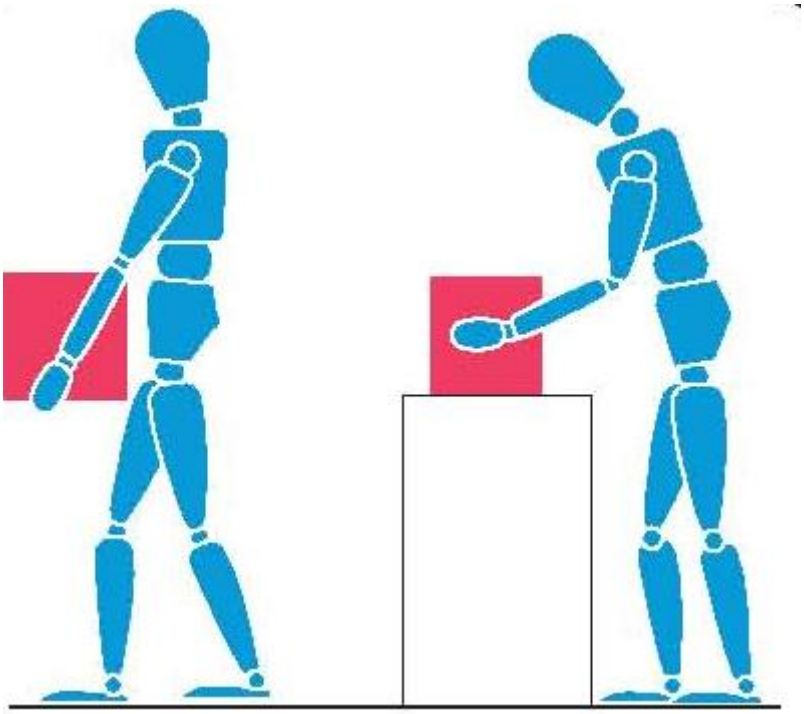
- Undivided burdens of 200 kg and over are allowed to be lift, to be carried, to be loaded by proper equipment.
- Building constructions, substances, apparatus, and equipments are allowed to be loaded, to be carried and to be stored making sure they cannot turnover, slip or fall off.
- It is allowed to place substances on each other in a quantity when this pile remains stable.
- It is allowed to place devices constituting a unit cargo on each other only then if their bedsore surface must adjust, and altitude may not exceed three units.
- It is necessary to fix pipes put on each other to prevent rolling away.
- Metals sheets may be stored on their edge separately in compartments by their size. It is necessary to store plate glass in transportable compartments. From the compartments glass may not be stretched out.
- It is necessary to assign storage place of building substances in building area.











Storage of hazardous and chemical agents

All hazardous materials must have Safety Technology Datasheet.

The MSDS marks are the followings information:

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING
2. HAZARDS IDENTIFICATION
3. COMPOSITION/INFORMATION ON INGREDIENTS
4. FIRST AID MEASURES
5. FIRE-FIGHTING MEASURES
6. ACCIDENTAL RELEASE MEASURES
7. HANDLING AND STORAGE
8. EXPOSURE CONTROLS/PERSONAL PROTECTION
9. PHYSICAL AND CHEMICAL PROPERTIES
10. STABILITY AND REACTIVITY
11. TOXICOLOGICAL INFORMATION
12. ECOLOGICAL INFORMATION
13. DISPOSAL CONSIDERATIONS
14. TRANSPORT INFORMATION
15. REGULATORY INFORMATION
16. OTHER INFORMATION

Distributor (or in the deficiency of this, the user) has to indicate clearly the name, the manufacturer, and the distributor of material, instruction and hazard symbol on the side of bundle.

- It is necessary to store hazardous substances in lockable place, and on the door of the container hazard signalling stickers must be put.
- If hazardous substance is combustible, smoking within 20 m range of the container is prohibited and it has to be labeled with warning board.
- Hazardous and harmful substances can be only stored in proper, intact, locked, anti-breakage containers, putting them in groups types by types, marking their content and it is necessary to store them in separated place.
- It is necessary to treat emptied pots, bottles, boxes as hazardous waste, it is necessary to select a transitional container, and periodically to transport them.
- Wastes need to be collected by type, with text and EWC code,
- It is necessary to train employees before using the substance about treatment of it, danger sources and what to be done if it gets into an eye or on skin and what individual safety equipment must be used.
- Radioactive substance, isotope can be brought into work area only with special permit.

Szimbólum	Veszélyességi osztály	Angol megnevezés
	robbanásveszélyes (E)	explosiv
	égést tápláló, oxidálószer (O)	oxidizing
	mérgező (T)	toxic
	erősen mérgező (T+)	very toxic
	könnyen gyulladó (F)	highly flammable
	rendívül gyúlékony (F+)	extremely flammable
	maró (C)	corrosive
	ingerlő (Xi)	irritant
	ártalmas (Xn)	noxious
	környezetre veszélyes (N)	environmental danger

The signs of dangerous material

	E	Explosive		GHS 01 Explosive
	F+	Extremely flammable		GHS 02 Flammable
	F	Highly flammable		GHS 02 Flammable
	O	Oxidizing		GHS 03 Oxidizing
No symbol				GHS 04 pressurized gases
	C	Corrosive		GHS 05 Corrosive
	T+	Very toxic		GHS 06 Toxic
	T	Toxic		GHS 06 Toxic
	Xi	Irritant		GHS 07 Irritant
	Xn	Harmful		GHS 08 Harmful
	N	Harmful to the environment		GHS 09 Harmful to the environment

The new (CLP) and old hazard signs. The new CLP signs must be use 1st of July 2015.

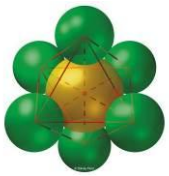
Sulphur Hexafluoride (SF6)

Sulphur hexafluoride is a gas that has been used since around 1960 in electric power transmission and distribution equipment with voltages exceeding 1000 V. Its special physical characteristics make it ideal for use in various switching and insulation applications.

In its pure form, SF6 gas is colourless, odourless, tasteless and non toxic. The only danger in breathing pure SF6 gas is that is displaces oxygen and therefore, can, cause suffocation. SF6 gas is chemically inert and non-flammable. The gas has a high dielectric strength and thermal properties conducive for insulating high voltages and quenching electrical arcs.

By weight SF6 gas is approximately five times heavier than air and tends to diffuse towards the pull of gravity and pools in low places. As a result of this pooling, the gas displaces oxygen and can cause suffocation without warning if the oxygen content of air is reduced from the normal 20 percent to less than 13 percent.

SF_6 Molecule



The SF6 is also a high potential Greenhouse gas.
If SF6 gas is subjected to an electric arc, heat causes the gas to decompose into potentially toxic by-products. (This gas also decomposes when exposed to other high temperature conditions such as heater filaments, smoking, welding, etc.) Fluorides of sulphur are the most toxic decomposition products and are in gaseous form. Some of these gaseous decomposition products are recombining to SF6 again. The additional use of molecular sieves can eliminate most of the rest gaseous decomposition products. The less toxic metal fluorides are in the form of white, tan or grey powder. The amount of decomposition of the gas is a function of the intensity and duration of the arc.

The following table lists some of the physical and chemical properties of important by-products:

By-products	Stability in air	End products	MAK toxicity (ppm_v)	Szag
SF_4 sulphur tetrafluoride	Rapid decomposition	HF, SO_2	3.6	Strongly acidic
S_2F_{10} disulphur decafluoride	Stable	SF_4, SF_6	0.26	Strongly acidic
SOF_2 thionylfluoride	Slow decomposition	HF, SO_2	2.5	Rotten eggs
SOF_4 silicon tetrafluoride	Rapid decomposition	SO_2F_2	0.5	Acidic
SO_2F_2 sulphurylfluoride	Stable		2.4	None
SO_2 sulphur dioxide	Stable		0.5	Sharp
HF hydrofluoride	Stable		1.0	Acidic
SiF_4 tetrafluorosilane	Rapid decomposition	SiO_2, HF	0.8	Acidic

Some of the SF6 decomposition products form corrosive and conductive compounds when exposed to moisture. These compounds, which can be harmful to human beings, are also aggressive towards materials within the application, especially insulating surfaces if subjected to prolonged exposure. That's why it's preferable to perform switchgear / breaker maintenance under dry environmental conditions.

Sample Pictures:

Conductive failure

Corrosive failure

General Safety Precautions

Storage

- Pressurised cylinders, that contain SF6 gas, must be stored upright in a defined, dry, clean and ventilated area, away from sources of heat (including direct sunlight), naked flames or vehicle traffic routes. This storage area must not be enclosed.
- Where the cylinders provided are liable to falling or being knocked over, individual cylinders must be secured in an upright position.
- A sign must be erected designating the storage area 'SF6 gas storage area'.
- Signage must be erected designating the storage area as a 'No Smoking', 'No Naked Flames' 'No Eating or Drinking'.
- A barrier must be placed around the storage area to prevent / discourage operatives from working in close proximity to the cylinders.

Gas Leaks

- SF6 must not be released into the atmosphere. SF6 must be handled in a closed cycle with a suitable SF6 service device.
- Mass balance techniques must be used to ensure all SF6 gas is correctly transferred between the pressurized cylinders and the gas insulated equipment, and to aid identification of any significant leaks.

- Oxygen content meters must be used by operatives and contractors working in low-lying areas (including basements and cable trenches). The oxygen content meters must be set to give an audible alarm where the oxygen content of the air in the low-lying area falls below 19%. On hearing the audible alarm, the concerned area must be evacuated immediately, and information has to be given to the responsible ABB Site Manager or Site Safety Officer.
- Re-entry into low-lying areas following loss of oxygen content must be restricted until declared free from danger by a specialist. Alternatively, in exceptional or emergency situations, the persons entering must do so under a permit to work and wear appropriate breathing apparatus and be supported by two persons outside the area, one of whom should have an appropriate breathing apparatus immediately available.

Personal Protection for SF6

The employer is responsible for providing the appropriate personal safety equipment to all employees involved in opening SF6 gas compartments and working on or in open, contaminated SF6 gas compartments and for maintaining this safety equipment in a fit state. The employees must wear the personal safety equipment provided.

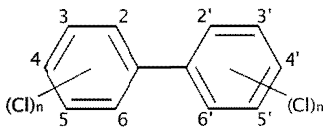
The following personal safety equipment may be required:

- Protective gloves
- Safety goggles
- Protective overalls
- Overshoes
- Respiratory protective equipment
- Skin protection

Before taking a break and after finishing work, employees must wash their face, neck, arms and hands thoroughly with plenty of water. Any dust that comes into contact with the skin or eyes must be removed immediately by rinsing with plenty of water.

PCB

PCB is a hazardous material that is unlikely to be used in modern processes and products as it is now banned in many countries across the world. However there is still a very real risk for ABB staff doing service or repair work on transformers, that those have been filled with oil containing PCB, or have been contaminated in earlier times with PCB by using an oil treatment plant, which contained PCB oil, or topping up oil from drums or tanks, which were PCB contaminated.



PCB chemical compounds are odourless, tasteless and clear to pale-yellow viscous liquids.
The name PCB was given in 1994, earlier these substances were known as “Phenols” or “chlorinated biphenyls”.

The PCB has a different trade names have been used in different countries.

PCB is banned for use in new equipment in most countries since latest 1981.

Nature of Hazard

Polychlorinated biphenyls (PCBs) can affect you, when breathed in, when taken with the food, or by passing through your skin. They are CARCINOGENS and extreme precautions need to be taken for handling. In case they are involved in a fire, they can break down into Dioxins and Furans, which belong to the most toxic substances known, being more deadly than cyanide.
Acute Health Effect:

- handling of the vapor can irritate the eyes, nose and throat
- exposure in high concentration can damage the liver

Chronic Health Effect:

- can cause skin cancer or liver cancer
- can affect the reproductive system of adults
- can be passed on through mother’s milk to children
- can cause a severe acne called chloracne lasting for years

Control

Before accepting any maintenance or repair work on oil filled transformers, an oil sample need to be tested by an independent and accredited laboratory or an ABB laboratory on content of PCB. This has to be done, when the maintenance or repair work includes any handling of the oil of the transformer. The test has to be performed within 90 days prior to the work start and the report has to have a direct reference to the identification number of the transformer. National legislation needs to be known and followed, in case of it being stricter, than ABB rules.

- In case the report shows 0 ppm PCB content no further actions are required.
- For PCB content between 1 and 50 ppm extra precautions need to be taken, including training of all workers involved on handling PCB. The taken measures have to ensure, that no contact between operator and PCB oil can occure.
- In the case of PCB content above 50 ppm, only specialized companies are allowed to handle such orders.

No ABB workers or contractors shall be exposed to equipment containing PCB's greater than 50 ppm or PCB contaminated material.

Environmental considerations

Due to their low vapor pressure, PCBs accumulate primarily in the hydrosphere, in the soil and in organisms. In the oceans a significant quantity of PCBs is dissolved. A small quantity of PCBs is also spread in the atmosphere, mostly in urbanized areas.PCBs exhibit a wide range of toxic effects. These effects may vary depending on the specific PCB.

PCB´s disposal

The PCB containing material must be stored in a closed container in the hazardous waste storage area of the customer or ABB. Only certified disposal companies are allowed to be hired for the disposal of this material. Records need to be kept to proof the correct disposal for at least 5 years, if country legislation does not state a longer period of time. The methods of destruction on PCBs are physical, microbial or chemical. In any case the process has to be kept in specific parameters to avoid products like Dioxins or Furans.

At no time is ABB to be considered the generator of PCB containing material, including but not limited to insulating oil and contaminated rags, cloths, absorbants, gloves and protective clothing. The customer shall provide properly labeled drums, totes, or tankers for PCB containing material. The customer is then responsible for the handling, storage, transportation and disposal of these containers.

Asbestos Materials

Asbestos is a fibrous mineral that occurs naturally in many parts of the world. It exists in two basic forms:

- curled whereas
- straight and needle

These forms are liable to crumble or break. They are also the most carcinogenic, although they do exist in less hazardous forms. The small fibres once inhaled can get into the lung and potentially cause a number of respiratory diseases.

Types of Asbestos

- ■Azbeszt*actinolite CAS 77536-66-4
- ■Azbeszt*gruenerite (amosite) CAS 12172-73-5
- ■Azbeszt*anthophyllite CAS 77536-67-5
- ■Chrysotile CAS 12001-29-5
- ■Crocidolite CAS 12001-28-4
- ■Azbeszt*tremolite CAS 77536-28-4

Of the types listed above crocidolite, often referred to as blue asbestos and amosite sometimes referred to as brown asbestos are the more hazardous in that they have the ability to cause cancer.

Asbestos found a wide variety of uses in industry owing to its versatility. It's heat resistance, insulation and chemical resistance qualities meant that it was widely used in the process industries, railways and ships.

As a general principle no work shall be carried out on site where ABB employees or contractors are likely to be exposed to asbestos.
However when working on customers' premises it is possible that ABB employees may inadvertently come across asbestos in one form or another. If this situation arises then the site manager shall take the necessary steps to ensure that ABB employees and other persons who may be present are not put at risk. STOP WORK IMMEDIATELY and:

■ take steps to prevent other persons entering the area affected. These measures shall include barriers and temporary signage prohibiting entry;

■ if persons have become contaminated by the material then remove outer clothing whilst still in the affected area and place in a plastic bag and then if at all possible take a shower.

■ do not remove contaminated clothing, materials from the area.

■ report the occurrence to the customer's representative on site;

■ make arrangements to have the material analysed for presence of asbestos;

■ If asbestos is found to be present then seek specialist advice regarding the appropriate next steps regarding the arrangements for cleaning up the area to enable work to continue and to protect any remaining asbestos that may be present.

■ do not resume work until the specialist advice confirms that it is safe to do so and proceed with caution.

■ check the customers' records (asset register) for presence of asbestos materials.

Asbestos materials may be found in substations in the form of roofs, ceiling tiles, fuse holders, behind radiators, and in electrical cabinets (wiring insulation).

Asbestos product	Use	Asbestos content	General comments
General			
Sprayed asbestos coatings	Thermal and acoustic insulation e.g. rail locomotives, marine boilers and turbines Fire and condensation protection in buildings Note loose fill has also been used.	Sprayed coatings contain up to 85% asbestos. In Europe these are no longer applied as they were generally stopped in mid 1970s but there is still a lot of old coatings left. Crocidolite was used for thermal insulation of steam boilers and amosite was used for fire protection of structural steel, condensation protection and acoustic insulation.	Potential for fibres to be released unless sealed. As insulation becomes old it becomes more friable and is likely to disintegrate. Removal of sprayed coatings shall only be carried out by a competent body and under highly controlled conditions.
Asbestos lagging	Thermal insulation of boilers, pipes, pressure vessels, preformed pipe sections, slabs, tape, rope, corrugated paper, quilts, felts and blankets.	All types of asbestos have been used and content can vary from 6-85 % in lagging to 100% in felts and blankets.	Friability depends on the nature of the lagging. There is potential for fibres to be released unless sealed. Potential increases with age. Removal of lagging shall only be carried out by a competent body and under highly controlled conditions.
Millboard and paper	General heat insulation and fire protection. Electrical/heat insulation of electrical equipment and plant. Asbestos paper has been used in the manufacture of roofing felt and damproof courses, steel composite wall cladding and roofing, vinyl flooring, facing combustible boards, flame resisting laminate and corrugated pipe insulation. Millboard was used in laboratories for thermal insulation.	Crocidolite was used up until about 1965 and thereafter chrysotile. This applies to millboard which was mixed with starch clay to 97% but not much was applied after the 1960's). Content about 100%.This applies to paper and paper goods which were made until the early 1990's, and only ever contained chrysotile. Content in the paper itself was 100%)	Uncoated asbestos paper and millboard is not highly bonded and shall not be used where it may be subject to abrasion and wear.
Insulating boards	Fire protection, thermal and acoustic insulation, resistance to moisture movement and general building board. Used in ducts, firebreaks, infill panels, partitions and ceilings including tiles, roof underlays, wall linings etc.	Crocidolite used in some boards up to mid 1960's. Thereafter, 16-40% amosite or a mixture of amosite and chrysotile.	Likely to cause a dust hazard if mechanically abraded or roughly removed. Extensive removal of boards shall only be carried out by a competent body and under highly controlled conditions
Insulating board cores and linings of composite products	Acoustic attenuators, cladding infill panels, domestic boiler casings, partition and ceiling panels, oven linings and suspended floor systems.		
Ropes and yarns	Lagging,. Jointing and packing materials. Heat and fire resisting gaskets and seals. Caulking in brickwork. Boiler and flue sealing. Plaited asbestos tubing in electric cable.	All types of asbestos up to approximately 1970 but since then only chrysotile. Content 100%.	Fibres may be released when large quantities of unbonded material are stored or handled. Caulking in situ is not likely to release fibres.
Cloth	Thermal insulation and lagging including fire resisting blanket, mattresses and protective curtains, gloves, aprons, overalls etc. Curtains and gloves were sometimes aluminized to reflect the heat.	All types of asbestos have been used in the past. Since the 1960's. generally chrysotile has been used. Content 100%.	Fibres may be released if material is abraded.

The work with the asbestos is necessary to report the authority immediately. It is necessary to put a workplan for the work. It is necessary to make special work requirements based on special rules, that an specialisation constructor may make work like this only!

Doors and gates

- Separate gates are needed to provide for motor vehicle traffic and for pedestrians, it is necessary to supply these with prominent signs, and it is necessary to leave them freely all the time.
- It is necessary to deposit warning, danger signalling and prohibitive boards at the entrance, valid for building area.

- In case of crossing traffic, ‘give a way’ sign must be placed well visibly.
- Mechanical doors may not be danger to employees. Emergency button must be installed on a place recognizable and accessible easily. These gates must be opened manually as well just in case of potential power failure.

Traffic roads, dangerous areas

- Traffic roads leading to workplaces have to be formed for motor vehicle traffic to be wide enough, devoid of holes, pits and to meet regulations.
- Traffic routes must be free of garbage, debris and building waste.
- Only that amount of building material is allowed to store in the area, that does not hinder traffic.
- It is necessary to set routes unambiguously, to check their state regularly or, if necessary to maintain them.
- It is necessary to mark hazardous areas visibly well.

Loading of lorries and trucks

- Only if vehicle (fitting) waiting for loading stopped in a place suitable (in size as well)!
- If the lorry driver stopped the engine and fixed the motor vehicle! (Fixing of the independent trailer is also needed if it is not automatically slowed down. Apart from the punch of handbrake against shift, it is necessary for drivers to apply fixing shoes.)
- If loading participants agreed with lorry driver, regarding details of loading (order, load-distribution etc.) and in case of special cargo relevant regulations are well-known to everybody!
- If nobody stays within the dangerous range of loading!
- In case of burden lifting, the person directing lifting and placement only may stay off danger zone!
- Loading area is necessary to be lit! (‘TO SEE AND TO BE SEEN’)
- It is compulsory for everybody in the range of lorries to wear visibility jacket, it is provided by employer.
- Reversing to loading places is one of the most dangerous manoeuvres! Reversing with lorry, machine is only allowed if driver visibility horizon is not blocked. In other cases somebody – who can be seen continuously by driver – directs reversing manoeuvre. Reversing can be only done very carefully at the speed of 2-3 km/h.
- Applicable signals must be checked beforehand. For the signal of ‘stop’ it is required to stop promptly.
- The person directing has to make sure before starting of vehicle motion if manouevre is unhindered and simultaneously has to call attention of people nearby to potential danger.
- It is necessary to entrust person who is capable of fulfilling task.

Arm signals belonging to directing are the followings:

Meaning	Description	Mark
Basic marks		
ATTENTION Drawing attention to next arm signals	Arms horizontally stretching, palms turned ahead	
STOP Interruption of finishing of motion	Right arm upwards, the palm turned ahead	
END The end of workflow	Two hands joining forces at chest height	
Vertical motion		
UP	Right arm points upwards,palm turned ahead, slowly circles	
DOWN	Right arm points downwards, palm turned inwards, circles slowly	
VERTICAL DISTANCE	Hands show the distance	

Horizontal motion		
AHEAD	Both arms bending, palms turned upwards, lower arms move slowly into the direction of body	
BACK	Both arms bending, palms turned downwards, lower arms move slowly receding from body	
FROM THE ONE GIVING THE SIGN RIGHT	Right arm horizontally stretching, palm turned downwards, hand moves rightwards	
FROM THE ONE GIVING THE SIGN LEFTWARDS	Left arm horizontally stretching, palm turned downwards, hand moves leftwards	
HORIZONTAL DISTANCE	Hands show the distance	

Dangers		
WATCH OUT! Stop promptly.	Both arms point upwards, palms turned ahead	
QUICKLY	The suitable hand signal doing faster	
SLOWLY	The suitable hand signal doing faster	

In course of tilting and transport, person cannot stay on the platform of dumper!

Unauthorized person cannot stay in loading places, or loading areas!

Safety regulations of hoists by elevators

Operation of elevators is regulated in details in 47/1999. (VIII.4.) GM order on Elevator Safety edition that should be governing when selecting elevators.

The 14/2004. (IV.19.) FMM regulation discusses this question of designing, using of work devices as well and regulates that as a permanently stationery elevator can be used only if it can hold its stability and load capacity for entire application time, especially subjected to the lifting load, and connection points of suspension of load and load bearing elements.

In case of selecting elevator employer ought to consider:

- weight and shape of load to be lifted,
- connection points of suspension of load and of load bearing elements,
- application of suspending elements,
- atmospheric condition during lifting,

Nominal load capacity must be signed visibly on elevator in order to avoid risks of overload, irregular load. If authorized effective load capacity of work device is different from the nominal load capacity at any particular operation state, and has any impact on stability of the work device, therefore values should be put on a board visibly for the operator, so that values must be stated clearly from the operation place (the operator does not have to leave operation place to read the values)

Suspension elements and load-taking elements must be marked so that required qualities for safe application can be seen. User must take care of that these devices are stored in a way that damage or dilapidation of them cannot occur. One always must make sure before starting work with them that devices are safe and not hazardous for health.

If the device was not designed to lift people and usage can be misunderstood the scope must be signed clearly on the work device.

Elevators for lifting, moving employees (people) should be designed:

a.) so that adequate device would be able to prevent risk resulting from fall of human holding structure (basket catcher)

b.) so that elevator would absolutely prevent employee from risk of falling out of the human holding structure

c.) so that elevator would absolutely prevent employee to be jammed, compressed or involuntary contact with objects

d.) If device goes wrong employee would not be in danger and can be rescued from the hanging human holder. If risk of fall of human holder cannot be prevented entirely, then requirement

can be fulfilled by daily rope-condition inspection (in case of selecting rope increased safety factor must be considered).

Employees can only be lifted by elevator, which was designed for this purpose, or with additional devices. Exceptionally employees can be lifted in other ways in order to prevent technical problems or damage, if employer makes adequate provision for safe lifting condition achievement, and provides proper supervision during lifting. While employees are in the human holder structure, the operator of elevator cannot leave one's post.

The oral communication possibility must be provided for the whole time of lifting between the operator and employees in the human holder structure. Before starting the lifting, conditions of rescue must be planned and provided so that for the entire work time the necessary, proper safety equipments for rescue would be available.

Stationary elevators should be installed to minimize risk of load hitting employee, crashing, accidental jam from lifting hook or from load-taking equipment or other unwished hazards.

In course of erection and usage of moving or folding elevator, we should take care that stability during operation must be provided considering all predictable hazards and quality of the soil, and risk of prostration orslip cannot occur.

In case of elevator with operation cabin user must provide personal (e.g. trained rescue people) and material conditions (e.g. rope, safety girth, life-rope) of safe rescue of operator in case there is malfunction, accident or if operator gets sick.

Preparation of lifting

Processing of lifting should be organized that suspension or taking off load from load-taking equipment can be carried out safely by employees doing this task, especially if employee operates directly or indirectly the work device.

All lifting activities must be planned carefully and be implemented and supervised so that safety and health protection of employees and people in the scope of work procedure must be provided. If load is lifted by two or more elevators at the same time, for safety of co-operate work procedure, particular technological instructions are needed and realization of these instructions must be checked. For lifting loads only those elevators are adequate which can hold securely load in case of partial or entire power outage. If this cannot be carried out fully safe, then employer has to make steps to prevent employees from hazards.

In case of lifting by moving elevator, tilt, overturn, move or slip of elevator must be prevented by applying support devices and other aid defined by manufacturer, considering local circumstances. Before start of lifting, stability of work device must be always checked by operator.

User is responsible for safety of work procedure, so one has to take care that only operator on-duty, checking, maintenance staff can go up to the elevator, its structure, engine house or driving place. Student driver can be on elevator only with supervision.

In course of work safety training attention of employees must be drawn that during lifting if anybody realizes malfunction, dangerous situation, which can risk safety of life or property, one has to inform the operator with the sign of: Attention! Stop immediately! Operator must perform it. In order to fulfill lifting task designed stability of elevator must not be increased by additional counterweight.

Operator must be informed clearly before lifting whose signs are followed. If it is needed, visibility of person in charge of giving signs must be provided by different color clothes, helmet or armband.

If operator can not follow the movement of load from operator place, then that many controllers must be provided that can guarantee safe execution of lifting. If more than one person is trusted with task of tying (loading) load, one of them has to control elevator operator. During whole load-moving procedure, both controller and operator must keep an eye on load and operator must follow controller's signs all the time.

Performance of lifting

Before and during of lifting and moving of load, for sign of controller, people in the scope of elevator must get further until elevator and its load can not endanger them (except stage work, because there usually it cannot be solved). The elevator operator can not start to perform lifting until load danger scope is abandoned.

Lifted load can only be moved over the area which is provided with protection against fall, staying under hanging load is prohibited. If this job cannot be done without moving lifted load over employees, necessary safety measures must be determined by employer and steps must be taken to perform work considering these measures. In this case catching structure operating by concept of closing by power or electromagnetic elevator cannot be used.

If two or more not manually controlled stationary elevators are erected or assembled and their scopes meet steps must be taken to avoid collision between loads and device structure elements.

If the elevator operator cannot continuously follow safely the entire way of load directly or with proper aid, to carry out the task another person has to be provided with adequate qualification, whose task is

safe controlling. Employer ought to provide continuous and direct communication possibility between operator and controller and employer has to make measures to avoid collision between lifted load and employees or working environment.

Working on or under lifted load can only be performed if holding of load is safely provided by substation or any other structural solutions (e.g. self-closing thread) except car service station- or railway elevator or stage works.

Hanging load cannot be left without supervision, except if

- stepping into the danger zone is blocked by technical devices
- fixation of load was performed safely
- holding load in hanging status is provided

If weather circumstances risk safe usage of device or safe operation of device, outdoor activities (moving load) by elevator must be stopped. In this case instructions defined in user manual of device must be followed especially to avoid rollover of work device.

For devices which were designed for power-driven load lifting or load moving, log should be kept, and in that shift examinations, possible malfunctions and their averting should be recorded.

Most important tasks of elevator operator

Operator must check notes of last shift in elevator- log and check whether those deficiencies have been terminated. Each and every time before starting shift devices in relation with safety and their efficiency must be checked especially:

- emergency stop, which shuts down operation of elevator
- warning, signing devices
- every power unit and rope, chains
- emergency switches
- brake of every movement
- bolting
- indicators of overhanging and load capacity
- other safety devices of elevator, which can be examined by elevator equipment
- devices and safety equipments defined in user manual

Operator can only install elevator by user manual, if one realizes any deficiency or malfunction one has to inform one's superior or put record in elevator log. If one realizes deficiency or malfunction that risks safe operation of elevator, elevator can only be installed after removing deficiency or malfunction.

Operator has to use sound signal before starting a movement to warn people in the scope of the device if elevator has a sound device.
Sound signals should be these:

- one short signal: warning before starting a particular work phase
- two short signals: order is not clear, or the load cannot be moved safely
- continuous signal: emergency

Elevator driver is responsible for proper choice of load-taking device, correct way of suspension, work of elevator operator, as much as elevator driver can judge it from one's work place. In case of failure elevator operator person has to be ordered to remove failure immediately. Elevator driver can only start lifting or moving if mounting is safe and lifting does not endanger anybody.

Elevator driver has to deny performing order or signal of controller if

- -it is in contrary of Elevator Safety Regulations or user manual and/or
- -in one's opinion lifting can cause accident or property damage

Elevator driver can not lift load by elevator:

- on which a person is staying, except elevator is suitable for person- lifting or it has person holder
- in which the center of weight can shift dangerously during lifting
- which cannot hold its own weight
- which is fixed
- which is frozen
- which is built-in, except elevator designed and manufactured for this purpose
- in which there are other unfixed objects
- to which other objects are leaned
- which can damage load-taking device or,
- which has bigger weight than elevator, or load-taking equipment can bear. This has nothing to do with the standard static or dynamic examinations.

If operator is not sure whether the object can be lifted, one has to ask order for user or the administrator of elevator.

Operator must keep an eye on proper function of device during operation. If one realizes any malfunction or abnormality which can risk safety of elevator or workers in its scope, one has to put down load immediately and to shut device down, and has to inform the owner of elevator and put a record in elevator log.

Operator cannot perform any modification on elevator, and can perform reparation only to a certain extent defined in user manual. During reparation on elevator operator can only accept orders from the head of maintenance staff.

Operator has to switch off the power switch forthwith in case of malfunction of power supply (voltage outage) or movement of elevator cannot be stopped by control switch.

In case of finishing operation or work breaks when the operator leaves the elevator, these steps must be taken:

- load and stiff load-taking device must be placed down safely
- elevator must be placed in a position required in the user manual
- elevator operation elements must be put in switched off position
- in case of outdoor elevators safety devices against starting or movement caused by wind- load must be placed
- in case of internal combustion engine (mobile) the engine ought to be shut down
- elevator must be placed in state of shutdown defined in user manual
- it must be avoided that an unauthorized person can operate elevator

Electric elevator must be separated from mains in case of work break and the power switch has to be placed in shut off position and locked by safety padlock. Operator has to check after separation whether parts which are still under voltage (enclosed cabinet, heater, freezing resistance, safety lights) may be able to cause fire. Electric equipments of heating and ventilation in the operation place cannot stay under voltage during work break.

Most important tasks of elevator operator and controller

Tasks of elevator operator are to choose and apply the proper load-taking device, safe fixing of load, fixation and if the owner did not order differently controlling the elevator driver with signals. Controller has to control elevator driver:

- in case of lifting loads which are tied, lifted with non-automatic or not operated from the operation place
- in case of performing movements which cannot be followed safely from the operation place at every phase of the movement
- to prevent not permitted reach of aerial or working wire under voltage

Elevator operator has to inspect load-taking devices before using, if there are individual marks on them, if load test is valid according to the punched sign, if it is adequate for lifting load, not damaged, not deformed.

Load-taking device must be placed on load so that load could not move, slide, oblique or jump off during lifting and the suspension point must be over the weight centre of load. Load-taking device must be secured from breakage of the lifted load corner, edges with proper solutions (application of protector).

Suspending load on elevator hook should be in a way that weight centre of load must be in vertical axle of the hook. If load may be able to slide or tilt during lifting that sort of load-taking devise or fixation mode has to be used which does not only supply the load during lifting but it constricts the load as well. It is forbidden to reconcile load with putting weight or clambering on it.

Controller can only give signal to lift load if

- in one's opinion load is safely and properly fixed to the load-taking equipment by regulations and
- people, who are in the scope of the device, are located in a way that load cannot endanger them

During lifting or putting down load it can only be caught or driven by hand in justified case and according to these conditions:

- it is required to stay from load in the distance of an extended arm and nothing should disturb the movement
- load must be caught on that part where hands cannot be hurt
- load can be driven up to height of shoulder

Controller has to stop traffic if moved load crosses a traffic route. Elevator driver can only put the load down if:

- the area is ready for loading and ready for putting the load down
- the area is not designated for transport, traffic or any other work
- the load capacity of the area is adequate for the weight of load

Fixation of load can only be removed from the load-taking device, if the load is on an adequate solid load-bearing platform and properly secured against moving, creeping, rolling, tilting etc. If the load-taking device touches the load from beneath, then load can only be placed on pads in order to protect load-taking device and for easy removability.

Load-taking device must be stored and transported so that it would not suffer any damage. Elevator operator has to take load-taking devices which are out of order back to their designated place and there put them down professionally, separate faulty ones, report the malfunction to the owner and remove faulty load-taking devices from work.

The load-taking devices must be stored to be protected from adverse impact (steam, wet acid, chemical substance, mechanical damage, intolerable heat) .

Extreme environmental impacts relating to lifting

Operation of elevator must be stopped in case of heavy snow, fog or any other meteorological or environmental impacts, if load or direct environment cannot be seen during the entire transportation procedure , or the controlling signals cannot be recognized clearly.

Elevator which operates outdoor – if the manufacturer does not order differently in the user manual or the reparation technology does not define lower limit- can only be operated if the maximum wind speed is 36 km/h.

In case of site or area wind prediction operation of elevator must be stopped so that necessary safety steps can be carried out before reaching the permitted wind speed.

Elevator exposed to wind must be fixed, secured against woken wind in a way that it cannot move, overturn or be damaged during work break.

Lifting in public places

If elevator is installed and operated close to the scope of public traffic roads, railways, flight routes, airports or water facilities or routes, populated area , regulations of the facility owner, user must be considered – in order to minimize expected risk- conditions of safe operation must be fixed in orders.

In case of a elevator which impacts public area lifting procedure order must contain at least:

- -marking the designated elevator type and the exact installation place
- -permitted lifting operations
- -located operation area
- -road signs control equipments which are about to be erected
- -additional safety equipment and measures (e.g. shut down of power unit or latch)
- -the way of controlling and/or diverting the traffic
- -using of safety roof

If it is necessary area of elevator movement and its overhanging must be located or electrically latched in counter direction in order to avoid endangering public areas.

Up to height of 15 meters lifting, operation area of elevator can be enclosed by frame (wooden or steel structure) as well, if at least 2/3 of operation area is in it. Enclosure should be installed with adequate color mark and lighting.

Regulation of lifting operation carried out near high- and low voltage aboveground wires

Around elevator operated near high-low voltage aboveground wires, wire must be voltage free. If it is not possible, then depending on the level of voltage, defined safety distance ought to be kept from wires.

Before starting the installation, written statement of power supplier statement must be requested about the extent of voltage and safety distance.

If elevator height is over 4 meters and wires are not free of voltage, lifting operation order must contain that

-at border of the smallest safety distance a guard must be put

- the smallest safety distance parallel with wire must be marked

-if elevator or load or load-taking equipment approximates the marked line, guard has to stop any movement

-where the guard has to be

The guard cannot be given any other task.

Conditions of safe working must be taught in controllable way to elevator driver, operator and controller staff in case of elevator installed or operated in a dangerous distance near high-low voltage aboveground wires.

In that case when elevator or any parts of it contact high-low voltage aboveground wires under voltage the operator must:

-give a sound signal which draws the attention of those people who are there

-attempt to remove elevator from the wire, or ask for an order how to free the wire of voltage

-leave the elevator keeping safety regulations and take care that one never contacts any metal parts of the elevator and the ground at the same time.

In this case people who are there have to abandon the dangerous area.

Installation and assembly of elevators (mainly cranes)

Elevator must be installed by assembly instruction, considering specifics of the installation location. Assembly can be set up if:

- joining points taking force are done in prescribed way and are capable of taking forces,

the installation location is adequate to take action of forces appearing in operation and off-operation mode of elevators

– if necessary, justified by ground mechanical examinations and calculations

Installation and assembly can be carried out only by experienced mechanics knowing assembly instruction of the elevator, who possess prescribed qualification. Records must be kept on assembling and fixing of the elevator.

It is forbidden to change the placement and size of weights ensuring stability of the elevator. In so far as assembly instruction prescribes weights to be set up on the installation location, it is necessary to guarantee the weight of these weights not to change.

If the assembly instruction prescribes wind speed limit for open air fixing, it is required to check wind forecast and to measure wind.

Assembling can be interrupted only if the stability of assembled machine-part already is ensured until assembling continues.

Protection against electric shock, in case of open air assembling protection against lightning must be done based on effective, relevant regulations, and conformance of it must be justified with measurement report.

Electric equipment can be only powered by fractional and fused power system.

On assembled elevator mechanic must check:

- if there is unfinished assembling operation or tool, unfixed part left on the equipment,
- if weight, placement and fastening of weights ensuring stability are adequate
- if supports and tying ensuring stability are adequate
- if hydraulic system is filled up
- if state of load-lifting construction, oil- filling of gear-box, fixed and set mode of single elements are adequate
- if state of elevator-rope, rope-ends fixing, mounting are adequate
- if direction adherence of all movements is adequate, if end-switch, brake and other safety equipments are operating
- if lubrication locations are filled up with lubricant
- if there are prescribed safety distances, warning signs, railings and enclosures

Mechanic is required to declare in written form about finished and proper state of assembly (e.g. in assembly record)

Terminology concerning elevators, hoist with crane from labour safety point of view

Crane: it is a elevator operating fractionally, which is susceptible to move load spatially with its load-taking equipment.

Classification can be done by different aspects:

- by function (loader, slave, special)
- by structural set-up (bridge-crane, tower-crane, cantielevator-crane, boom crane fixed on under-carriage
- by locomotion (swimming)
- crab: it is a elevator operating fractionally, which is susceptible to move hoisted load in planar way.

Main structural elements:

- hoist units (parts: winch or main host)
- winch or main host (identical structural set-up, hook block sheave, rope drum, engine)

Standard defines size of rope, rope guide and hook block sheave and the shape of rope concerning its seat. Mostly source power for cranes is electric power.

Safe grab of load and fastening depends on the structure of crane taking load.

It can be:

- hook
- grab
- crane magnet
- vacuum crane
- fast grab

or other special grab equipment.

They must be selected based on specifics of load.

Personal conditions.

Crane driver: who is authorised to operate crane and is assigned to do this task in written form, turned 18, or is a skilled workman, in case of metallurgic crane turned 22, in reference to regulations for this task is susceptible by preliminary and periodic medical examination and possesses required qualification.

Crane controller: that crane operator who is authorised to guide crane operator to manoeuvre crane.

Crane operator: that person who individually performs manoeuvre of elevator or stays and fixes load onto load-taking structure of elevator, who turned 18, or is a skilled workman and in reference to regulations for this task is susceptible by preliminary and periodic medical examination, possesses required qualification, and also performs check of suspension material.

Techican conditions

- all elevators and their accessories must be equipped and used properly.
- It is necessary to check technical state of them and to do maintenance.
- It is required to do check-up by effective, relevant regulations, to do periodic examinations (structural and main examinations)
- Only those employers can operate them who possess appropriate experience
- Maximum load sign must be marked on all elevators
- On construction site all power-operated equipments must be checked by operators prior to all working activities and operators must make sure safety equipments and actuators are right.
- As long as any failure is detected and cannot be prevented, it is required to take the right step, to record failure and put it in the log.
- all machines must have user manual, permit for using, Certificate of EU Conformity, Certificate of Labour Safety, records of periodic checks (every 5 years is required to do main check), certificate of rope quality and certificate of load test
- In case of elevators, cranes, mobile cranes it is also required to possess valid structural and main examination reports
- Load-taking equipments must have Certificate of EU Conformity issued by manufacturer.
- Lifting swings must be in perfect condition. They must be checked annually.
- Crane hook must have safety latch
- The following warning sign must be put on cranes: “It is forbidden and dangerous to stay under hanging load”.
- Mobile cranes must be out-triggered. Whole machine leans on pads instead of wheels. If ground is too loose, boarding must be put under pads
- Hung load on rope can weave and it can be dangerous.
- Load-taking equipment must be transported and stored so as not to get damaged.
- In one hook at the same time only that many rope loops, ring and etc. can be hooked that they can fill up the throat of hook.
- Crane operator must withdraw any load-taking equipment with failure
- Crane operator must take off-duty load-taking equipments back to designated storage place, put them down properly, seclude disabled ones and report failure to owner
- If stability on hoisted load can be provided only by friction on load-mount part of load-taking equipment, and it can slip, then it is required to use hoist-beam
- If load-taking equipment ranges underneath load, in order to equipment be removed and taken care of load can be placed only on pads.
- Load-taking equipments must be stored to be protected from harmful impacts (moisture, acid, steam, chemical materials, mechanical harm, extreme temperature)
- Load-taking equipment can be used only between lower and upper temperature limits warranted by its manufacturer

- It is forbidden to shorten the length of rope or chain branches by knotting or twisting.
- As lifting chain only chain manufactured for this purpose can be used.
- Temporary knot on chain can be used only by link designed and manufactured for this purpose with safety latch.
- Chain cannot be exposed to heavy duty use especially breaking – or hitting chain- like.
- In case of stay of 4- branch chain maximum load capacity of two branches can be considered.
- Before use twisted chains must be straightened, evened.
- If chain must be wriggled around load several times, then chain links cannot cross one another.

Out-trigger of mobile crane

If possible out-trigger must be carried out on solid, stable overlay in order to avoid turnover or tilt. As long as there is no possibility for this, in that case considering ground physical specifics in order to ensure proper splitting load, double- line plank minimum 3 coll thick must be placed under pads.

Special regulations of cranes relating to load-taking elements

Chain is forbidden to be used as load-taking equipment further on if:

- one chain link suffers strain of 5 %
- nominal value of diameter of material constituting chain link decreases by 10 %
- Inside opening of chain link is dilated by more than 10 %
- Deformation, cutting or crack can be seen on one chain link
- Marking of load capacity is missing or cannot be recognised.

Steel-wire ropes cannot be used as load-taking equipment if:

- diameter correlated to the nominal one decreased by 10 %
- corrosion can be seen on the surface of visible fibres constituting steel-wire rope
- suffered permanent impressed, creased, untying deformation
- was exposed to temperature over 80^{o}C
- one hasp broke away.
- Breaking of fibres on any parts of rope exceeding limits

Plastic load-taking or strap can be only used on terms of user manual of manufacturer.

Crane operator must survey load-taking equipments before use:

- if there is distinctive sign on it
- if load test by visible marking is valid
- if it is susceptible to hoist load

- if it is not harmed or deformed

Size and placement of load-taking equipment must be selected that inscribed angle of rope branches cannot exceed 120 °.

If branches, taking load (rope, chain, linkage) of load-taking equipment exceeds deflection of 15 fok measured from one another, load capacity decrease resulting from this must be considered in the following way:

Inscribed angle by rope branches loaded on two branches	Load capacity %
0°- 15°	100
15°- 45°	90
45°- 90°	70
90°-120°	50

Weight of rope branches can be only increased to that extent and in that way until branches in controllable mode, together participates to take load, not to touch, not to cross one another.

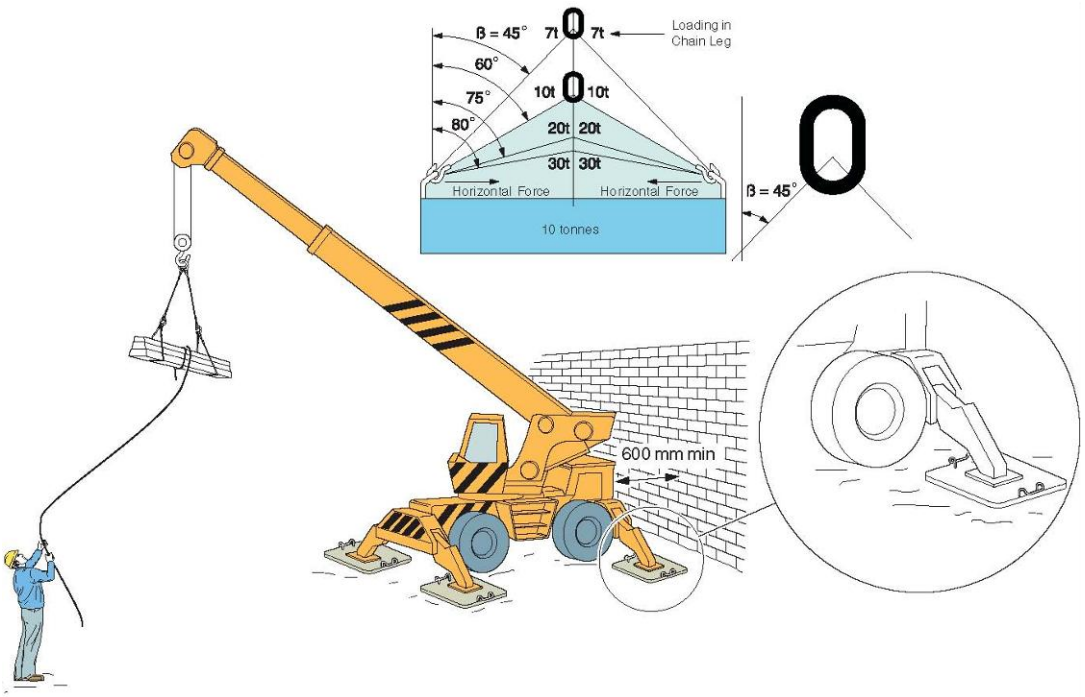
Crane operator can only apply two- or three-branch swivel or protector if quantum nucleus of the object can be found lower than stay place of the object.

Load must be hung onto hook of elevator that quantum nucleus of load would be in upright centreline of the hook.

Load-taking equipment can be fixed only onto right load capacity parts of the object to be lifted.

Load-taking equipment must be placed on load that it would not move, slip, twist or jump off and stay point would be over quantum nucleus of load.

Load-staying equipment must be protected from crushing occurring at edges, nooks of hoisted load by proper solution (e.g. rope-saving protector)


β = 45°
60°
75°
80°
7t
7t
Loading in Chain Leg
10t
10t
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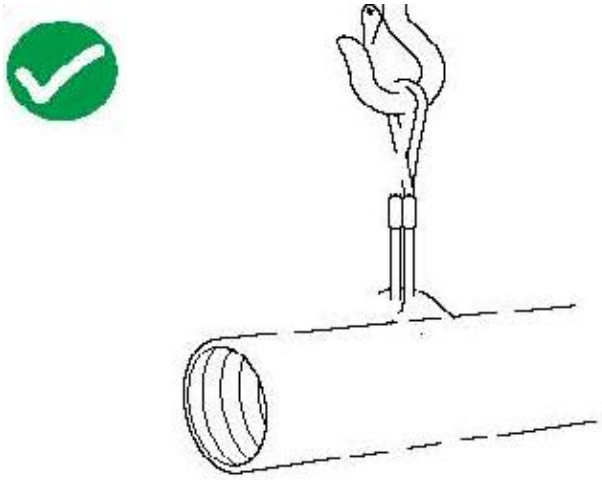
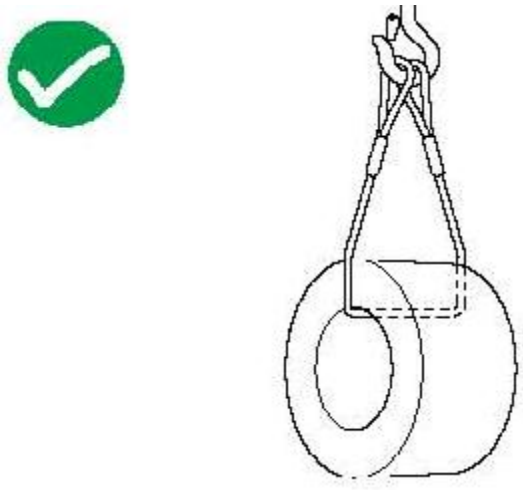
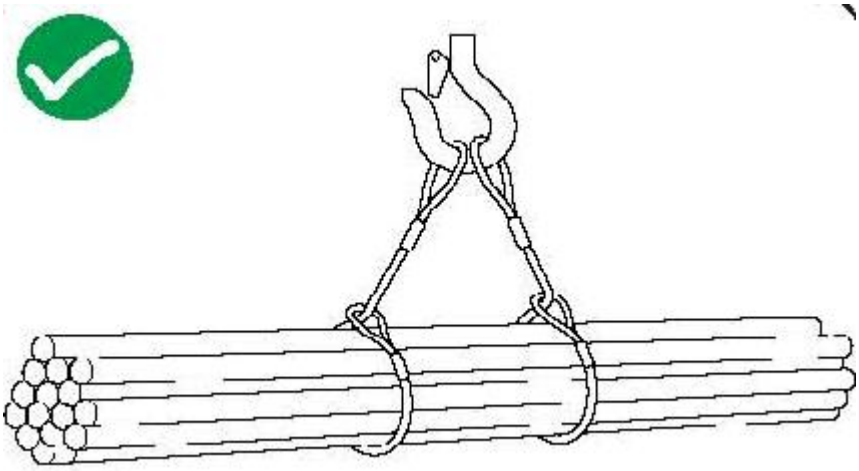
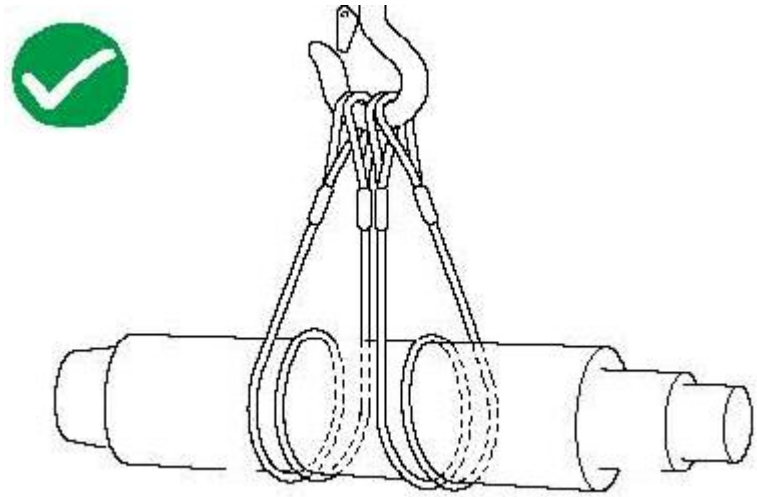
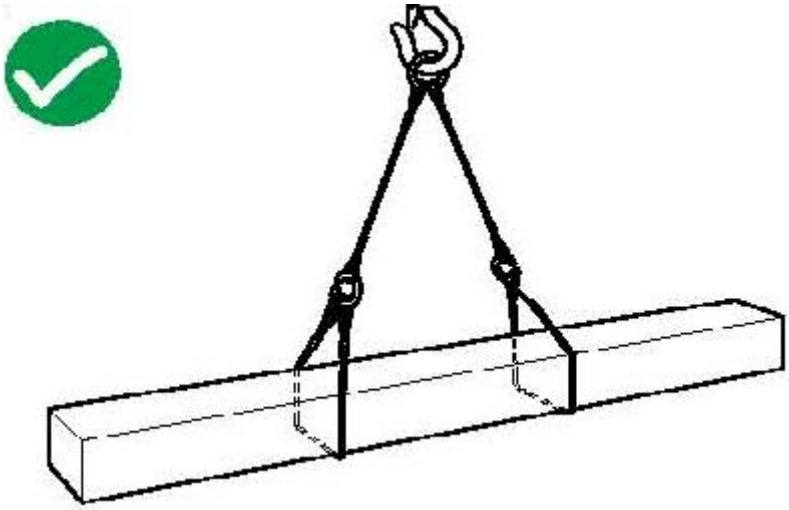
Horizontal Force
Horizontal Force
10 tonnes
β = 45°
600 mm min

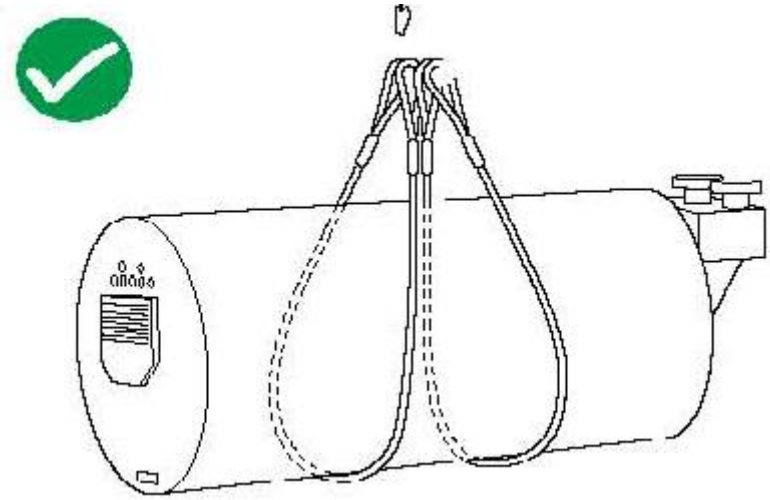


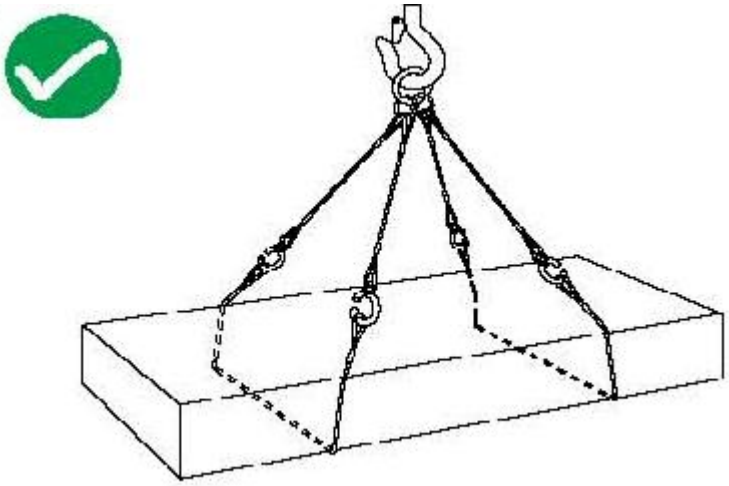


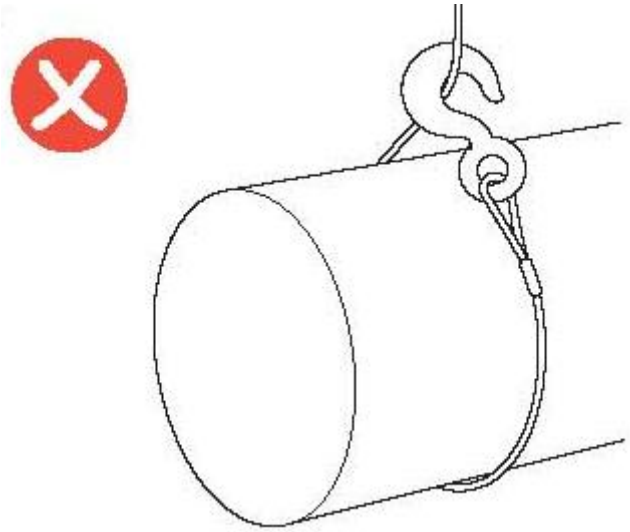


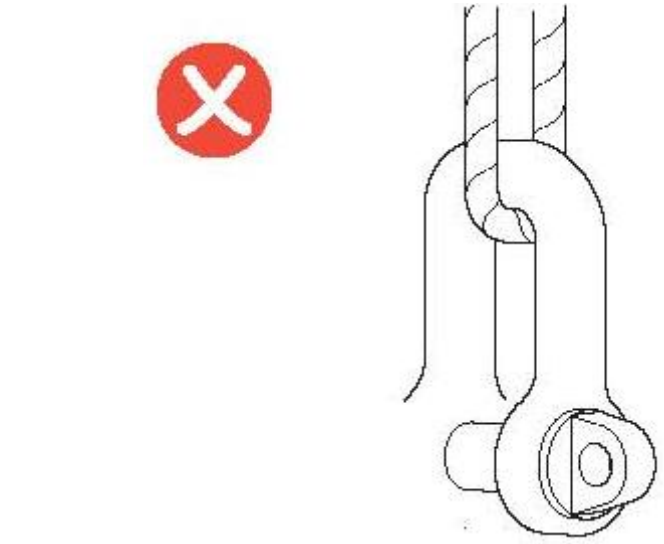


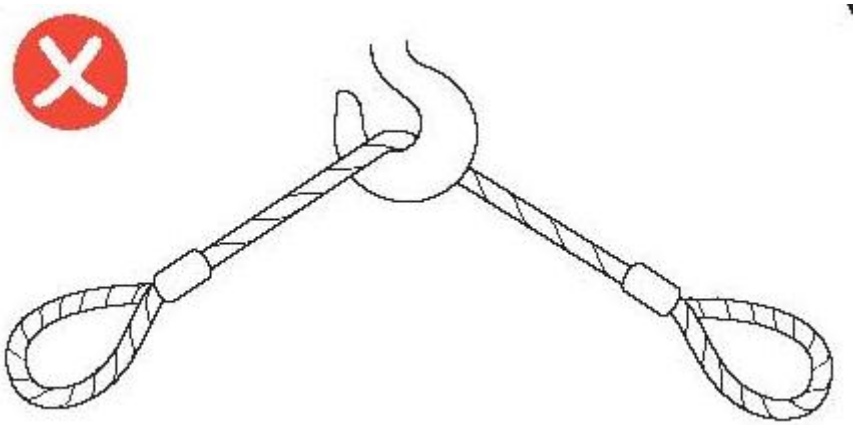


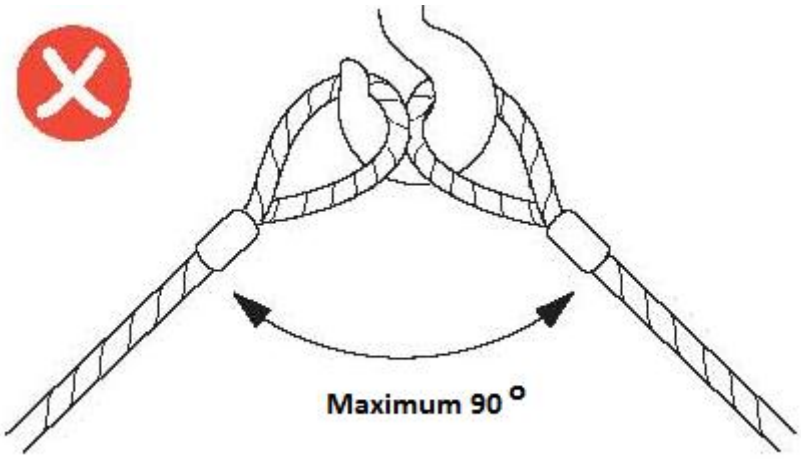


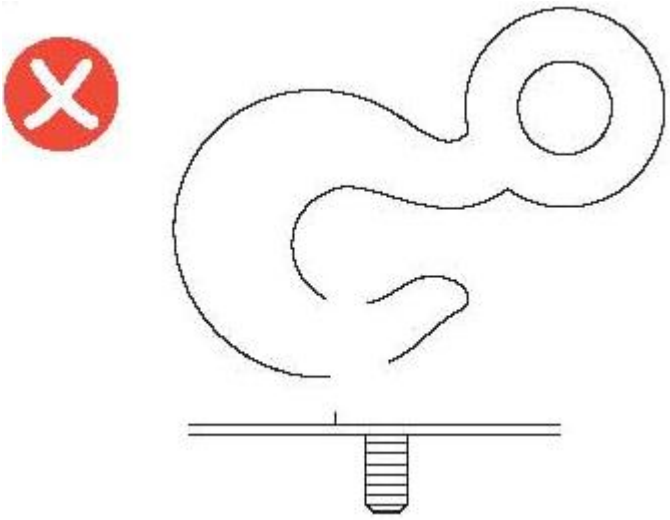


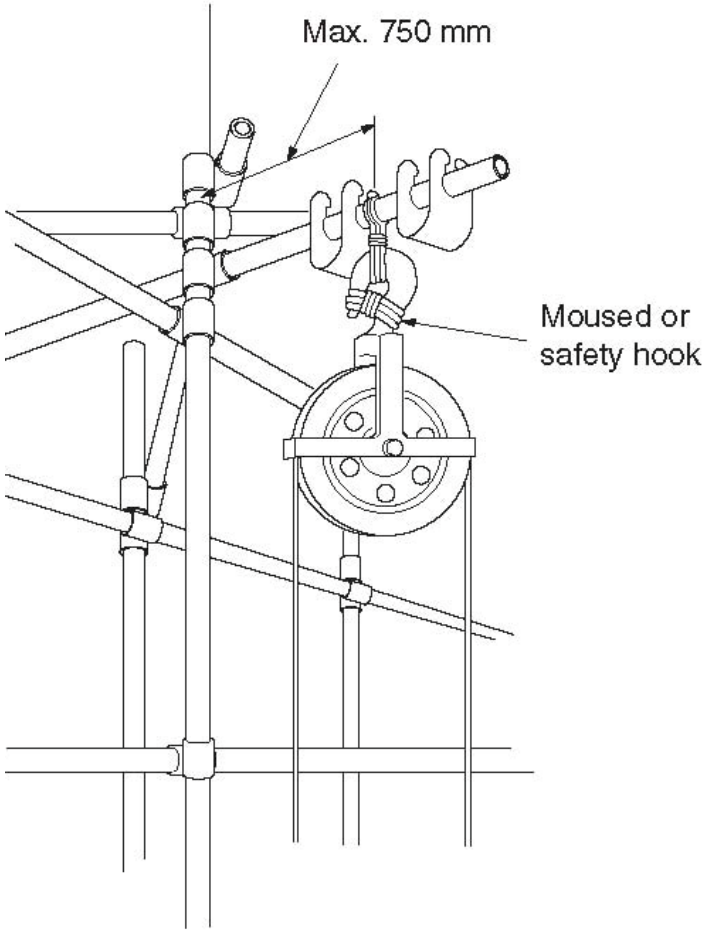


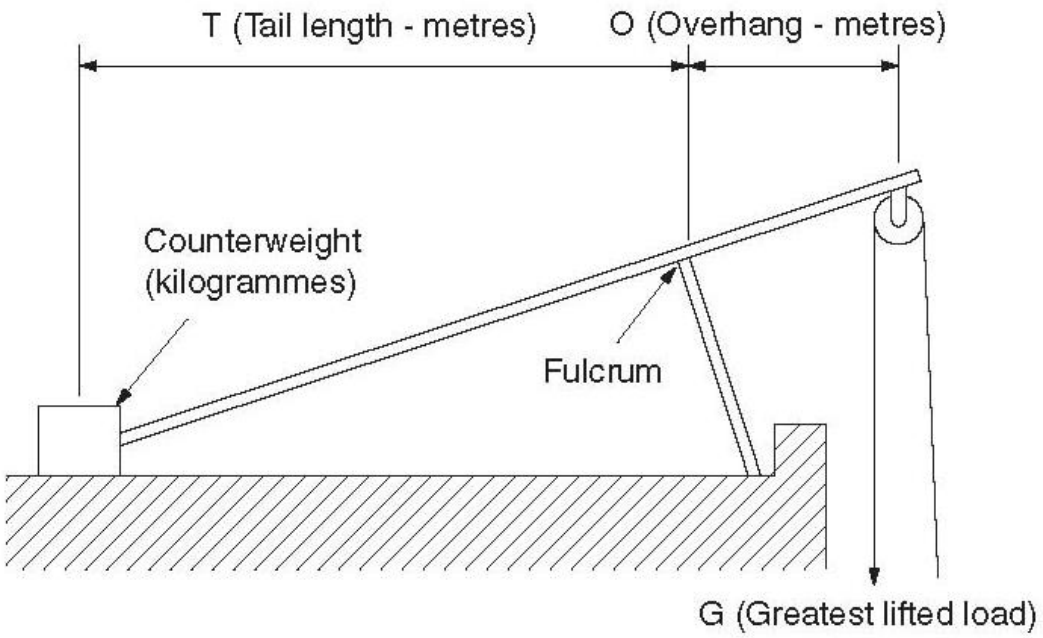





Maximum 90 °




Max. 750 mm
Moused or
safety hook



Other requirements:

Lifting equipment and accessories to be tested by competent person and load test certificate to be made available initially when purchased and thereafter when the item of equipment has been examined.

Inspection of lifting accessories and spindles shall be done prior to actual lifting. The frequency and detail of inspection, and maintenance shall be as per the manufacturers' recommendation, and as a minimum 12 monthly for all lifting accessories e.g. slings, spreaders, chains, ropes and shackles etc and for hoists, cranes and other lifting machines.

All lifting equipment including accessories shall have an ID number and have a tag fitted indicating the date of the last inspection.

The following records shall be retained

• Certificates from suppliers of load test and safe working load for lifting equipment;

• Reports of 12 monthly thorough examination of lifting machines and date of inspection of lifting accessories.

Special regulations of hoists carried by helicopter

In course of hoists general safety regulations relating to general hoists are governing. In case of hoist by helicopter every single time written lifting plan must be done and on location of hoist all participants must go on safety site visit.

Only that helicopter can be used to hoist that is approved by manufacturer to lift, fixing of load can be done to the so-called bomb lock of helicopter with standard load-taking elements.

Pilot carrying out hoist must be highly experienced, it means 5000 flown hours and minimum 500 hoist activities (justified by flying log, issued accounts).

Company doing hoists must possess liability of Ft 1 billion worth minimum, in case of winter hoists helicopter must have de-icer and defroster equipment. In course of hoist helicopter pilot must be in radio connection with assistant-mechanic on tower.

In projects of ABB Ltd. two-motor helicopter is authorised to do work with the following load capacity limits:

- MI-2 helicopter: maximum 900 kg
- MI-8 helicopter: maximum 2000 kg
- KAMOW 32 helicopter: maximum 8000 kg

In course of hoist by helicopter participating staff is provided by the helicopter company, it is a basic requirement that staff must be an experienced team who have been working together for a while. For staff participating in hoist, training, provision of working conditions, keeping safety rules are provided by the helicopter company. In course of hoist working area must be hermetically sealed, if hoist is carried out over existing building, building must be evacuated.

In course of hoist by helicopter current in overhead railway must be cut off, overhead railway from hoist location cannot be closer than 5m.

Safety distance from electric high-voltage transmission line is minimum 100m.

On hoist location at working-height of helicopter high object (e. g. antenna, lightning rod) penetrating to rotor-level cannot be. In order to avoid legal disputes, helicopters carrying out hoist should be owned by the entrepreneur, because in course of working activity incidental accidents, failures, etc. may occur.

Material storage

Substances must be stored by their extent, kind, shape, weight, quantity, and other physical and chemical characteristics, considering maximum capacity of storage and with the respect of the environmental- and fire protection regulations.

In case of substance storage it is necessary to ensure the opportunity of anti-hazardous disposal and removal of substances.

Substances harmed, cannot be placed in bundle, they must be stored separately.

In case of materials with pointed, sharp parts (e.g: pins), pointed, sharp parts must be removed before storing or a safe method of storing has to be found.

In case of storing lumber in string (plank, board, etc.) in every single corner only identical thick of material can be put. string width cannot be less then 0,6 times string height.

String dimensions (maximum height of string):

- Brick: 1,8 m,
- Tile 1,8 m,
- Cube- Border- and other form stones: 1,5 m,
- Tile for floor: 1,2 m,

Plate glass must be stored on its edge on racks containing compartments.

Concrete pipes are allowed to be stored on their cloak up to 1,2 m of altitude, fixed.

Iron beams may be stored at maximum 1,0 m of altitude, with proper size and capacity of pads line by line.

Method of prefabricated concrete elements storage must be defined by manufacturer and it is necessary to inform user about it.

The storage altitude of sacks may be at most 1,6 m.

Cable drum handling

Cable drum handling (loading, unloading, lifting and shifting) are potentially high risk if they are not planned and executed properly.

Hazards and risks

a) Trapping injuries(fatal or serious) due to fall of cable drums during unloading or moving in constricted areas

b) Serious or fatal injuries from loss of control when moving cable drums or crush injuries due to trapping between two cable drums, or between moving and fixed drums or between drum and fixed structure.

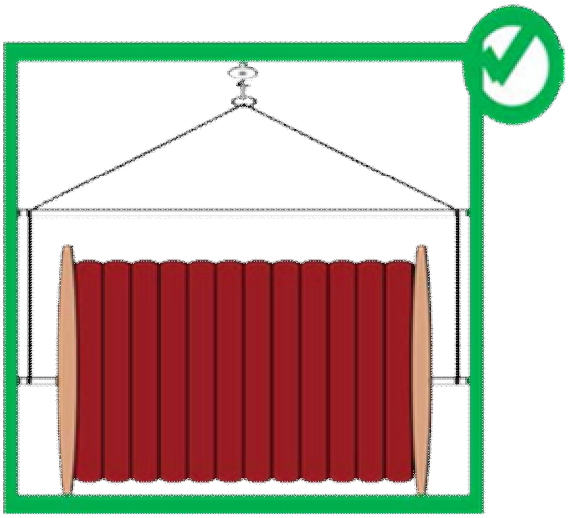
c) Hand / Leg injuries due to sharp edges on metal packing strips and protruding nails.

d) Strain injuries from manually handling heavy cable drums.

e) Fall of drums due to damage and failure of lifting accessories e.g. slings, cable drum spindle shafts) which will result in damage to cable

f) Damage to cables due to sharp nails

g) Tripping hazards due to wooden packing and coiled cable at ground level

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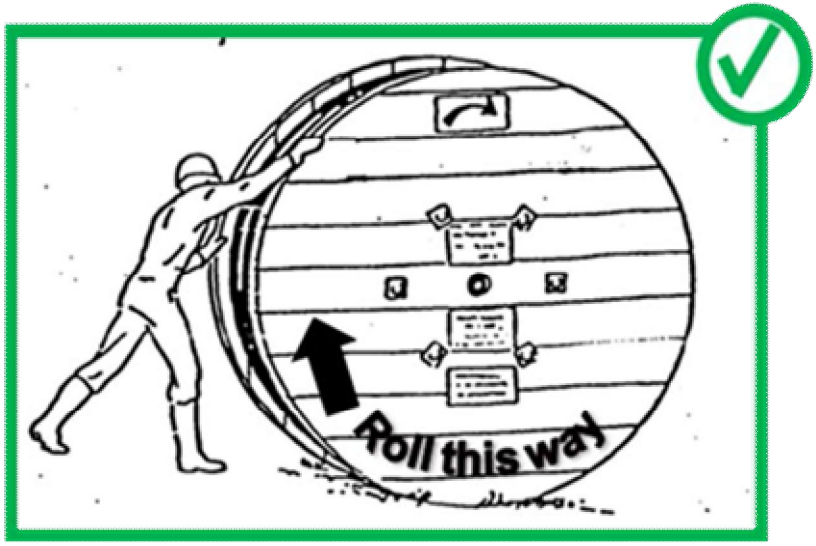

Roll this way

Cable removal from drum

1) The cable should be pulled from the top of the drum. To prevent crossing of turns on the drum due to sudden stop in pulling, a brake should be arranged at the cable drum.
2) Uncoil the cable slowly. if the drum rotates too quickly there is a risk of the assembly toppling over.
3) Do not loop/ install armour cables in formations, which do not comply with bending radius requirements.

When handling cable drums the following personal protective equipment shall be worn:

- Head protection - helmet
- Foot protection ISO 20345
- Eye protection
- Hand protection (gloves)

Safety regulations relating to fixing formwork

Erection and dismantling of formworks, prefabricated structures or temporary struts and buttresses can be carried out only in supervision of authorised person.
Proper steps must be taken in order to ensure safety of employee in case of danger resulting from incidental fragility or stability of the structure.

Formworks, temporary struts and substantiations must be designed, calibrated, assembled and maintained that they could safely resist any possible forces and bearing force.

Formworks and supporting scaffolding must be designed that they could take occurring loads and bearing forces during entire implementation and they could also pass loads and bearing forces to the ground properly.

All formworks must be formed and planned that their stability would be proper. In course of concreting works sufficient working place must be provided for workers and working activity should not require special posture.

If the ground is not susceptible to take expected load then load distribution (from beams or any other materials that can take and pass load) must be provided.

Dismantling of formworks

On buildings or on their elements a formwork can be only constructed or supporting scaffolding can be only removed if the concrete or strength of building is appropriate and person in charge checked it and approved construction of formwork.

In order to achieve proper strength of concrete or building, building must be protected from frostbite or too early dry up. In course of drying time building cannot be exposed to shock or load.

Formworks must be done in that way that construction of formworks would be safe.
In case of formworks construction of ferro-concrete structures (floor structures, bridging) made by substantiation, work must be carried out in two phases:

1. *loosening of supporting structure, slight lowering of it,*
2. *after checking stability, dismantling of formworks.*

In case of formworks construction shock must be avoided.

In course of formworks construction only that person can stay on location who performs work.
Construction of formworks must be carried out in reverse sort order of building of formwork.

Sharp materials, protruding nails from formworks materials must be removed.
Prior to formworks construction structures must be checked, if there are overloads or any other deficiency on them that would risk people performing work after finishing or during formworks construction.
In course of load-test working place must be railed off and by help of guards access there (besides enclosure and rail off) must be provided. It is forbidden to stay or perform work under load-tested structure.
In course of load-test to avoid incidental disruption of structure it is needed to place calibrated scaffolding.

Safety regulations of prefabricated structures assembling on site

- In course of construction work from prefabricated structures, stability of both the building and elements must be provided.
- Elements must be designed in a way that their transportation and assembly can be carried out.
- Suspension elements designed for moving elements must be planned, calibrated and formed in a way that safe hoist and insertion of assembly place could be carried out.
- Elements can be transported and moved by transportation-, lifting- and suspension instruments designed only for this purpose.
- Lifting elements on place can be carried out only in that case if wind speed does not exceed 36 km/h.
- Elements must be stored, transported, installed in a way that their position would be fixed against involuntary displacement.
- Transportation, hoist and moving of elements can be carried out only based on static aspects given by manufacturer.

Airing

In case of performing work in closed workplace it is necessary to ensure fresh air considering physical burden of employees.

The illumination of building workplaces

Building workplaces, inside building workplaces, and traffic roads on them need to have natural lighting.
If daytime natural light may not be enough, or night work is performed, it is necessary to apply artificial illumination.
If necessary, it is required to apply portable light-sources.

The colour temperature of applied artificial light may not influence, or may not modify the visibility of safety and health care signs.
It is necessary to place fittings of artificial lighting apparatus so as not to cause accident.

The illumination of inside building workplaces

To light inside building workplace not higher than 3,0 m, it is necessary to use ligthing apparatus of mini-voltage.
In case of mini-voltage bare light-source (with no lampshade) is acceptable. It has to be put on suspension of 0,5 m long.
Application of lighting apparatus of low-voltage is acceptable accomplishing all conditions mentioned below:

- the lighting electronic circuit is with a current safety switch;
- lamp bodies are fixed and their placement does not hinder working activities or material supply;
- applied lamp bodies protected against mechanical injuries, or supplied with suitable additional protection.

To light inside building workplace higher than 3,0 m, it is necessary to apply lighting apparatus of minimum 3,0 m of altitude.

In building workplaces and on traffic roads the following medium illumination values must be ensured

Building workplace and traffic road	**Medium illumination power**
Surface construction	20 luxes
Civil engineering	20 luxes
Assembly of steel and metal constructions	30 luxes
Track building	30 luxes
Tunnel building	30 luxes
Resting places- and social rooms	100-200 lux
Office-rooms	500 luxes

Single building activities done outdoors the following medium illumination values must be provided

Activity	**Medium illumination strength**
Woodworker work done on machines	500 luxes
Mending work: rough medium fine	 200 luxes 300 luxes 500 luxes

Surface shaping - surface painting	500 luxes

Safety technology of electric equipments of preparatory works area

Electric current is a potential source of danger to people working or staying in building workplaces, therefore it is essential to keep all regulations concerning electric equipments of preparatory works areas.

The MSZ No. 2364:2008 collection of standards contains requirements concerning establishment of electric equipments of buildings and main chapter 704.of MSZ 2364-704:2002 No. standard contains requirements concerning electric equipments of preparatory works areas., This MSZ standard supplements and replaces the withdrawn MSZ-04-64:1990 No. standard, but does not contain regulations concerning high-voltage places, crossing cables of other function and preparatory work area buildings.

Besides safety protection against electric shock defined in MSZ 2364-470:2008 No. standard, the following rules must be observed in preparatory work areas:

It is necessary to supply sockets and manual electric equipment (connected constantly) up to 32 A nominal intensity current with the following protection:

- safety switch of at most 30 mA of nominal releasing current of failure current, or
- SELV (safety mini-voltage) feeding with mini-voltage (with no earth electric shock protection), or
- Electronic seperation of circuits, that is all sockets, or all manual electric equipment (connected constantly) must be fed from from a separately separator transformer, or
- from a separate coil of a common separator transformer.

The most common solution among safety methods listed above is the application of current-safety switch, therefore we have to make two important remarks:

- In case of big-escaping current a 30 mA current –safety switch –due to sensitivity- is not suitable to provide safety operating several electric equipment simultaneously.
- Check of functioning ability of current-safety switches (and documentation of this) is necessary to do regularly

MSZ 172-1:1986 standard, which is not obligatory currently, regulates to check monthly the functioning ability of current-safety switches.

MSZ 2364:2008 standard (currently it is only a draft) regulates check of functioning ability of current-safety switches only in the courses of mechanical checks (establishment, relocation, etc.)From the accomplishment of the touch protection checks providing, but currently yet only in the form of a draft it MSZ tram given in the enclosure of 2364 standard collections safety regulation only the accomplishment of mechanic checks (establishing, relocation, stb.)

From standards mentioned above the following regulations are highlighted concerning power cords of preparatory works and power cupboards.:

- Doors of power cupboard and compartments cannot be opened by unauthorized ones.

- In the course of operation structural elements must be accessible, but it has to make sure that parts of voltage cannot be touched not even accidentally.
- Transferable preparatory work power cables, or wires feeding machines, equipment and devices longer than 20m can be put only on dry, smooth surface for only one shift period and it is necessary to ensure the protection of cable against physical injury.
- It is prohibited to put cable into ground or to expose it to chemical action or constant moist.

Energy distributor equipments

- It is necessary to plan, to prepare, to apply fittings so as not to be explosive. Employees must be protected against dangers of electric shock.
- Distributor cupboards are needed to supply with earth. All equipments found in the building land must be checked, measured and documented from electric shock protection point of view.
- Preparatory work buildings, containers, containing electric equipments must be supplied with earth, checked and results must be documented.

Safety of Electricity work

Electricity if not used correctly can prove to be a high hazard that can result in electrocution with fatal consequences. 30mA is sufficient to bring about a cardiac arrest and death. ABB projects will involve a range of electrical risks ranging from possible contact with power lines, power transformers, circuit breakers and switchgear at high voltage as well as low voltage equipment below 1kV. Portable tools and appliances and temporary installations can also present electrical risks is they are not properly installed, used or maintained. They can include power tools e.g. drills, lighting, generators etc.

The 7 Steps That Save Lives

ABB work on systems at all voltages. The situations are different, the arrangements with customer's are different, the procedures and terminology are different. The 7 steps represent basic principles that must be achieved by our Electrical Safety Systems and provide a framework against which existing controls may be reviewed. The objective is that all operations maintain minimum standards for work based on the 7 steps.

Working on equipment below 1kV

It is well known that work on or near to rhis systems carries the risk of a flashover, generating arcs that can cause serious injury, death and severe damage to apparatus. It is not widely recognised that similar dangers exist on low voltage systems.

High power low voltage

Systems can generate short circuit currents of many thousands of amps, typically in the range 10,000 - 50,000 Amps. Clearances are small and although the voltage is below the level where the air will

ionise to initiate a flashover, a small piece of conducting material can easily initiate a power arc that will be capable of causing serious injury or death.

Electrical risk level

To help with the assessment and control of electrical risk these rules set out four risk levels 1-4. With risk level 1 being the objective for all work.

Level 1: Dead/de-energized

Work carried out dead with the circuits isolated and locked off to prevent conductors becoming energised.

Level 2: Totally Shrouded

Work carried out in the vicinity of live conductors which have been totally shrouded with insulating material. This insulating material shall have mechanical and impact strength as well as providing an insulating barrier between work zone and live conductors. The process of fitting the insulating barrier shall be intrinsically safe.

Exceptional circumstances requiring formal prior approval for each job

Level 3: Near Live conductors

Work carried out in the vicinity of live conductors, that requires conductors to be exposed, then only one conductor at a time shall be exposed and all other conductors including neutral and earth and any adjacent earthed metalwork, shall be fully shrouded. Work on switchboards and busbars is not permitted.

Level 4: On live conductors

Work carried out on live conductors, that requires conductors to be exposed, then only one conductor at a time shall be exposed/unshrouded and all other conductors including neutral and earth and any adjacent earthed metalwork, shall be fully shrouded.

Low voltage work on high voltage equipment constitutes high voltage work
must be carried out under the rules applicable to HV systems.

Work on low power and control systems

Work on low power and control system may be carried out live or with the control system active if

a) only one live conductor is exposed at any one time. Neutral conductors shall not be exposed whilst a live conductor is exposed.

b) earthed metal shall be screened to prevent danger.

c) installation and removal of wiring in live low voltage panels where no live conductors are exposed is permitted only when the wiring does not pass through voids where it is concealed from view.

d) control wiring shall not be modified live and shall be pre-installed onto active relays meters regardless of the control system.

Physical barriers, warning notices, etc.

a) barriers should be used to isolate the working area to create a safe zone and keep unauthorised persons out.

b) approved warning notices to be displayed re electrical danger, point of isolation and danger-test area.

c) all locks to secure points of isolation shall be uniquely keyed and readily identifiable. Master key suites are not permitted.

d) earths and short circuits shall be of an approved design and of flexible aluminium with a clear protective covering.

Personal Protective Equipment

a) only ABB approved PPE shall be worn

b) arc flash resistance clothing shall be provided at all times when in the vicinity of live apparatus. Class 1 IEC is the minimum requirement or class 2 where the work activity requires it.

c) where insulated gloves are used they shall be worn in conjunction with abrasion and puncture resistant outer gloves.

d) approved eye protection in the form of a face shield.

Insulated tools etc

All LV work shall be carried out with insulated tools and shall be maintained in good condition. Multimeters are not permitted.

Applying the 7 steps

STEP 1 - CLEARLY IDENTIFY THE WORK LOCATION AND EQUIPMENT

■ A caution/danger notice shall be posted on the isolator and also on the conductor(s) to indicate that it is being worked on.

■ It is important to be able to distinguish between the equipment that is dead and other equipment that may be live.

STEP 2 - DISCONNECT (SEPARATION)

■ Disconnect equipment from supply and ensure that the isolator is locked in the OFF position. If a number of people are working on the system then a multiple locking hasp and warning notice shall be used so that each person can apply his personal lock. This is often refered to as “Lock out - tag out”.

STEP 3 - SECURE AGAINST RECONNECTION

■ If isolation has been achieved by removing a fuse then ensure that the fuse is removed and held by the supervisor and that the fuse cabinet is locked and the key retained by the supervisor.


WARNING
Under Maintenance
DO NOT START
Isolated as Per Check Sheet
Dated: 18/11
Initials: BL

STEP 4 - CONFIRM THAT THE INSTALLATION IS DEAD

■ The circuits to be worked on shall be proved as dead by testing, at the point of work. The testing device itself shall be tested immediately before and after testing.

STEP 5 - CARRY OUT EARTHING AND SHORT CIRCUITING

■ In addition to the above it is advisable to apply properly designed earthing devices to the conductors being worked on.

■ On transformers it is important that both sides of the transformer have been isolated and earthed.

STEP 6 - TAKE SPECIAL PRECAUTIONS WHEN CLOSE TO BARE CONDUCTORS

■ Where there are adjacent conductors that may be live then additional screening measures will be required to ensure that no contact is possible.

■ In the case of HV work (>1kv) safe distances shall be established by suitable barriers, to prevent the risk of contact.

STEP 7 - ISSUE THE PERMIT TO WORK

■ The use of a written permit to work linked to the lock off device shall be drawn up and issued by the supervisor who shall witness the testing of the conductors to ensure in the permit

■ Supervisor shall check on the work periodically to ensure that there is total compliance with the safety requirements;

Key Requirements when Working on Equipment at High Voltage (>1kV)

■ Written procedures drawn up in respect of the work to ensure that the “Safety Rules” can be properly applied and complied with.

■ As with all work there shall be a suitable risk assessment in place and a safe method of working drawn up.

■ Discussions with the customer shall be made in advance of the execution of the project in respect of the H&S requirements on site.

■ all work on or near power systems shall be under the control of a nominated person who shall be responsible for electrical safety and all persons working on such systems must be trained and competent to undertake their work safely.

Application

■ All apparatus shall be treated as live unless it has been made safe and released for work in an approved manner.

■ Electrical equipment is subject to the safety rules if it is capable of being energised from a power system. The ABB 7 steps must be applied.

■ Where these safety rules cannot be applied then other equally effective measures shall be applied.

■ ABB must issue a permit to work once all the required safety precautions have been applied and they have been witnessed.

Switching

■ Any person who undertakes switching must have the requisite information, instruction, training and competence in respect of the potential danger arising from the switching activity.

■ The person who carries out the switching must be authorised in writing and must carry out the operation in conjunction with the person who is in control of the system.

Communication & control

■ There must be arrangements to ensure communications are clear and not subject to misinterpretation.

■ Where there are numerous switchers or work parties on the same circuit, a control person must be nominated and be responsible for safety co-ordination.

Work and switching near live apparatus

■ Work and switching will only take place after a careful risk assessment by a competent person and the application of sufficient controls.

■ Work will at all times be under the supervision of a competent person nominated to be in charge of safety, considering the nature of the work and risks involved.

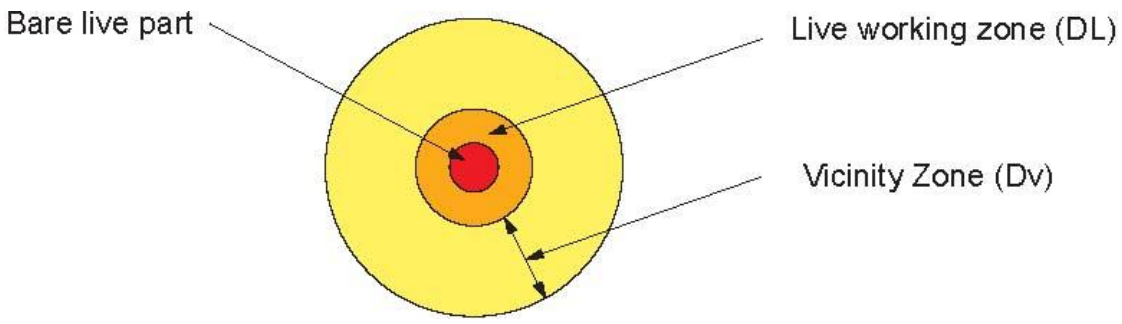
■ Flame resistant clothing will be worn in accordance arc flash protection.

■ Other PPE will be used according to local regulations and risk assessment controls.

■ There shall be safe and proper means of escape in the event of failure of the live apparatus.

■ Temporary demarcation and signage shall be highly visible.

Guidance on Minimum Distances for Live Working and Vicinity Zones



Guidance on Minimum Distances for Live Working and Vicinity Zones

Nominal system Voltage kV	Distance in air defining the outer limit of the live working zone (DL) mm	Distance in air defining the outer limit of the vicinity zone (DV) mm
<1	No contact	300 mm
3	120	1120
6	120	1120
10	150	1150
15	160	1160
20	220	1220
30	320	1320
36	380	1380
45	480	1480
60	630	1630
70	750	1750
110	1100	2100
132	1300	3300
150	1500	3500
220	2100	4100
275	2400	4400
380	3400	5400
480	4100	6100
700	6400	8400

Work on Dead Apparatus only

■ Sufficient labels, schematics and plans will be available to clearly identify the location and apparatus.

■ Where apparatus is not easily identifiable, such as cables, suitable identification arrangements must be made with the person in charge.

■ An initial risk assessment will consider the condition of any live equipment, and danger from ancillary systems such as fire protection.

■ In order to assist with identification during the course of the work, nearby live apparatus shall be identified as dangerous by the application of temporary warning labels.

■ Processes shall ensure continuous and clear identification of safe and dangerous areas throughout the course of the work. There shall be written procedure to ensure safe access to cells in switchgear where some parts remain alive.

Disconnect Completely, Secure against re connection

■ The apparatus will be made dead

■ A suitable electrical gap will be made across all points at which the apparatus may be made live including potential in-feeds from low voltage apparatus.

■ The gap shall be physically secured from inadvertent or wilful re-connection, typically by the application of barriers or locks, removal of fuses to a safe place, removal of apparatus from its normal

service position or disconnecting/blocking stored mechanical energy devices.

■ It shall not be possible for remote protection or control to reconnect the circuit under work through electrically closing a switching device.

■ A warning notice shall be fixed to each point of disconnection.

■ Keys will be kept in a secure place

Provide protection against live parts

■ All live apparatus in the vicinity of the work shall be locked off, or identified and made inaccessible by other means.

■ A risk assessment shall be carried out to ensure that dangerous voltages cannot be directly or indirectly created on any of the electrical circuits connected to the point of work from nearby live circuits including the re arrangement of earth connections.

■ Special attention must be paid when the scope of work requires phased outages of different circuits. The sequence of circuits to be made dead must be clearly understood by all members of the work party. With each change of circuit from live to dead, or vice versa, Access control and warning labels must be changed to suit and all members of the work party must fully understand which new circuits are now live.

■ Work on apparatus connected to overhead lines shall cease in the event of a lightning storm.

Take special precautions when close to bare conductors

■ Special precautions must be agreed with the Nominated Person when the minimum clearances cannot be made to unearthed conductors during preparation of the safe working area..

■ The minimum precautions in the above circumstances are:

- Wear suitable insulated gloves
- Ensure access is suitable to avoid inadvertent slips.
- Be accompanied by a second person who can render assistance.

Verify the installation is dead

■ Where the design of the apparatus allows, it shall be confirmed dead by a suitable tester at all points of work and points of application of portable earths.

■ The tester shall be of a proper design, and proved before and after each test.

■ Where the design of the apparatus precludes this, other suitable arrangements shall be agreed with the person in charge.

Carry out earthing and short circuiting

■ The apparatus to be worked on shall be connected to earth by connections and conductors capable of carrying the full short circuit current at that point. They shall remain in position for the duration of the work.

■ Where possible the apparatus shall be earthed by a fully rated switch.

■ Earths shall be applied between the point of work and all possible sources of HV supply, they shall remain in position for the duration of the work.

■ Portable earths shall be applied to all phases and in such a manner as to prevent danger from residual charge or induced voltages.

■ Earths at the point of work shall be connected to create an equi-potential zone for all persons at the point of work. They may be moved during the course of the work.

■ Precautions shall be taken to prevent danger from voltages across earth conductors connected to earth at different points.

Electrical permit to work

Note: The permit to work is about control of the workplace and people. It is a summary of all the previous protective measures and hazards. It is also a clear statement of responsibility from the person responsible for these protective measures and the person nominated to be in charge of the work party.

■ There shall be a nominated competent person in charge of the work party, who shall understand the limitations of his work and the safe working area.

■ The Nominated Person issuing this is responsible for creating the safe working area in accordance with 7 steps principles.

■ The permit to work shall contain clear, legible details of:

-The location of the work, and all the precautions that have been taken to establish the safe working area.

-The scope of the work -Hazards in the immediate area –

- Signatures of issuer and Nominated Person in charge of the work party (where these are different people), times and dates of issue and cancellation.

-Signatures of work party members.

- The permit to work may also contain authorization and handover details between the customer and the ABB Nominated Person.

■ The nominated competent person in charge of the work party shall be responsible for the safety of

the work area and all other persons in his/her work party regardless of seniority.

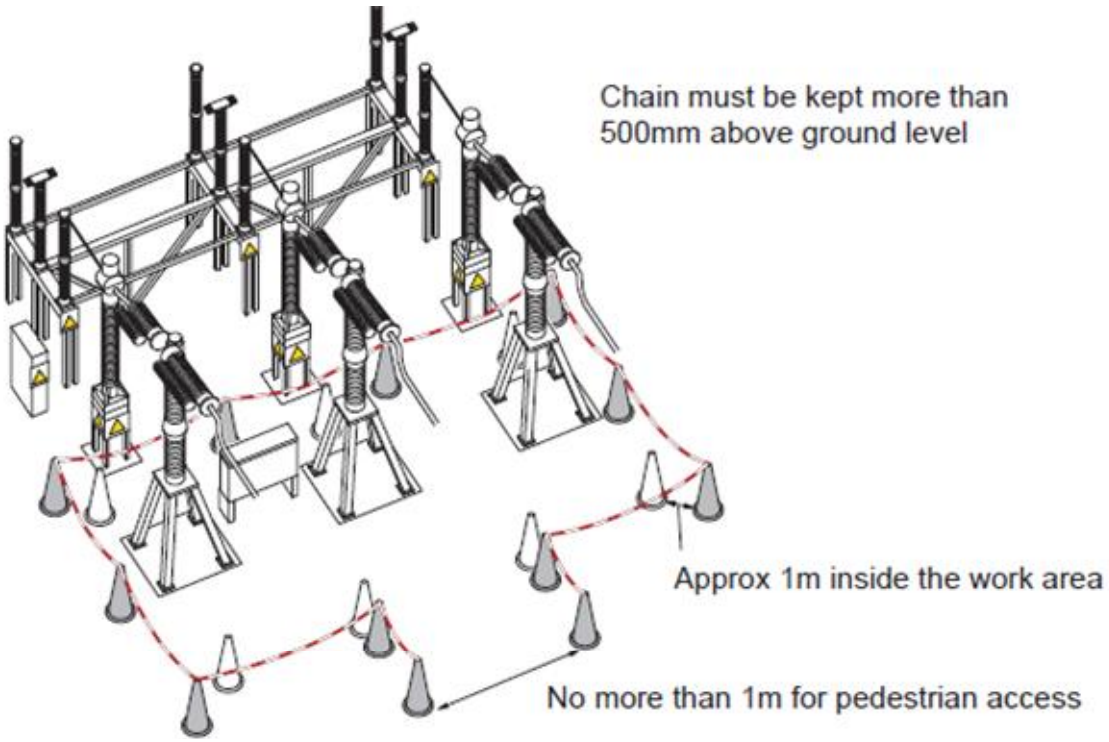
■ Warning signs and demarcation equipment is not to be removed until after cancellation or the issue of further safety documents.

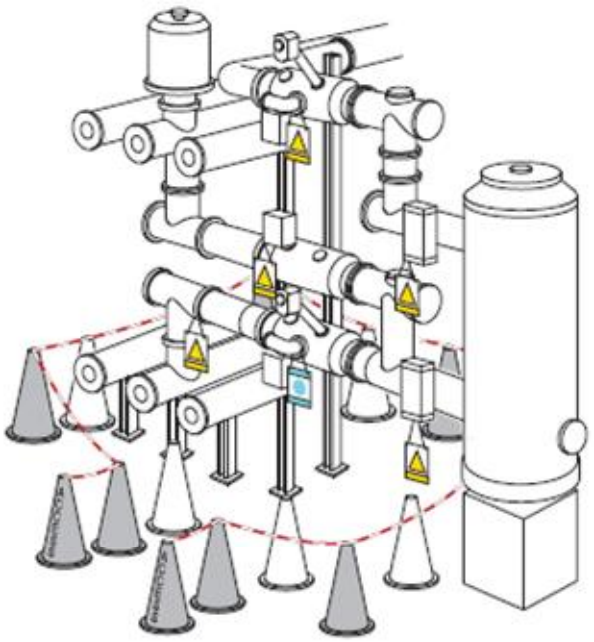
■ The Nominated Person in charge of the work party shall be responsible for ensuring all persons and tools are withdrawn on completion, and return of the apparatus in proper condition according to the work undertaken.

■ Where the boundary of the safe working area changes during the course of the work, further permits to work will be issued and work parties briefed accordingly.

Safe working areas in switchyards

Demarcation of a work area is one of the main control measures to ensure clear boundaries between safe and unsafe workplaces. Demarcation equipment (Barriers, Chains, and Cones etc.) and Safety Notices must be use.



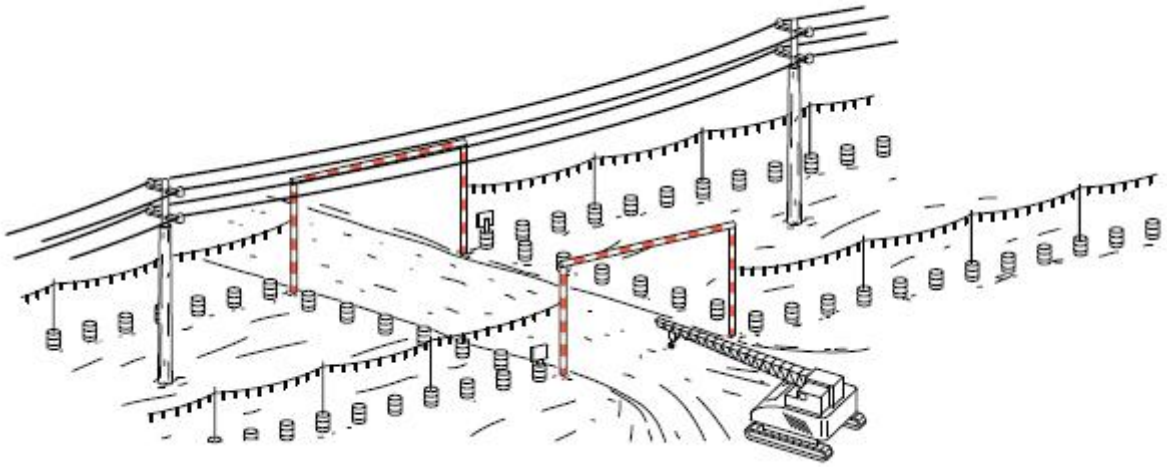


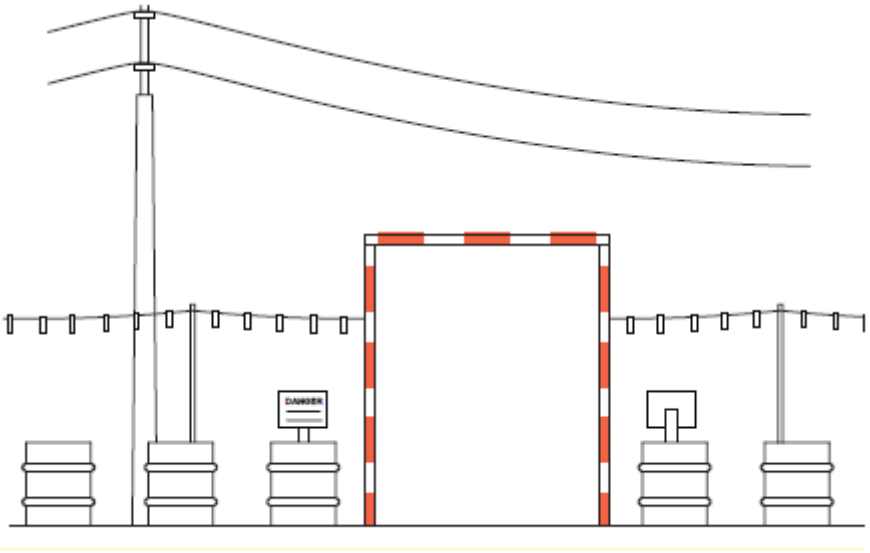
Contact with overhead power lines

Contact with over head power lines also represents a significant hazard as they operate at high voltage. The most common causes of accidents are as a result of situations where physical contact with the OH line is made.

TYPICAL HAZARDS

- Handling long scaffold tubes
- Handling long metal roof sheets
- Handling long ladders
- Operating cranes and other similar vehicles
- Raising the body or inclined container of tipper lorries or trucks
- Using mobile elevated work platforms





Contact with underground cables

Serious injuries can also result when undertaking digging operations or carrying out excavation work when there is a possibility of either penetrating electricity cables or crushing them. In such circumstances injuries can often be severe, potentially fatal with burns to the hands, face and body.

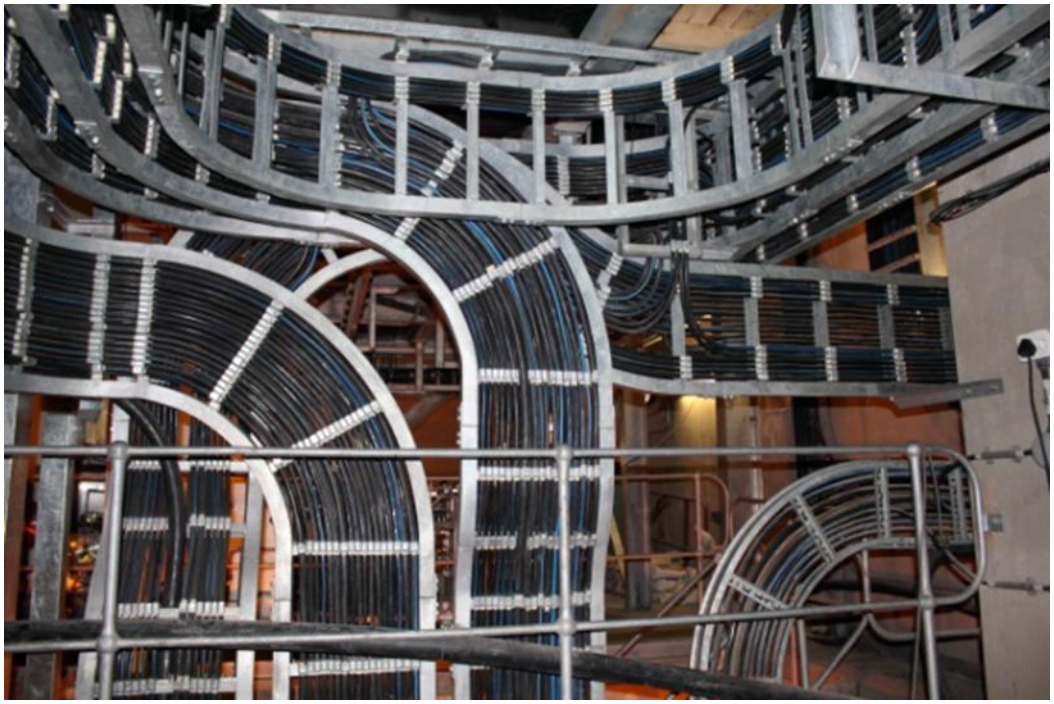
Precautionary measures include

- Checking with the customer on the likely presence of any cables.
- Check with utilities and obtain any relevant drawings.
- Use locating devices and mark presence on ground and on the site drawing.
- Hand dig in areas where cables may be present.

Cables, cables intalling to underground

- The workers should be trained, at the time need the continuous technical supervision and management.
- It is necessary to provide the safe across to hole (bridge) for the pedestrian traffic,
- The pit is depper than 2,0 m it is necessary to put at least 30 m fixed ladders,
- Plastic pipe, in all sizes, it is necessary to let put to the pit by rope.
- The cover pipes are prohibited storage on the near border the pit at the all time,
- If you are the cable cable investing in happens to the help of a crane, it is necessary to observe the regulations concerning the hoists. He has to make the ones working from home practise the management of the crane.
- The unauthorized person is prohibited near the work

Installation in a building



Potential hazards

- Working at heights
- Falling objects and equipment
- Working adjacent to live equipment
- Unstable existing equipment – during a replacement
- Lifting of racks / trays to work locations

- Swinging of suspended loads
- Unbalanced load

Safety of Portable Tools

Portable Tools-Typical hazards

1) The metal work becomes live when :

a) the earth wire pulls out of its plug terminal due to a loose cordgrip and touches the live terminal;

b) wrong connections are made to the plug or apparatus terminals;

c) the earth wire has become disconnected causing a short circuit.

2) Damaged or missing covers on fuse boxes, socket outlets, terminal boxes which expose persons on site to bare live conductors.

3) Flexible cables are damaged when they are dragged over sharp or rough surfaces or run over by vehicles. As a result the outer insulation becomes damaged and exposes bare conductors.

4) Temporary repairs are made which fail because they are not strong enough.

5) Using equipment outside which is not weather proof and therefore not suitable. It is particularly dangerous where any of the above are used in wet or damp conditions.

Control measures

■ where risks are high because the site is wet or because it constitutes a confined space then pneumatically powered tools should be used thus eliminating any electrical risk.

■ where electrically powered tools are used then battery operated tools are the safest option.

■ use a SELV system (safety extra low voltage system)which is separated from earth which limits the voltage supplied to a maximum of 50V. This can be used for lighting and some power tools. May not be suitable for motor drives.

■ a reduced low voltage system which delivers 110V to the equipment which is designed so that the maximum voltage to earth is on 55 V in a single phase system (65V in a 3 phase system) is safer than using 230V.

General requirements

■ Temporary construction electrical supplies shall be of robust quality to withstand site conditions.

■ ensure that there are no bare conductors wires visible in any flexible leads or connectors

■ plugs and sockets are in good condition

■ there are no taped joints in any cables and leads

■ no visible burn marks on any equipment

■ all equipment is checked on a regular basis by a competent electrician and a record kept.

■ Tempory leads / cords etc are secured to prevent damage from vehicles etc.

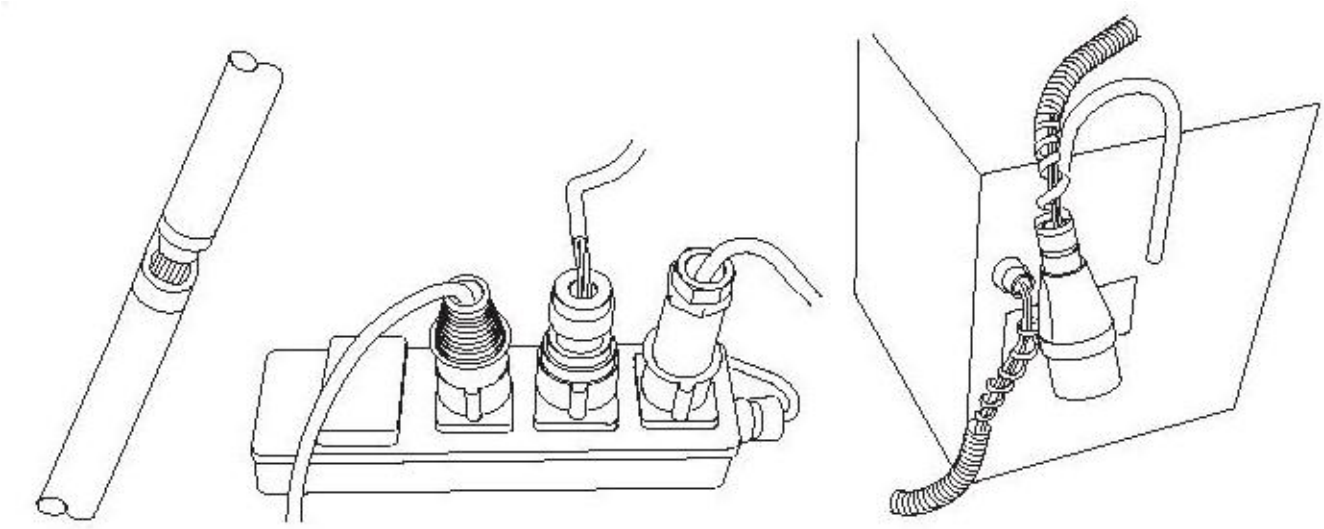
Check of electric hand tools

- It is necessary to make electric shock protection examination yearly and it has to be proved by report.
- It is allowed to do work with faultless manual tools only.
- Electric cables may not be injured, it is not allowed to make addition to it. It cannot be got stuck by door, cannot be run under door because insulation may be damaged. It is necessary to exchange injured cables promptly.
- Electric cables are allowed to be run in cable holder.
- It is strictly forbidden to roll (by machine) on cables run on the ground. Cables must be placed between two boards so in this case the wheel of vehicle would touch boards only.

Inspection of equipment

Suggested schedule for inspection of portable electrical equipment.

Equipment	**Voltage**	**Use check**	**Formal visual inspection**	**Combined inspection & test**
110V portable and hand held tools, ieads, site iighting etc	Secondary windrig tapped to earth	Weekly	Monthly	Before first use and then 6 monthly
230V portable and hand held tools, leads, site lighting etc.	230V mains supply through 30mA RCD	Each shift/daily	Weekly	Before tirst use and then 6 monthly
230V equipment such as lifts, hoists and fixed floodlighting	230V supply with fuses or MCB's	Weekly	Monthly	Before first use and then 6 monthly
Fixed RCD's		Each shift/daily	Weekly	Before first use and then 6 monthly



Arc Flash Protection

Electric shock

The hazard of electrocution occurs when a person makes contact with energized parts, which if the person is subject to a voltage across his body can result in serious injury and often death depending on the voltage, and the current and time involved.

Arc flash burns

The hazard of arc flash occurs if an accidental short circuit occurs when a conductive object gets too close to a high amp (power) current source, or by equipment failure. It can often result in the release of very high energy levels over a very short time period releasing large amounts of heat with the conductors becoming molten, which are then vapourised. This can result in severe burns, principally to the hands and face.

Other hazardous effects

These can include exposure to ultraviolet radiation associated with the flash which can result in damage to the eyes. There is also the additional possibility of being injured as a result of the arc blast (pressure wave) and hazard of any consequential fire. There is also an additional hazardous effect of hearing damage as a result of the blast and also the inhalation of hot gases or vapours. Equipment containing mineral insulating oil will present significant additional fire and explosive hazards.

Switching

Switching operations by their nature can expose the person who undertakes the operation to high hazard including that of arc flash. In this context switching may be defined as any action which changes the electrical state of an operational power system. This could include the insertion or removal of an electrical device and application or removal of system earths.

Arc flash PPE must therefore regarded as a compromise of mitigation for potential failures, and must be considered as part of a range of controls dependant on risk levels associated with particular situations, and type, of switching operation.

Requirements of switching

■ Live switching is carried out from a remote position

■ Ensuring that the operator has a high level of specialist competence.

■ There is in place a systematic and highly disciplined procedure that is followed

■ Ensure that switching can be carried out dead, and live operations confined to modern or remote operated equipment

■ Reduce potential fault level / energy by re-configuring systems or protection settings

■ Check equipment ratings, maintenance / commissioning history

■ Certain operations such as insertion of switching devices, potential fault closure, and making live, present a higher risk exposure

The risk assessment should then have identified the hazards that the PPE will protect against balancing the level of PPE required and operator impairment.

Risk assessment

All work undertaken by ABB shall be subject to a formal hazard identification followed by a risk assessment. This is particularly important where ABB is working on customers' sites which shall be validated on site by the nominated person for the work activity, usually the ABB person who will supervise the work. The hazard identification and risk assessment and the controls identified shall include the maintenance of effective clearances from live parts. This is to ensure that the control measures normally specified for the work activity are appropriate for the site conditions and in fact mitigate the risk to a level that is as low as is reasonably practicable in accordance with the principles of prevention or the hierarchy of controls.

The requirements for arc flash PPE shall apply to both high voltage and low voltage work.

■ suitable head protection

■ eye/face protection

■ suitable voltage rated gloves

■ whole body clothing

■ safety footwear.

■ hearing protection

■ voltage rated tools

Specific requirements-clothing

The min standard required to protect against arc flash is that the equipment must be capable of withstanding a minimum incident energy of 8cal/ cm2 in respect of clothing. This is equivalent to class 1 International Electrotechnical Commission (IEC) 61482 or hazard cat 2 National Fire Protection Association (NFPA)-70E. This standard of personal protective clothing shall be worn by all ABB employees and contractors who may be working on site.

Where activities are undertaken where higher incident energies are foreseeable then additional protection layers will be required as a result of the increased hazard. Such additional measures shall be determined as a result of a risk assessment undertaken during the planning of the work but in any event on site by the ABB nominated person responsible for the work activity before the execution of the work. This will require clothing and equipment that shall withstand higher incident energies of 25cal/ cm2 (class 2 IEC or hazard cat 3 NFPA) and in certain cases 40cal/ cm2 (class 2 or hazard cat 4 NFPA).

The equipment therefore for whole body protection shall include the provision of:

■ flame resistant long sleeved shirt to withstand a minimum incident energy of 8cal/ cm2

■ flame resistant trousers to withstand a minimum incident energy of 8cal/ cm2

■ jacket for internal use to withstand a minimum incident energy of 8cal/ cm2

■ jacket for external use to withstand a minimum incident energy of 8cal/ cm2

Where multi layers are worn then the combined performance must achieve a minimum protection level of 8cal/cm2. In many cases a combination of multi layers will provide for a greater level of protection than the sum of the protection level afforded by the individual layers.

In providing PPE to ABB employees for protection against arc flash due consideration shall be given to the wearing of undergarments. Undergarments made from man-made fibres such as nylon, polyester, viscose or rayon, may melt onto the skin as a result of the heat transfer through the outer clothes and hence it is preferable that such garments should either be flame retardant, or at least 100% natural fibres such as cotton, silk or wool.

Hand protection

The personal protective equipment shall include the provision of voltage rated gloves. in accordance with EN 60903 or its ASTM equivalent. The class and voltage range are specified as follows:

Safety Class	Checking Voltage	Voltage rated
00	2500V	500V
O	5000V	1000V
1	10000V	7500V
2	20000 V	17500 V
3	30000V	26500V
4	40000V	36000V

1, 2, 3 and 4 with a protective class working should not be used, even if they were warehouse also, if they were not checked within six months. The 00 and 0 protective gloves class in the case the air pressure test and a visual inspection may also be considered to be aliquot, but the overall safety of the electrical testing the owner at the request may be carried out separately.

Eye & face protection

All employees who undertake work on customers' sites must be provided with suitable eye protection to EN 166 or its equivalent as standard. For work involving higher risk activities then the protection shall provide for full face protection as standard which shall cover the full face.

Voltage rated tools

All ABB employees who are exposed to the possible hazard of arc flash as a result of their work shall be issued with suitable voltage rated tools particularly for work on low voltage equipment (<1kV).

The voltage class and safety distances

Nominal Voltage **Safety distance**

0→ 1000 V	1,0 m
1 kV →110 kV	3,0 m
110 kV → 220 kV	4,0 m
220 kV → 380 kV	5,0 m
Unknown Voltage	5,0 m

Testing at Site (Electrical)

All persons working within the testing facility shall be competent (electrical education, valid under- or live voltage electrical education) with minimum 1 year experience) to undertake their work safely and in accordance with the requirements of this instruction. They shall also have received training and instruction on:

- The ABB 7 Steps of electrical safety (Referred to as 5+2 in Germany and Switzerland)
- Rules for working at High Voltage,
- Rules for working at Live Voltage,
- Competence in respect of electricity and its application and dangers.
- Competence in emergency response, electrical fire fighting and above all, on first aid in case of electrocution
- Basic competence in risk evaluation to manage pre start check in case of work at customer sites (ABB “take 5” campaign)

When a team of two or more people is at work (The testing work cannot be carried out alone), one competent person must be nominated in charge of overall safety. Nominated person is required to have the responsibility for electrical safety and control of a work party.

When the activity is totally or partially carried out by contractors, a supervisor must be nominated with sufficient experience and specific competence in dealing with external parties.

The primary hazards associated with electrical testing are:

- electrical electrocution
- burns from electrical arch
- electrical fire and explosion
- impact with sharp edges object in case of electrical blast
- falling from height

To above activity related hazards must added site additional hazards

- impact with falling objects
- slips trips and falls due to water /or oil on the floor.
- Impact with vehicles, road safety
- Intoxication or chemical burns
- Explosion caused by inflammable vapors or dusts,
- Noise
- Extreme temperatures
- Biological hazards (e.g. malaria in countries at risk)

All machinery and technical installations shall be subject to a risk assessment that actively involves the operators and maintenance staff and is reviewed by OHS advisor. In general a risk assessment shall be carried out where stored or input energy could cause physical failure of the test piece or test Installation.

Where maintenance cannot be undertaken with routine operational safety controls, then a specific risk assessment shall be performed which identifies the task and specific safety measures that persons must follow to ensure their safety. Specifically at customer sites it is possible to find machinery in poor maintenance conditions. In such a case specific procedures and working instructions must be set ABB service technicians.

The following table represents an example of a general risk assessment associated with electrical tests

Electrical Tests	Electrical Risk			Mechanical Risk			PPE
	Prob	Sev	Rank	Prob	Sev	Rank	
Wiring and Electrical Function tests	4	2	Med	3	2	Low	
Test of Protection and Measurement Circuits	3	3	Med	2	2	Low	
Test of Voltage Presence Signaling Circuits	2	5	Med	2	2	Low	
Insulation test of Auxiliary Circuits at Industrial Frequency	2	5	Med	2	2	Low	
Insulation test of Main Circuits at Industrial Frequency	2	5	Med	2	2	Low	
Measurement of the Insulation Resistance of Auxiliary Circuits	2	5	Med	2	2	Low	
Measurement of the Insulation Resistance of Main Circuits	2	5	Med	2	2	Low	
Measurement of the Ohm Resistance of the Main Circuits	2	5	Med	2	2	Low	

General rules for the safe conduct of tests

1. Access control and responsibility

a) There must be one person (shift test area supervisor) responsible for the entire (primary) functional test area on each shift.

b) Access to the test area must be restricted to test department personnel, project engineers and customer representatives, pre approved by the test leader.
c) Only authorized ABB test personnel are permitted to carry out functional tests. Under no circumstances are customer representatives permitted to touch or handle equipment during testing.

2. There shall be a person nominated (test leader) for the safe conduct of each test activity. The test leader as supervisor is responsible for ensuring that:
When conducting tests, all persons involved have been briefed on the OHS requirements and that they are followed throughout the duration of the test.
Personal protective equipment is both available and worn when it is required.
Checks are made prior to energizing the test object to ensure that all the connections are correct and that the safety measures are in place.

3. There shall be a “prohibition zone” around the apparatus being tested. This will be created by suitable barriers, screens and warnings.

In figure above xamples of mobile barriers to protect test areas in a workshop: steel connected to earthed or insulating plastic.

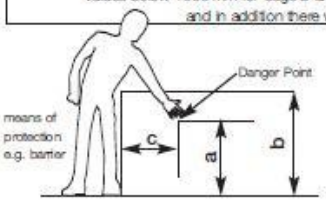
The primary test area barrier must be located at a minimum distance of 1.4 m from the nearest point of contact with a switchgear panel. Any person standing outside the barrier should not be able to make personal contact with any equipment within the primary test area while standing or walking normally. Safety Zones in mm (based on EN 50191, EN 294)

Horizontal distance between the Barrier and the Prohibition Zone

(in relation to the height of the barrier and the distance of the danger point from the floor). For distances greater than 1800mm of the danger point from the floor see Table A,3 of EN 50191. (Taken from EN 294)

Distance of the danger point from the floor, *a* mm	Height of the edge of the means of protection (barrier), *b* mm							
	1000	1200	1400	1600	1800	2000	2200	2400
	Horizontal distance *c* between means of protection (barrier) and the danger point mm							
2400	100	100	100	100	100	100	100	100
2200	600	600	500	500	400	350	250	
2000	1100	900	700	600	500	350		
1800	1100	1000	900	900	600			
1600	1300	1000	900	900	500			
1400	1300	1000	900	800	100			
1200	1400	1000	900	500				
1000	1400	1000	900	300				
800	1300	900	600					
600	1200	500						
400	1200	300						
200	1100	200						

Values below 1000 mm for edge *b* are not specified as this would not increase the arm's reach and in addition there would be a risk of falling into the test area.



a Distance between the danger point and the floor (danger point is the point on the boundary of the prohibition zone having the shortest distance from the edge of the means protection)

b Height of the edge of the means of protection

c Horizontal distance between the edge of the means of protection and the danger point

FIGURE 2
Demonstration of the dimensions listed in Table C. (Taken from EN 294).

Width of opening (diameter or side length) mm	Minimum distance from the prohibition zone mm		
	slot	square	circle
over 4 to 6	10	5	5
over 6 to 8	20	15	5
over 8 to 10	80	25	20
over 10 to 12	100	80	80
over 12 to 20	120	120	120
over 20 to 30	850	120	120
over 30 to 40	850	200	120
over 40 to 120	850	850	850

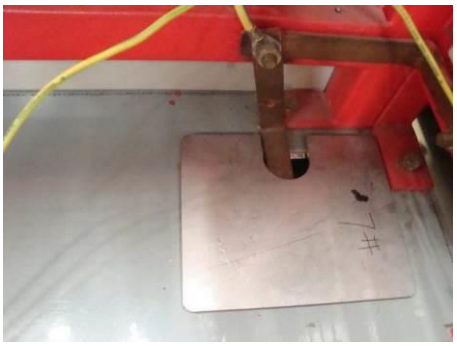
Table D
Minimum distance between openings in the barrier and the prohibition in relation to the width of the opening (Taken from EN 294).

NOTE: Anyone that has a pace maker shall not be allowed in the test area as the magnetic field created during the test might interfere with the functionality of the medical device.

4. On equipment >1kV there shall be a visible earth applied before touching test connections (application or removal). Where possible, the visible earth shall remain on test equipment when not in use.

Dielectric test on the main circuit (L1, L2, L3) at Industrial Frequency

The resistance from any point in the test area to the common earthing point shall be low enough to ensure a voltage drop of no more than 25 volts across any part of the circuit if the maximum fault current available were to flow through it. In any case the resistance shall be no more than 10 ohm. All earth conductors shall be connected at a common point, that common point is then connected to the Test Area Earthing grid. The HV lab and test object or enclosure must be earthed.



b) The secondary wires on the Current Transformer must be shorted and earthed.

c) The distance of the testing transformer and voltage divider to other devices is dependent on the test voltage applied but should be at least 1 meter and 1.9 meter from any fence or barrier less than 1.8 meter high

d) At least two qualified persons are required to be present at all times during HV testing

e) The output terminal of the test transformer shall remain earthed until immediately prior to the start of the test. The terminal shall be earthed immediately after the test is de-energized, whether this is due to an interruption or the completion of the test.

f) Full discharging is required at the conclusion of every test.

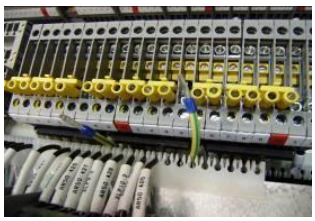
g) If any abnormal phenomena (such as smoking or flashing) are observed during the HV test, the power should be immediately cut off using the emergency stop button, and the problem investigated.

4.2 Dielectric test on the auxiliary control (DC, AC, CT & PT) circuits at Industrial Frequency

a) Check the HV probe and lead connections for damage before starting the test.

b) Check that the HV test device is in good operating condition

c) Remove all earthing connections from the auxiliary and control circuits



d) The HV test device should be connected to the frame of the switchgear panel and both should be connected to the common earth

e) The operator should wear insulation shoes and insulation gloves. The use of the “one hand” technique is recommended. (One hand technique: when working on energized circuits one should always keep one hand behind your back or in your pocket. Many times a person will carelessly ground himself with the hand he is not using the increases the chance that he will complete an unintentional circuit. Such a practice is an additional safety measure that takes in consideration that in

some situations gloves are not always worn all the time)

4.3 On equipment <1kV there shall a test for absence of voltage before touching test connections (application or removal). The voltage tester shall be designed for this purpose and checked before and after (in accordance with 7 steps methodology). Visible earths may also be used.

4.4 There shall be suitable manufacturer's information available for the safe operation of equipment.

4.5 Protective earth connections shall be in good condition and securely clamped to test equipment, apparatus and local earth grids.

4.6 Where test objects can contain stored energy, there shall be a safe means of discharging this before solid earthing, testing or touching connections

4.7 All test equipment shall be properly constructed, routinely inspected, maintained and records kept.

4.8 Where tests are carried out near live power systems or on systems taken out of service, the requirements of ABB minimum electrical safety rules (7, 5+2 steps principles) shall be met. Precautions shall be taken against induced voltages on subsequently unearthed power conductors including insulated sheath systems.

4.9 Where tests are carried out on live, in-service power systems, there shall be present a person authorized and competent to safely operate the power system, in the event of an emergency

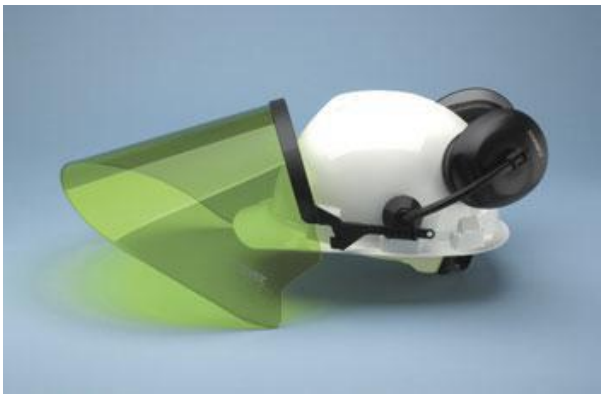
Test and measurement instruments

All equipment must be specifically designed, constructed and installed for purpose according to

manufacturer's instructions and relevant national safety standards.
Measurement and control arrangements must protect the operator from dangerous voltages at all times, in both normal and abnormal (test failure) conditions.
Portable measuring instruments shall have properly protected leads, probes and internal circuitry.
Instruments for proving dead must be designed for purpose and tested before and after proving. The use of multi-meters for proving dead is not recommended.
High voltage test sets should have 'zero start' protection so a short interruption in supply will not result in full voltage being re- applied.

Personal Protective Equipment

The following personal equipment must be used for all HV testing; Safety insulation gloves similar to the example below.
Safety insulations boots (EN20347 OB I) similar to the example below.
Safety Glasses / Visors safety electrical insulation helmet. Protective clothing requirements must be determined using the arc flash clothing code of practice. However, the minimum level which must be worn by all persons carrying out electrical tests is long sleeve shirts and long trousers



Typical risk situations on site

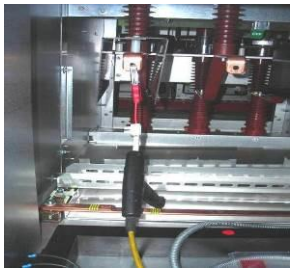
Some typical hazardous situations that can be encountered on site are listed in this chapter.
The presented list must be considered as main examples, It doesn't cover all possible risk situations and it doesn't replace safety working instructions that must be adopted in all risky tasks.

Tests and measurements within the prohibition zone: live working

Entry into the prohibition zone when dangerous voltage is present should be considered live work and subject to carefully worked out procedure with additional controls. Typically additional controls would be the use of voltage rated PPE, insulated screening and the use of the "four eyes" principle among others.

Application of test voltage using probes

These should be specifically designed for the purpose and operated using the "two hand" principle. Such safety measure requires concurrent and continued use of both hands during test, preventing them from entering the danger area.
Further detailed information is available in EN 50191.
See below for example some pictures on the use of a portable MV test set with probes for witchgear testing where an additional safety button was installed to protect operator: tests can be done only if the operator press this button.



In general, work on live parts is not permitted in ABB except special precautions are taken as followed mentioned.
According to ABB safety policy live work should not be undertaken, except in exceptional circumstances. The task should be subject to a risk assessment, with preference being given to alternative dead working options. If live work must be carried out, then it should be in accordance with an established and written procedure, using closely supervised persons who are specially trained and authorised in that procedure. Before work, each situation must be checked to confirm the procedure can be applied safely.

Tests on or near Power Systems

In addition to danger from the test process, testing on or near power systems must consider danger from the power system. The principal controls for danger from power systems are outlined in ABB minimum Electrical Safety Rules >1kV and <1kV (GISA 0.05A32 &33)
In many cases the competent person responsible for power system safety may be different from the test leader. In this case it is important to establish a common understanding of responsibilities and working arrangements in advance of the work. Competence as a test leader does not necessarily mean competence in power system safety.

a) Tests on primary power system conductors which are capable of being energised from the power system.
   - The conductors must first be made safe and released by a safety document in accordance with 7 steps (5+2) principles.
   - Access to supposed dead conductors must always be by means of a disciplined identification and proving dead process.

- Earths may then be removed for testing.
- Testers must be aware that there may be dangerous voltages induced from live power systems. The use of insulated gloves is recommended.
- Testers must be careful not to overstress insulation at points of isolation where service voltage and test voltage may be additive.

b) Tests near live operational power systems
   - Live equipment must be identified, labelled, and separated from the test area by barriers where applicable.
   - Safe working clearances must be maintained from live exposed conductors.
   - Particular care must be used when working in partially energized multi-panel switchboards. There is a significant risk of incorrect access to live components by hand, or when inserting test bushings. Interlocks must not be completely relied upon.

c) Tests not involving contact with primary conductors. Typically these involve test, calibration and measurements on protection, control and telemetry. The tester should consider the following points:
   - The location and electrical state of primary power conductors
   - Potentially dangerous low voltage wiring within panels (protect with insulated material, test supplies to have earth leakage protection)
   - Nearby live operational circuits, are they a hazard, can they be affected by the test process.
   - Danger from open circuit current transformers
   - Danger from common earth connections with operational equipment
   - Where tests are carried out on live, in-service power systems, there shall be present a person authorized and competent to safely operate the power system, in the event of an emergency.

Capacitors

Capacitors may form part of the test equipment or the test piece. As well as electrical danger from stored energy, electrocution and arc flash hazards, capacitors may contain flammable liquid which could be ignited by a short circuit and be a substantial fire risk.

Since the level of risk is dependent upon the size, location and voltage, a risk assessment shall be carried out at each location using the protocol described above.

The following general precautions shall be observed:

Access shall be restricted to specifically trained and authorized persons with a second competent person in attendance. Capacitor banks shall be in separate restricted areas with fire fighting

facilities. There shall be suitable arrangements for safe discharge. Capacitors shall be visibly shorted and earthed before touching connections (Individual capacitors shorted when in series) Capacitors shall remain shorted when not in use It is recommended that fixed capacitor banks are re-configured by suitable switches rather than manual handling of links and connections.

Inductive test objects

Energy stored in magnetic fields can generate substantial 'back emf'

Magnetic coupling can induce voltages in components not under test. All such components must be shorted and grounded when not actually being energized in a test.

Impulse testing

Surge impedance can result in voltages appearing across apparently good connections (especially earth circuits)

Pay particular attention to possible touch and step potentials around the test area, especially in temporary test areas for impulse current cable fault location.

Cables

Cables can hold substantial amounts of charge, safe methods of resistive discharge may be required. Polymeric insulation in particular can release charge onto conductors after initial discharge.

Cables can be charged up with lethal amounts of energy from very low output resistance measuring instruments.

Capacitive coupling

- At higher DC Voltages, nearby unearthed objects may become charged
- Capacitive coupling may occur between adjacent insulated windings
- Where the above conditions exist, the windings and components must be grounded

Lone Working

■ avoid the need for lone working if possible. For electrical work lone working is not permitted.

■ reduce the risk by limiting the activities to low risk ones only such as monitoring duties only and no operation of plant or equipment, working at height, in excavations or operating vehicles or mobile plant etc.

■ ensure that the lone worker is competent and understands the limits of his work activities.

■ provide a suitable means of communication so that he can alert someone in a supervisory capacity in the event that there is something of concern, or in the case of an emergency.

■ ensure that there is pre-determined calling in system so that the lone worker has to check in at certain times and if he does not then steps can be taken to investigate.

■ actively contact the lone worker to check on his status throughout the shift.

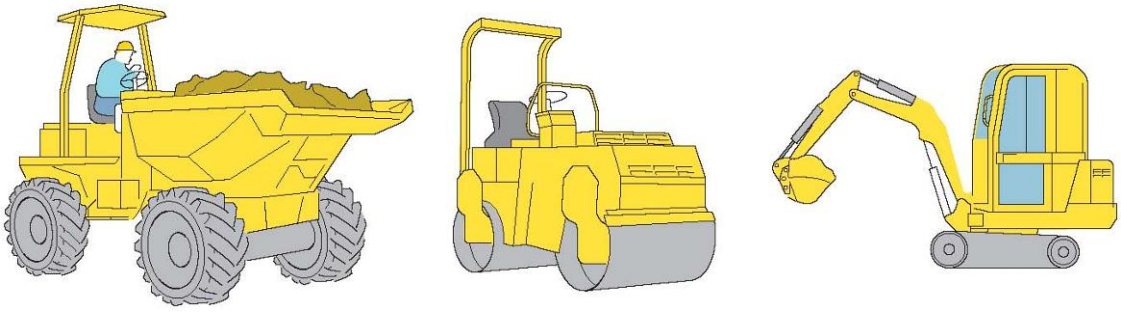
■ provide the lone worker with some form of alarm, manual or automatic which operates when there is a lack of activity.

■ ensure that the lone worker has a “travelling” first aid kit available. When considering the safety of any lone worker this shall include all persons including contractors working on site.

Mobile Plant, Equipment & Vehicles

The general safety requires are followings:

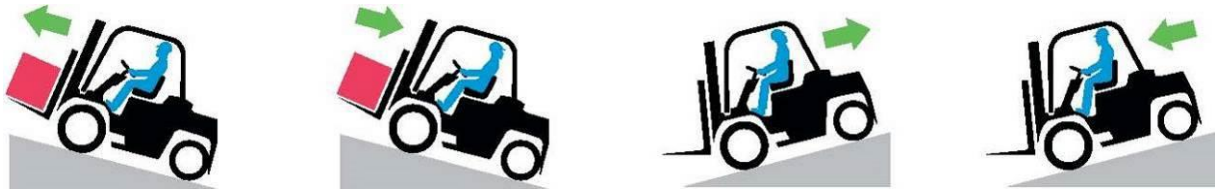
- stability under all foreseeable operating conditions;
- safe access to and from the cab and any other working position on the vehicle;
- provision of effective braking systems;
- provision of headlights, flashing light, horn, windscreen wipers and a reversing alarm;
- physical guards to safeguard dangerous parts such as power take-off shafts and couplings as well as protection from hot surfaces on exhaust pipes
- provision of roll over protection (ROPS) as well as protection from falling objects (FOPS);
- general protection from weather, noise, vibration, dusts etc.



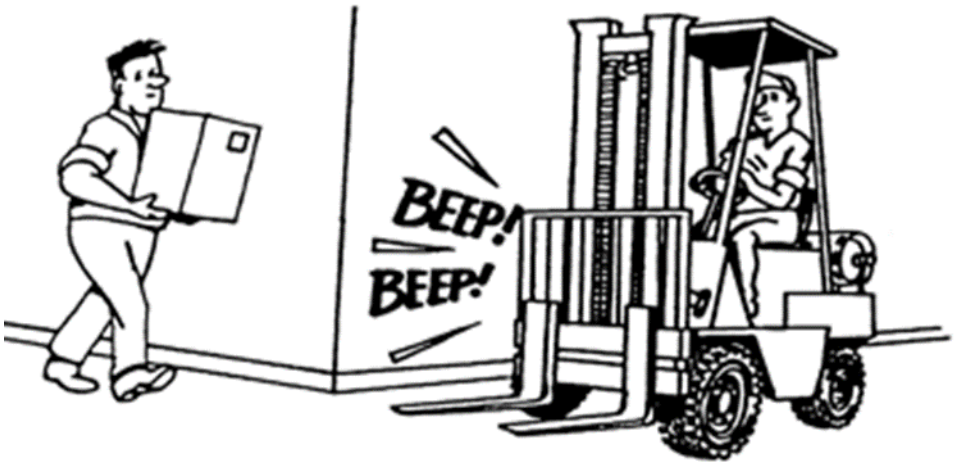
- ensure that drivers are properly trained (and in some cases OKJ certificate) are competent and are authorised to drive the vehicle;
- vehicles should be of suitable construction and be properly maintained on a regular basis;
- all drivers should carry out a daily check (and write the notice) of their vehicles. This shall include tyres, brakes, lights, horn, mirrors, reversing alarm and flashing light;
- all vehicles must be driven with proper regard to speed limit on site and general conditions;

- seat belts shall be fitted and worn whenever the vehicle is moving;
- do not reverse without checking behind for pedestrians, other vehicles or fixed structures;
- do not remain in vehicle during bulk loading operations, unless loads are small e.g. dumper trucks;
- loads are the responsibility of the driver to ensure that they are safe to transport and no vehicle should travel with the load raised;
- always ensure that the vehicle is parked on level ground with the handbrake on, fuel isolated and the keys returned to the site office.
- In all cases drivers or operators of mobile plant etc shall be competent and authorised to operate or drive plant or vehicles on ite. Documentary evidence shall be provided and a copies kept on site.

Lift trucks travelling up or down a slope



To avoid this, drive with forks as low as possible



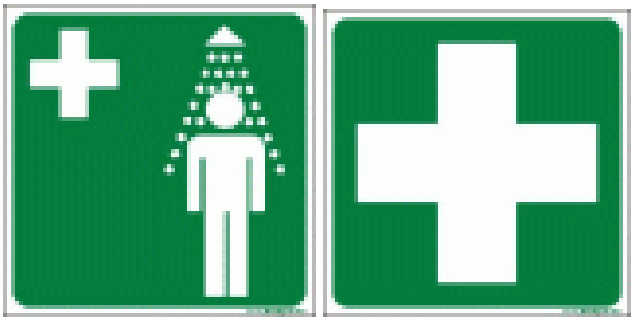
- **Blow the horn and drive slowly when approaching a blind corner.**

- **Do not speed.**

Signage Signage

There a 4 basic categories of safety signs.

1. **Safe condition** -signs that indicate the safe condition can be rectangular or square in shape and will typically be used to indicate the means of escape in case of fire, then first aid station, safety shower etc. The pictogram is on a green background and the green portion must take up 50 % of the sign.



2. **Prohibition-signs** that prohibit an activity or behaviour that is likely to increase a danger. They are circular in shape with a black pictogram (0.06 X size of sign) on a white background, red edging and diagonal line where the red coloured part amounts to 35% of the sign. The diagonal line to be 45∞ and 0.08 X the diameter.

3. **Hazard warning**-signs that give warning of a particular hazard or danger and are triangular in shape with a black pictogram on a yellow background with black edging where the yellow portion must amount o at least 50% of the sign.

4. Mandatory signs which indicate a requirement that must be complied with (for example: PPE using). The signs are round in shape and have a white pictogram on a blue background where the blue portion is 50% of the area of the sign.

The table minimum size should be 0.25x0.25m. Safety signs can also come in combinations.
The site set up should include identifying what signage is required and may also include the installation of a site notice board which can indicate what PPE will be required to be worn on site.

Individual safety devices

In building workplaces people may be exposed to several kinds of danger (falling off high altitude, hit, cut, sting, slip, falling, etc.). Employer has to assess potential harms, which might endanger safety and health of employees (qualitatively and quantitavely), and has to take preliminary technical and organizational steps to minimalize risks. If these steps are not proved to be sufficient, employer has to provide individual safety device for employees and request their usage.
Building workplaces are generally temporary workplaces, so it is not practical or economical to provide permanent and collective protection. The most expedient solution is to use individual safety devices.
It is the employer who is responsible for delivering, cleaning and maintaining individual safety devices. Every employee must be given personal safety device per person. Every employee must be given that safety device or devices which needed for performing his own work. The usage of individual safety device is obligatory.

The name of individual safety device	Protection	Protection against harm	The name of works
Safety glove	Hand	Mechanical injuries, burning lesions ,	Touching rough objects, causing injury, welding glove,
Safety shoe	Foot	Steel- nosed boots,	Heavy objects protection against falling on foot,
Safety helmet	Head	Protection against objects falling from high altitudek, protection against sideway hits	At fitting works

Goggles	Eye	Protection against mechanical injuries, objects getting into an eye.	Grinding, demolition works,
Work belt, body belt	Whole body	Falling off high altitude	Fitting of concrete pillars, working on roof working
Dust mask	Breathing protection	Against the inhalation of dust,	Dusty works, demolition,
Welding glasses	Eye	Against dazzling, blinding light,	Welding works

- Employer ensures workclothes, safety wear and individual safety device, and makes sure they are cleaned and corrected.
- Individual safety device must be selected to protect against any harm and danger, considering the body size of employees. Individual safety device must be certified (EK certification) and if necessary it has to be at disposal.
- Wearing safety helmet is obligatory in construction implementation work area! Except for office works or skilled work performing inside workplaces (no danger of objects falling).

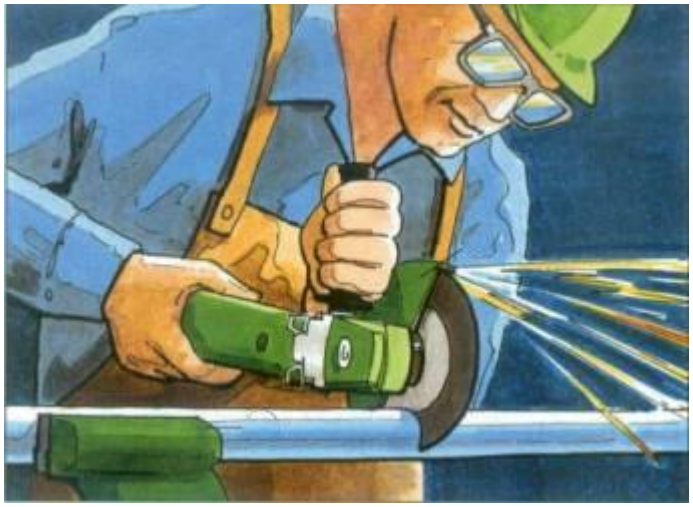
Hand/arm protection

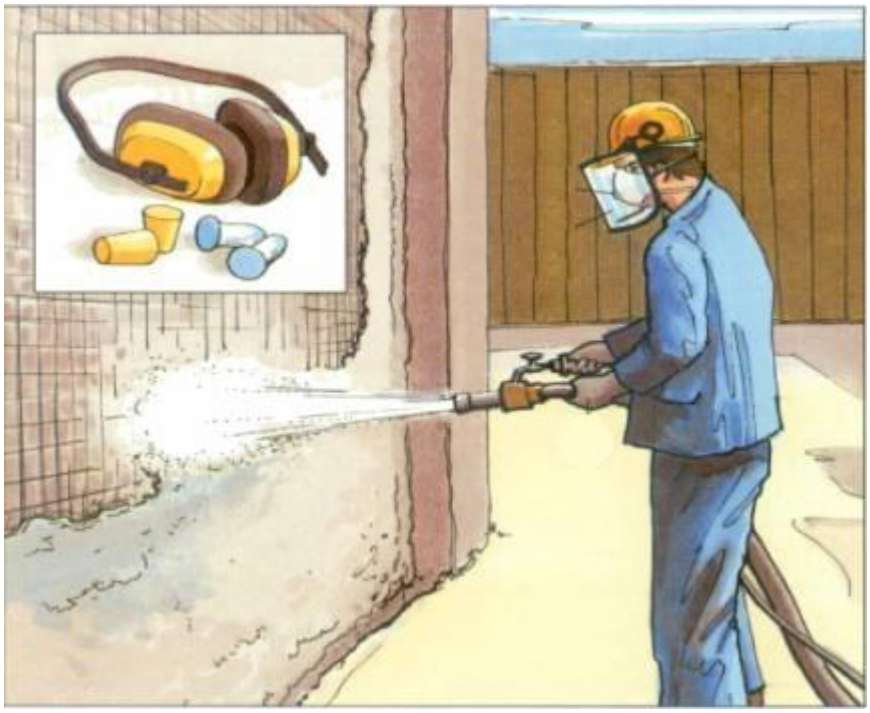
Gloves provide protection against a number of hazards. This includes protection against cuts and abrasions, barrier protection when handling chemical substances. Gloves also provide a degree of protection from electrocution and arc flash, but these must be rated for the voltage being worked on.

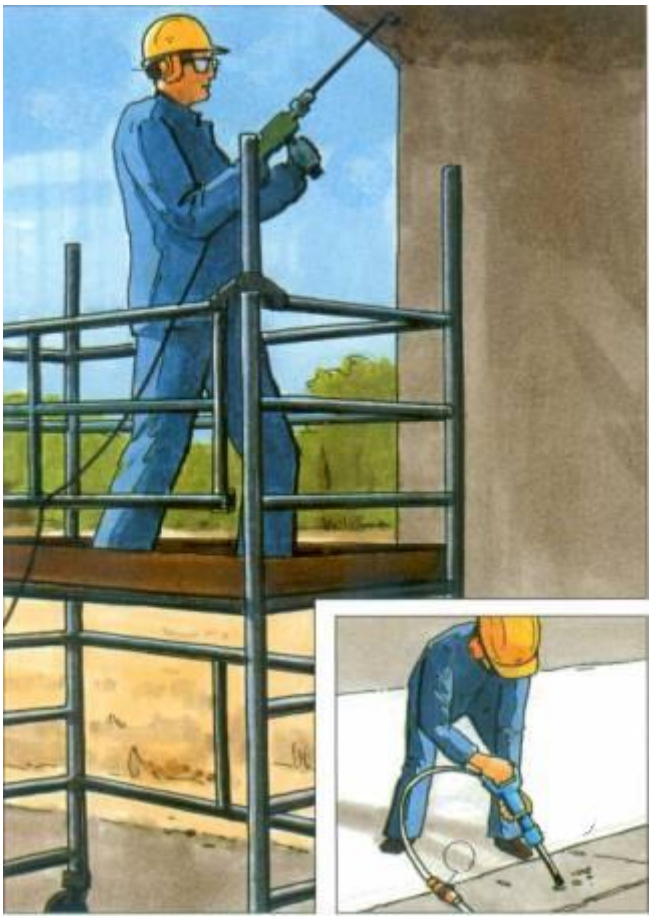
Eye- protection

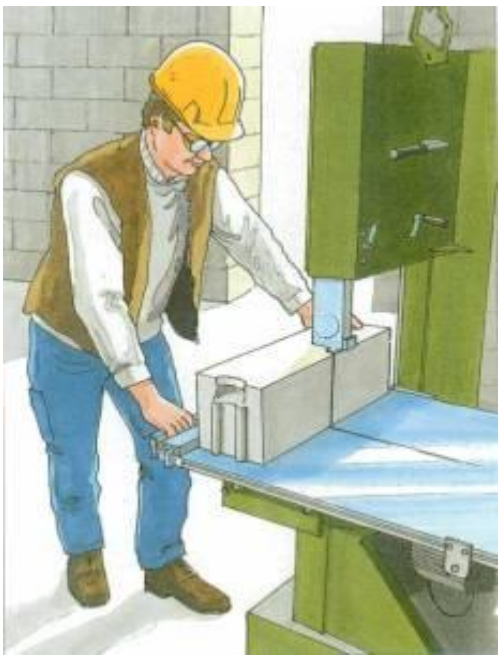
In the very rare case employers provide eye-protecting individual safety device for employees working in constructing and fitting workplaces, which may prevent spurting, jumping, cutting out, falling down substances getting into eye. Although in the course of slicing, drilling, engraving, putting on concrete and mortar mechanically the usage of safety device is necessary. Eye-protection is also necessary in

wind and draught. (Nowadays, a lot of constructors make it obligatory to wear safety goggles no matter why the one staying in building area.)



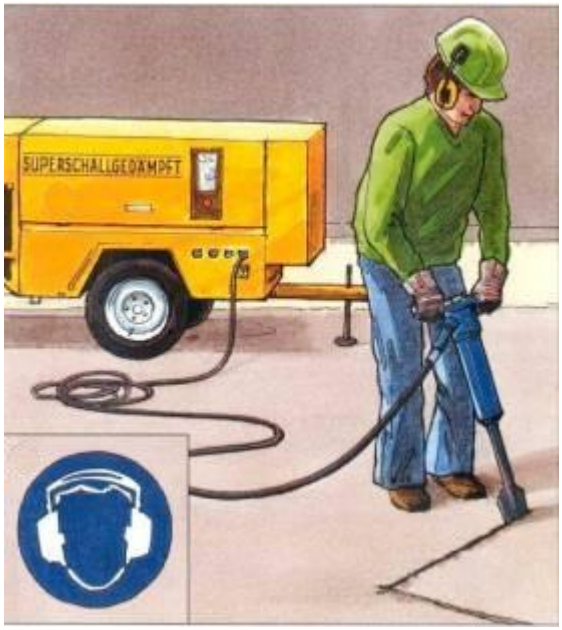






Hearing protection

In the course of particular construction activities, considerable noise is imposed on employees. For example people working with hammer operated by compressed air or people working necessary to be provided with earplug, ear-case or ear-padding on the basis of sound pressure level.



Hearing protection should be made available on site where the noise levels are likely to exceed 80 dB(A)or a peak sound level of 112 Pa which is the lower action limit. Where it exceeds 85 dB(A) or a peak sound level 140 Pa which is the upper action limit then hearing protection must be provided and worn.

Noise exposure

- Exposure to loud noise over long periods can lead to hearing loss. In some cases this may be severe. It is also compounded in later life due to the normal loss of hearing associated with old age.
- Noise is transmitted through vibrating air to the fine hair cells in the inner ear which become damaged. This damage is irreversible.

- It is the higher frequency sounds that tend to cause most damage in terms,
- Noise is measured in decibels dB(A). The daily noise dose is expressed as a personal daily exposure (Lepd).
- The scale is logarithmic and so an increase in noise of 3 dB(A) represents a doubling of the noise energy.
- The lower action limit is 80dB(A) and a peak sound pressure level of 112 pascals (Pa). This is the level at which hearing protection must be made available.
- The upper exposure action level is 85dB(A) and 140 Pa peak at which hearing protection zones need to be established and hearing protectors provided to workers and worn.
- The maximum permitted exposure averaged over a working week of 5 eight hour days is 87dB(A) and 200 Pa peak which must not be exceeded.
- Each of the exposures listed in the table below are in fact equivalent i.e. they are the same.

Exposure period (hours)	Noise Level dB(A)
8	85
4	88
2	91
1	94
0.5	97
0.25	100

Some typical noise levels

Typical Construction Equipment	Typical Sound level dB(A)
electric hand tools	99
air hand tools	100
fork lift trucks	101
hammer drills	102
dumper trucks	103
concrete mixer	104
petrol driven tools	105
circular bench saw	107
excavators	109
crawler cranes	110
ready mix equipment	112
loading shovel	114
rock drill	115
generators	117
compressors	120

Controlling noise on site

- Ensure that any plant procured is designed to produce low levels of noise.
- Where plant or equipment is to be used on site and it has a high noise level e.g. a generator or compressor then locate it in an area

  set apart where it will not directly affect those working on the site, or ensure that it has some acoustic covers. Important when working in residential areas.

- Identify all geographical areas where hearing protection is required through the use of signs etc;
- Identify all mobile and portable equipment that requires the use of hearing protection while being operated;
- Where such protection is provided workers shall be instructed in its use and its care and maintenance.
- Adequate supplies to be made available on site for workers and also other persons such as visitors.

Environmental considerations

The above refers to the occupational effects of noise on those who may be working on site. It should also be noted that where the site is located within a built up area then the noise might have an effect on the local residents. This is particularly important where work is carried out at night. In many cases local authorities will impose certain restrictions in terms of noise emissions. The site manager will need to check what the local requirements are with the local authority.

Employees working in high noise areas exceeding 85 dB (A), shall periodically attend training on noise effects and appropriate personal protective equipment that should be used.

The training shall include instruction on the following topics:

- • Effects of noise on hearing ability and general well being
- • Noise induced hearing loss is irreversible and therefore permanent
- • Noise induced hearing loss can occur with relatively short exposures
- • Other hearing impairments or defects e.g. tinnitus.
- • Measurement of noise levels
- • Noise reduction techniques
- • Types of personal protective equipment available
- • Process for obtaining the correct equipment
- • Care and maintenance of equipment including need for cleanliness.

Vibration

Working tools may cause vibration that could lead to "white fingers" or hand-arm vibration syndrome (HAVS). This is especially dangerous when proper damping techniques are not applied, if machines are not maintained, if tools are not alternated, or if a worker uses a vibrating tool for consecutive hours during a workday. Workers need to be trained on the hazards of working with vibrating tools, and should always allow the tool or machine to do the work.

The harmful effects of vibration:

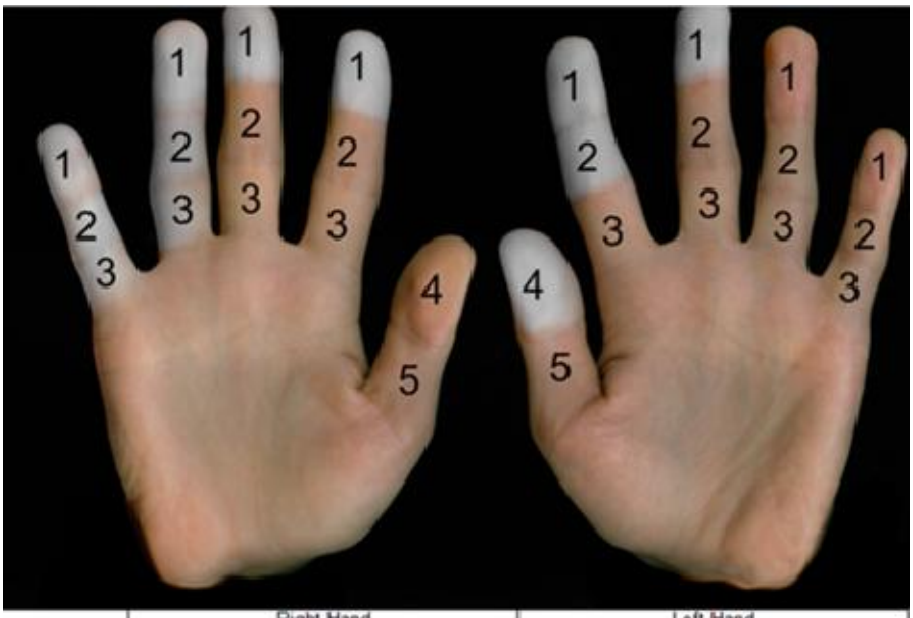
The fingers will be white color.

Pain in the blood is come back to hand,

The condition worsens when your hands are cold,

The effects of the vibration is measured on a scale of 0-Stockholm-4,

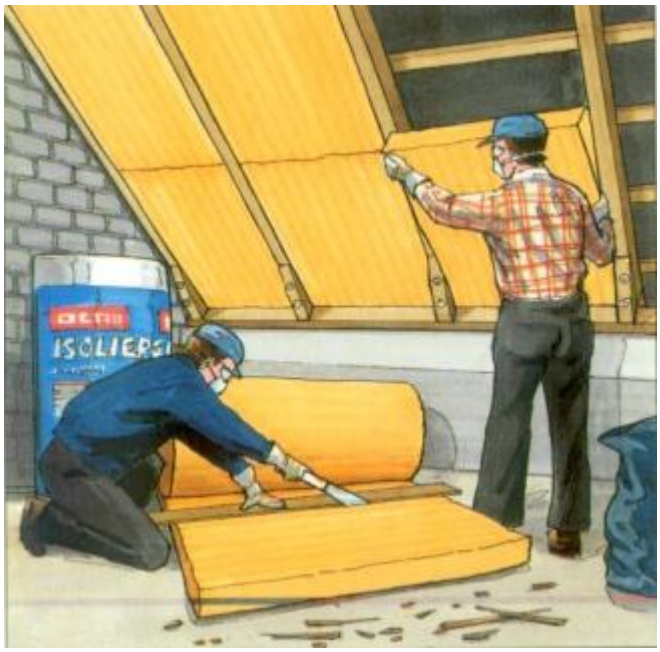
The vibration is caused by lesions can be not reversed,



	Right Hand					Left Hand				
Finger	5	4	3	2	Th.	Th.	2	3	4	5
Possible Score	1+2 +3	1+2+3	1+2+3	1+2+3	4+5	4+5	1+2+3	1+2+3	1+2+3	1+2 +3
Exemplary score	6	6	1	1	0	4	3	1	0	0
Sum	14					8				

Breathing protection

In the course of working with fiberglass, etc. substances used for insulation of buildings, in the very rare case people use safety device to protect elementary particles to get into nose and mouth cavity. In spite of the fact working with substances like this may cause respiratory sickness.



In the course of working activity with solvents, chemical agents, plain safety mask is not sufficient, proper gas mask supplied with suitable pad must be given and worn!

Your employer is responsible for selecting appropriate respirators to protect you from airborne hazards. To ensure that the correct respirator is selected, your employer must consider a number of factors.

Your respirator will need different types of filters, cartridges, or canisters depending on the type and amount of airborne contaminant in your workplace. It is your employer's responsibility to determine which filter, cartridge, or canister is necessary and how often it needs to be changed. For example, respirators that have particulate filters will not protect you against gases, vapors and the non-particulate components of fumes, mists, fogs, smoke and sprays.

Your employer must also determine if the work atmosphere lacks sufficient oxygen, that is, if it is oxygen-deficient, or is contaminated to the point of being immediately dangerous to life or health. In that case, you must follow the regulation of Confined Spaces.

The most common risk factors and prevention solutions in building workplaces

Falling objects, substances

In building workplaces falling objects, substances are always expected so it is fundamental requirement to wear safety helmet all the time (at ground-, roadwork as well!).Except for office works and skilled works performing in inner workplace, in these cases people are not jeopardized of falling objects. In case of a body position when helmet may fall off, it must be fixed with chin-strap.

Falling off high altitude

Deathly work accidents mostly occur as a result of falling off high altitude.

If sufficient protection against fall cannot be provided with technical solution, employee can only work wearing work belt, safety band, but in a case like this beforehand - so before starting of work – employer has to form and assign constructions, to which employee may fix safety device.

Working at high altitude is considered to be one of the most dangerous activities of construction work and it is proved by fact that accidents caused by falling off high altitude are the most serious ones. Employers, but unfortunately even employees often underestimate potential danger, and often assert that having worked at high altitude for years, they have never fallen off.

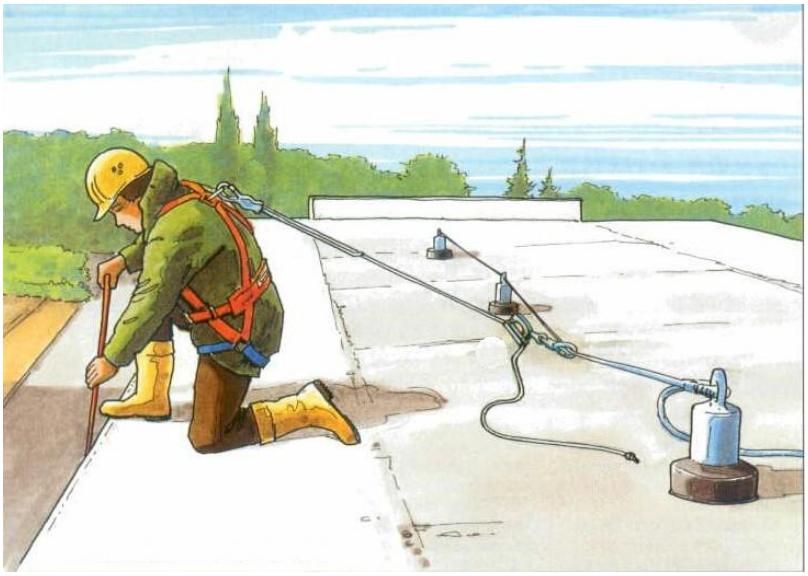
- It is necessary to develop protection equipments providing safety against fall. If it is not possible, or it cannot be solved technically, then work belt, safety band must be used. In a case like this, a construction needs to be assigned, to which employee can fix safety equipment.
- Working on work level being over 2,0 metres is considered to be work at high altitude.
- Assembling transitive beams on top of concrete pillars, it is obligatory to wear belt preventing fall.

It is necessary to provide protection against fall in the following cases:

- when altitude of working exceeds 2,0 m;
- if workplace or traffic road may be located over water or above any other substance, which might cause drowning;
- In the course of opening or building floors, roofs, ceilings, lighting, mines;
- At work to be done on roof exceeding 2,0 m of altitude and paths leading to them;
- In groundworks.

Protection against fall must be developed with technical solutions, safety equipments and collective protection. This protection has to be as efficient as the protection of footboard supplied with railing of 1,0 m high.

Employees must be given practical training on safe usage of devices.

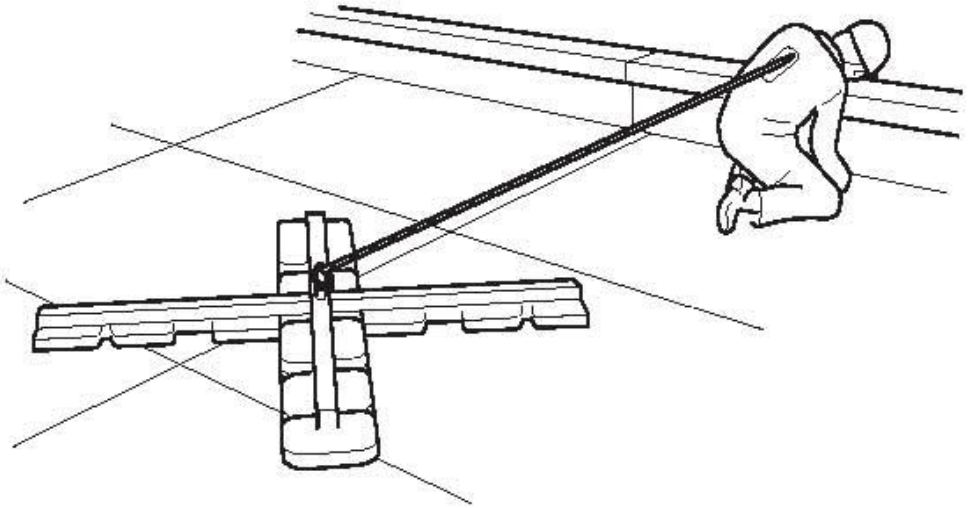


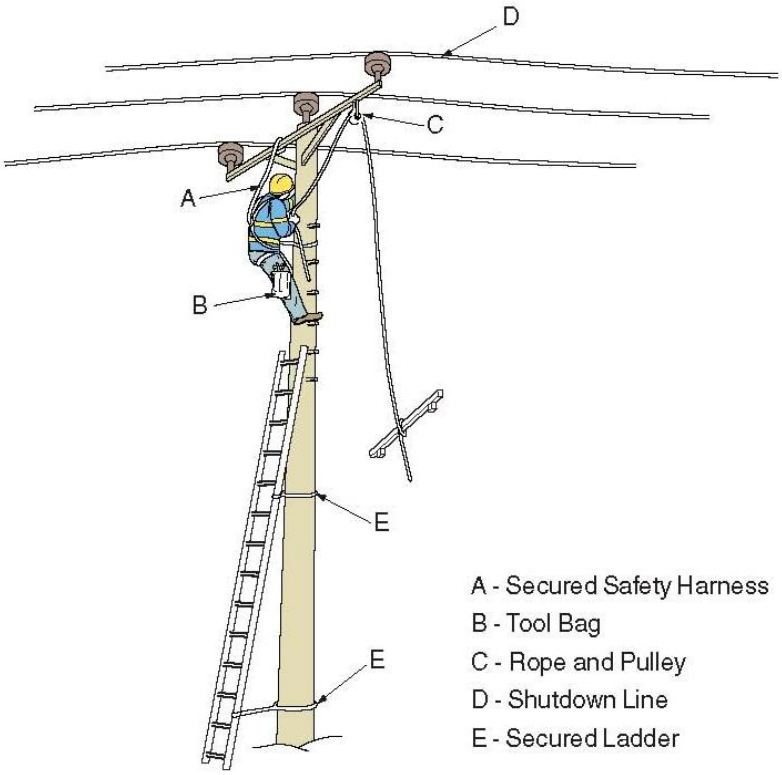
Working in the dangerous neighborhood of roof edge

Working near a roof slot

Working on latticed construction

Working on roof ladder fixed on roof plane



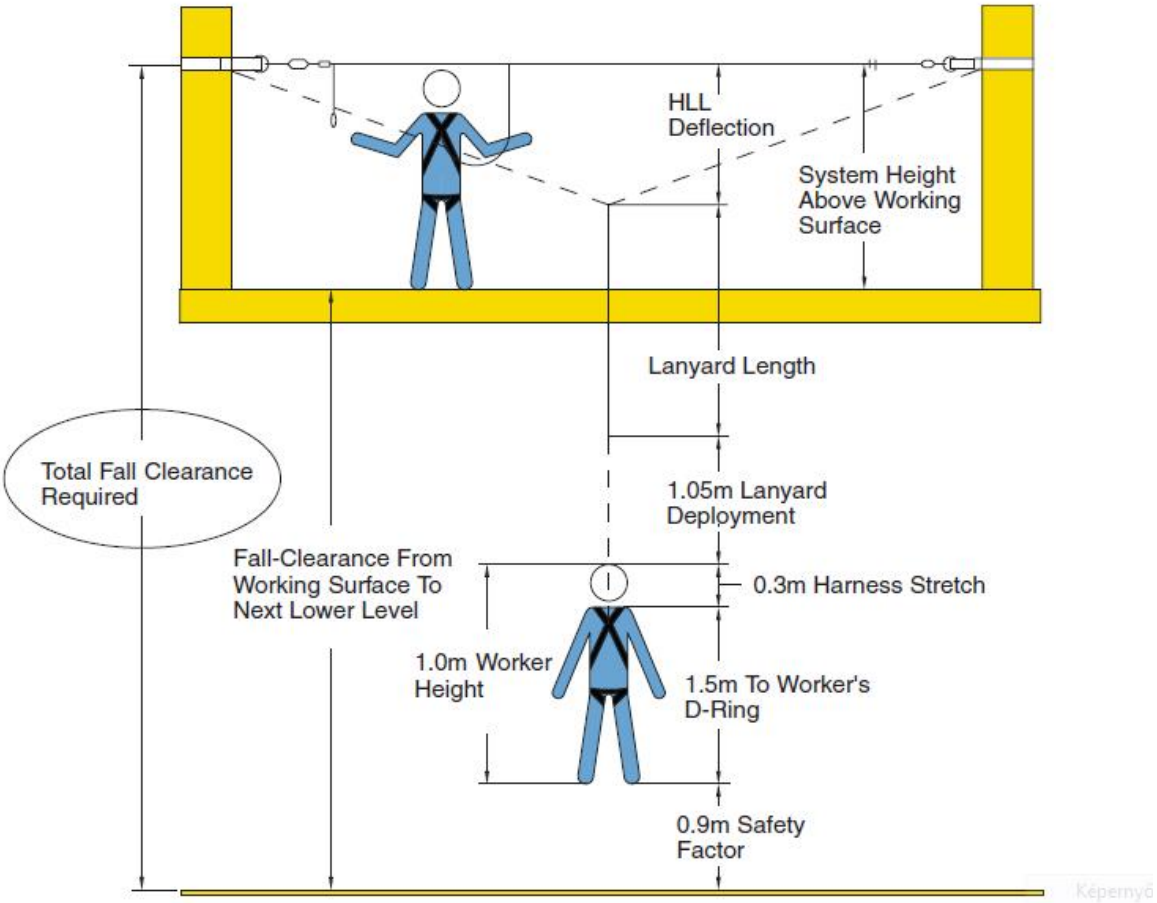


Safety in the use of Harnesses & Temporary Lifelines

Horizontal temporary lifelines need to be set up correctly having given proper consideration to the key factors. They include:

- position of the anchor point relative to the position of the operator;
- fall clearance
- swing factor

The typical configuration where the max angle between the lanyard and the vertical should not exceed 30°. Wherever it is practicable the operator should work directly under or alongside the lifeline to avoid the hazard of a swing fall.

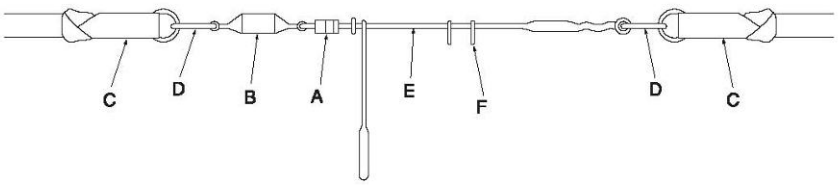


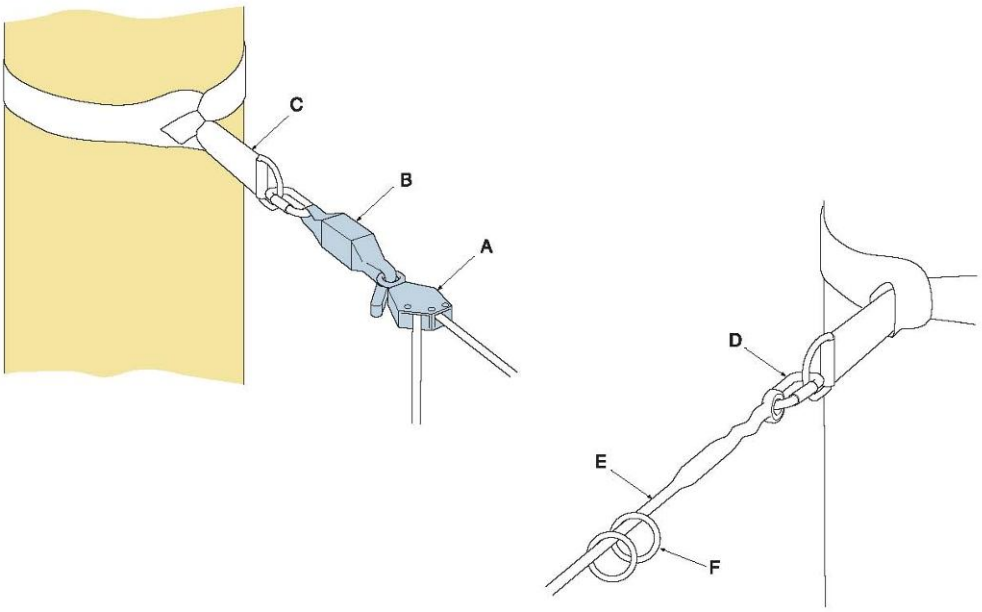
The lifeline shall be 15.9 mm polyester with a tensile strength of 77.8kN minimum tensile strength and must be attached independently of the working surface and be placed at or above the back D-ring on the harness.

The maximum free fall distance should be restricted to 1.8m

Anchor points

Anchor points shall be capable of supporting 22kN. Lanyards should never be wrapped around rough or sharp anchor points. A cross arm strap should be used.





System should have a minimum capacity of 140kg for one worker and maximum capacity for two workers of 140kg each with two O-rings and in line shock absorber.

A	Tensioner	Used to adjust the length of the rope, indicate proper tension and maintain tension rated at 22.2 kN.
B	In Line Shock Absorber	Designed to limit forces to 11.2kN which provides a safety factor of 2:1 for 22.2kN
C	Cross arm straps	Used to secure lifeline to anchorage point. &6mm wide heavy duty polyester with 22.2kN breaking strain.
D	Snaphook	Self-locking snaphook used to connect the ends of the lifeline to an approved anchorage connector. Typically zinc plated forged alloy steel proof tested to 16kN connector. Typically zinc plated forged alloy steel proof tested to 16kN.
E	Lifeline	15.9 mm polyester rope used to span between two anchorage connectors
F	O-ring	Used to connect worker's shock absorbing lanyard or self retracting lifeline to horizontal lifeline. Typically zinc plated 60X50mm diameter forged alloy steel with minimum strength of 22.2kN.

Ensure that the anchor point is at a height that limits the free fall distance to 1.8m or less. The anchor point must also be compatible with the snaphook or carabiner.

Installation

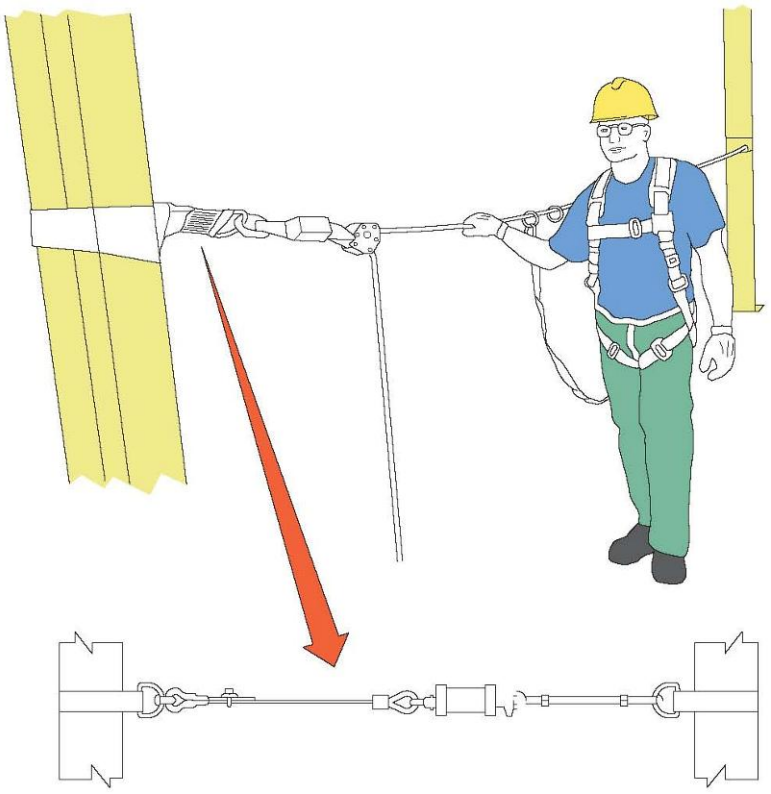
The horizontal lifeline system must be erected and checked by a competent person.

Before installation carefully inspect all component parts to ensure that no components are missing or damaged. Ensure that cross arm strap is wrapped as many times as possible to prevent slippage. The D-ring should pass completely through the loop.

Snaphooks or carabiners should be secured on each end of the lifeline and that there is no loading on the keeper. Remove slack in the system by the pulling the rope through and by applying tensioner.

Shock absorbers can elongate by up to 1m.

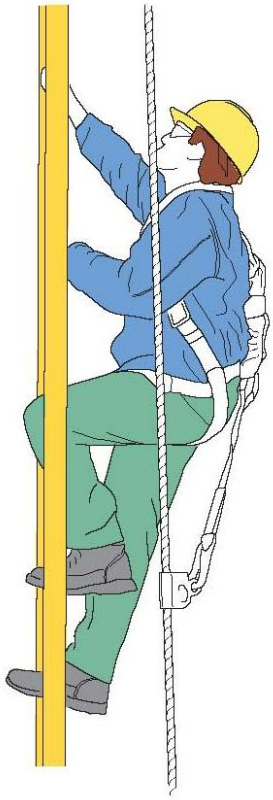
	Fall clearance-1 worker		Fall clearance- 2 workers		Fall clearance-1/2 workers with self retracting lanyards	
Span length	Length of lanyard		Length of lanyard		Clearance 1 worker	Clearance 2 workers
	0.9m	1.8m	0.9m	1.8m		
0-10	5.72m	6.62	5.72	6.62	5.72	5.72
11-20	5.9	6.8	5.92	6.62	5.9	5.92
21-20	6.07	6.98	6.2	7.10	6.07	6.2
31-40	6.25	7.15	6.5	7.4	6.25	6.47
41-50	6.42	7.32	6.77	7.67	6.42	6.77
51-60	6.62	7.75	7.07	7.97	6.62	7.07



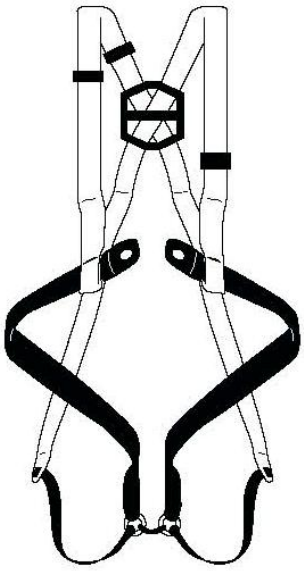
VERTICAL LIFELINES

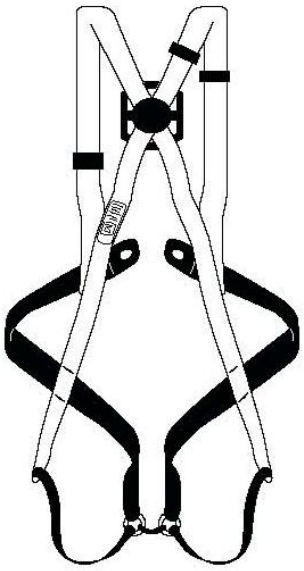
The same basic principles apply in respect of vertical lifelines.

An important factor is to ensure that the lifeline is properly assembled with a carabiner and that it is properly secured to a suitable anchor point.



- Harness: The attachment ring should be in the back and near the shoulders. Hardware, except rivets, must be capable of withstanding a tensile loading 22.2kN without cracking, breaking, or taking a permanent deformation.





- Lanyard: The lanyard must be rope or shock-absorbing web lanyard, not to exceed six feet in length. The lanyard and all of its components in a fall arrest system must have a minimum tensile strength of 22.2kN. Locking type snap hooks should be used to connect the lanyard to the harness.
- The lanyard may be self-retractable that allows freedom of movement but protects the worker should a fall occur. The webbing moves with the worker, reeling out when the person moves away, and retracting when the worker moves closer. See fig 4. If the worker falls, the reel locks, restricting the fall distance to two feet or less. The lanyard may be connected with proper connectors to a vertical or horizontal lifeline.
- A shock-absorbing lanyard will substantially reduce the force created during a fall. The maximum lanyard elongation when resisting a fall must not exceed 1.06m in length.
- Lifeline: The lifeline can be horizontal or vertical and must have a minimum tensile strength of 22.2kN. Vertical lifelines may only support one worker at a time.
- Rope Grabs: A person may be connected to a lifeline by means of a rope grab or by a rope grab and lanyard combination. The lanyard must be less than six feet long to restrict the overall fall to six feet or less. The lifeline size must be stamped on the rope grab, and only that size and type of line used.
- Anchorage: The strength of any fall protection system is dependent on a secure attachment point. The attachment point must be capable of supporting a least 22.2kN per employee attached to the line, or designed with a safety factor of 2:1.
- Rigging: Anchor points should be as high as possible, but never lower than the connection point on the harness. Workers must be tied off in a manner that ensures no lower level or

other surfaces are struck during a fall.

- Training and Inspection: All persons using a fall protection system must be trained on the safe use of the system including: Proper fit, wear, inspection, limitations, and care of the system. Fall protection systems must be inspected prior to each day's use and inspected at intervals as established by the manufacturer.
- Rescue: An emergency rescue procedure must be established prior to using any fall arrest system, including self-rescue, outside services, and in-house rescue. The procedure should outline equipment to be used for rescue, notification procedures, emergency phone numbers, and responsible personnel.
- It is important that only certain competent nominated or authorised persons are allowed to install lifeline equipment. All such assembles must be inspected and checked prior to use.
- In addition all users shall be given suitable training and instruction in how to inspect their harness prior to use and also how to operate the lifeline system.
- In addition to training the installers and users it is also necessary to provide training in the event that there is an emergency i.e. fall and how to effect a
- inspection for physical damage, wear and corrosion check the tensioner for damage, crack, wear corrosion and malfunctioning components. Inspect lifeline, harnesses and anchorage points for cuts, frays, burns etc
- Each part of the lifeline system shall be subject to a regular inspection and a suitable record kept. Each part of the system including the lanyards and harnesses shall have an ID number
- EN 365-Personal Protective equipment against falls from height –General requirements for instructions for use, maintenance, periodic examination, repair, marking and packging refers.

Railings

According to earlier regulations railing must be supplied with 1,0 m of high footboard, double-line and with distance not bigger than 0,5m.

According to effective regulation railing must be supplied with 1,0 m of high footboard, triple-line and with distance not bigger than 0,3 m.

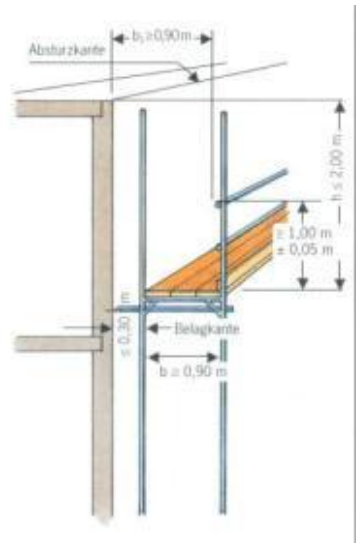
Railings manufactured by earlier regulations are permitted because changing them may cause significant extra cost. Additional important requirement in connection with railings is that railings have to be stable and solid enough.

Scaffolding

Scaffolding formed to prevent falling must be solid, high and provided with minimum one foot board, a middle board, and a bar, or any equivalent solution to accomplish their function.

The distance between the edge of scaffolding floor and the building pane may not be more than 30 cm.

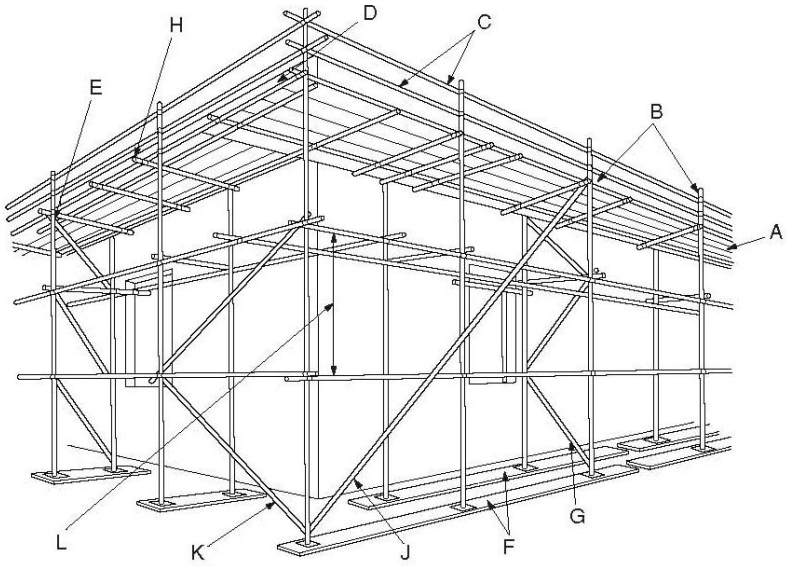
The working site - if falling might be possible off there - then the distance between working level and rack floor walking level may not be bigger than 2,0m.
The detailed requirements relating to scaffolding in the MSZE 17177:2010.



Safety requirements of scaffolding

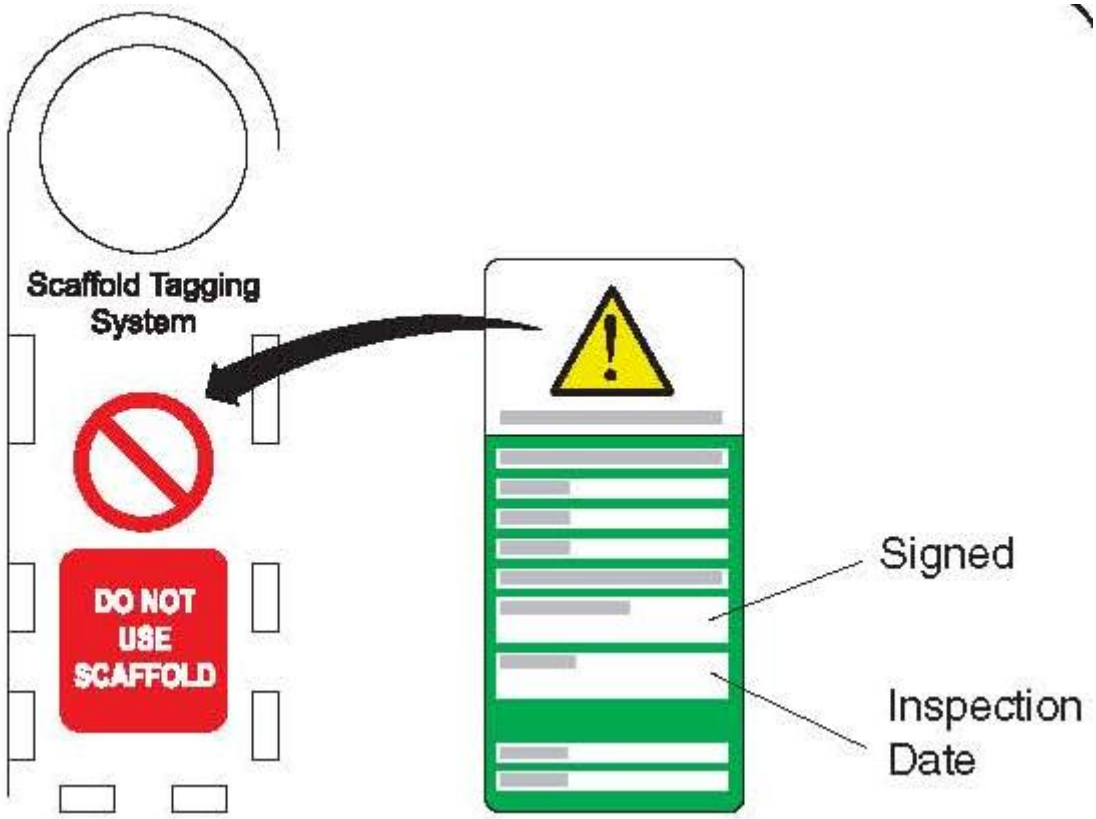
- Planning, implementation, supervision of construction scaffolding must be carried out on the basis of relevant effective measures.
- Scaffolding must be made of standard elements.
- All scaffoldings have to be checked before using, after stormy weather, or long interruption.
- It is necessary to fix accurate time of supervision in writing.
- Examination has to cover quality of material, stability of braces, clamps, screws.
- Scaffoldings have periodical examination, which must be done. (including moving, rolling scaffoldings.)
- Self-propelled basketlifters belong to group of hoists, safety labour protection regulations concerning them, is accordant with regulations concerning hoists.

A - Working platform (600 - 1000 mm min width).
B - Guard-rails and toe-boards fixed to the standards.
C - Guard rails 950 - 470 mm.
D - Toe Board 150 mm.
E - Transoms fixed with putlog or right-angle couplers.
F - Timber sole plates when standing on soil (38 x 225 mm).
G - Diagonal bracing at right-angles to building every other standard.
H - Transoms max 1.2 m apart for general duty.
J - Longitudinal or facade bracing.
K - Zigzag bracing.
L - Lift height 2.1 - 2.5 m.

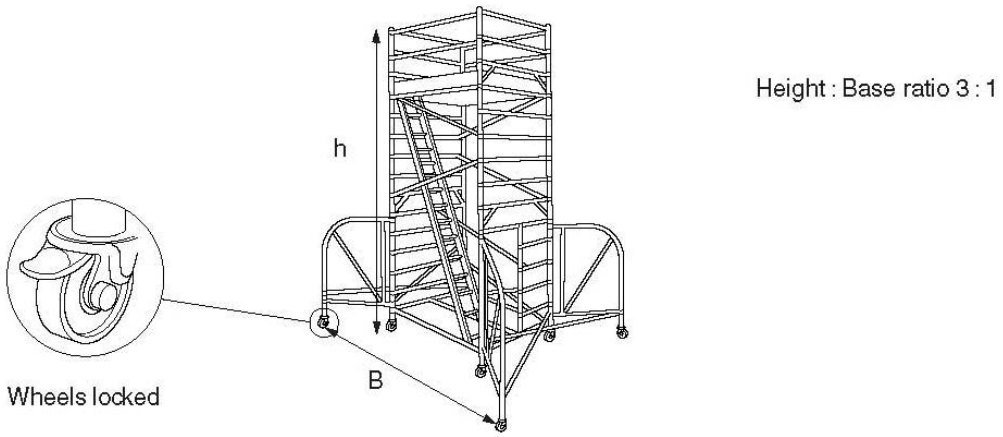


Key checks

- Scaffold needs to be erected by a competent person and tagged to indicate it has been checked.
- Scaffold erected on ground must have suitable sole plates to support and spread the load. Avoid manholes and excavations.
- Working platform width 600mm min and adequately supported.
- Scaffolding tubing and fixtures shall be made of metal.Timber boards to be of sound material and adequate strength.



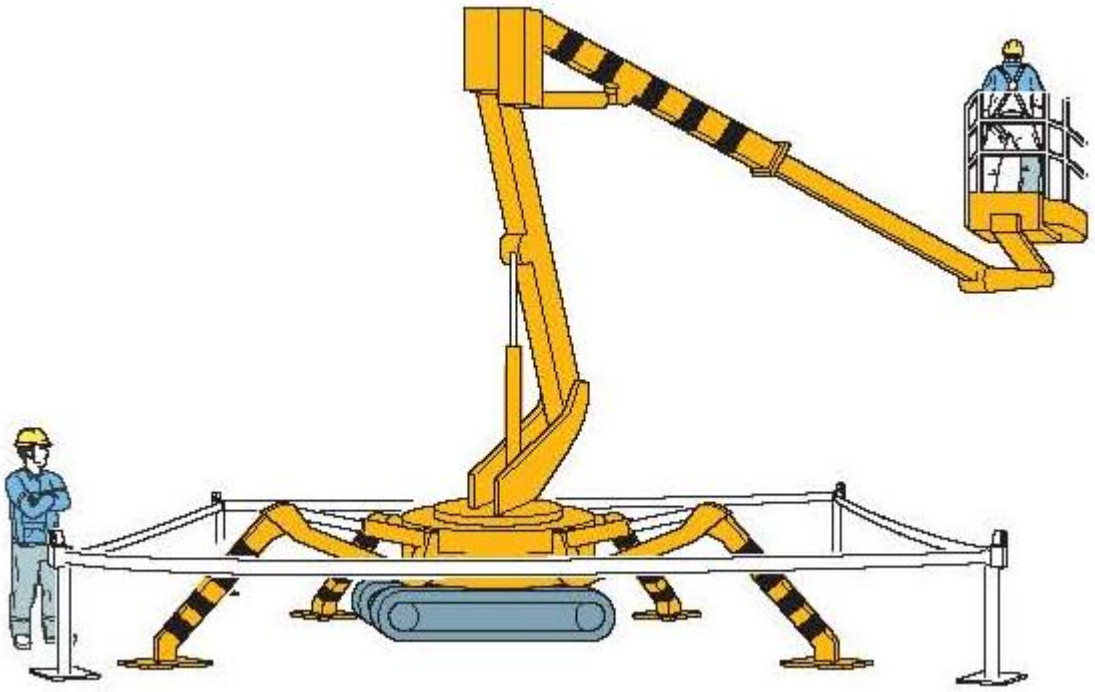
- Scaffold must be inspected before use, after any alteration and in any event every 7 days.
- Scaffold needs to be suitable for the predicted loads and adequate consideration of any wind loading.
- The scaffold's duard rails for the general according to the guard rails safety requirements should be established.



- Mobile scaffolds shall be erected according to the manufacturers instructions by a competent person and tagged as safe for use.
- The ratio of height to base shall not exceed the manufacturers recommendations, 3:1 for tower scaffolds used outside.

- The mobile scaffold must be vertical and erected so that the legs are on firm and level ground.
- Wheels and outriggers to be locked or secured in position with a suitable exclusion zone marked out.
- Provide a safe means of access e.g. an internal ladder.
- The mobile scaffold will need to be tied to the structure it is serving, if the tower is sheeted and is likely to be exposed to strong winds, or if it is used for water jetting.
- Do not overload the mobile scaffold or use a ladder footed from the working platform.
- When the mobile scaffold is moved check for overhead power lines and check that there are no holes or dips in the ground and do not allow persons to remain on the scaffold while it is being moved.
- The detailed requirements relating to mobile scaffolding in the MSZ EN 1004 standard.

Mobile Elevated Work Platforms (MEWP's)



Typical problems

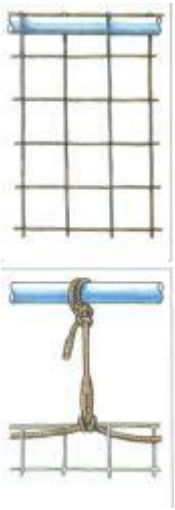
- operators being thrown from the basket because it gets caught on a fixed structure or because the operator is too heavy handed with the controls;
- the MEWP is struck by another vehicle or item of mobile plant because part of it extends into the roadway;
- entrapment of the operator between the basket and a fixed structure or object;
- failure of the levelling system on the MEWP;

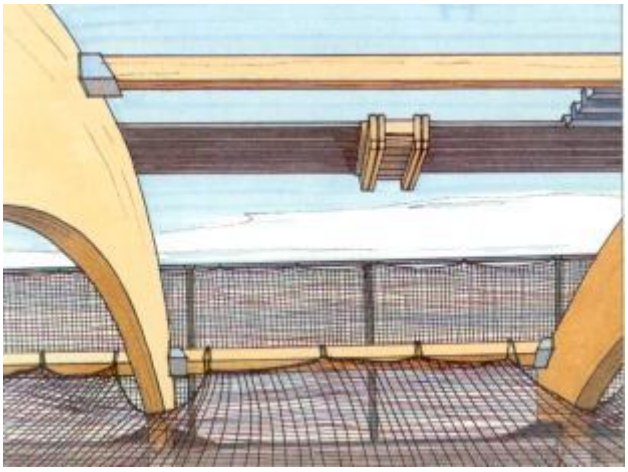
- overturning due to incorrect installation or using it on uneven ground, or because the outriggers have not been deployed correctly
- possible contact with overhead cables, 15m clearance required;
- ensuring that the basket is fitted with proper guard rails and toe boards;
- MEWP must be fitted with outriggers which must be properly deployed together with spreader plates;
- use of suitable fall restraint equipment or, in high risk situations, fall arrest equipment;
- use of properly trained and instructed operators who have been authorised to use such equipment;
- provision of a safe working method including emergency arrangements.
- All elevating equipments and accessories must be installed and used properly.
- Technical maintenance of them must be ensured.
- Equipments need to be checked, examined periodically on basis of valid regulations. (structural-, and chief examinations)
- Only employees with proper experience may operate them.
- Maximum capacity must be indicated on all elevating equipments.
- Drivers of any mechanical equipment operated in building workplace have to check and make sure everything operates perfectly before start of work.
- If any failure is detected and cannot be prevented, driver has to take right step, report failure, register it in machine registry book.
- Machine registry book has to be at disposal of all machines, as well as installation report, Certificate, Labour Safety Certificate, reports of periodical examinations (it is obligatory to do safety technology examination every 5 years), certificate of ropes (work certificate) and report of capacity test.
- In case of hoists, report of structural and chief examination of cranes, car cranes has to be at disposal.
- Quality Certificate certified by manufacturer must at disposal of equipments carrying burden.
- Cords are needed to be adequate. They have to be reviewed annually.
- Crane must have hook safety.
- It is necessary to place warning sign on crane: ‘Danger! Staying under hanging burden is prohibited!’
- Car cranes must be propped. Instead of wheels, whole machine stays on props. If soil is slack, floor must be installed under props.
- Burden hanged up onto rope may oscillate, which might cause accident.
- Terminate and sing the working area, and use safety helmet

Safety net, fender

In case of safety net, or fender, hole size may not exceed 10x10 cm.

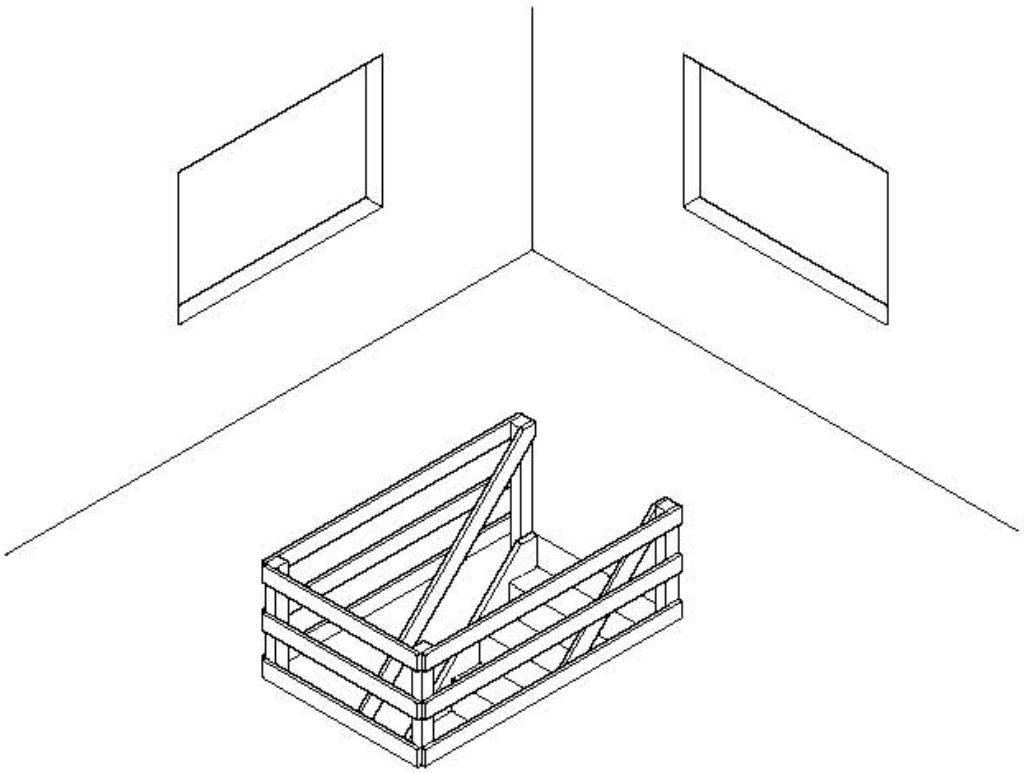
It is necessary to select and to place safety net so that if employee fell in safety net, the bottom of net would not reach dangerous surfaces!

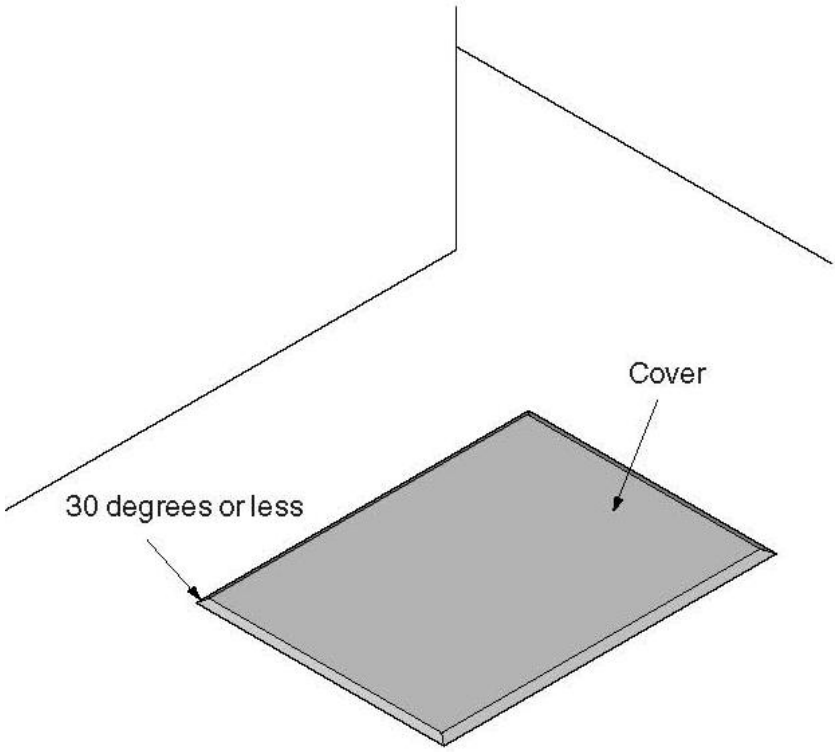




Coverings

In case of applying covering, it is very important requirement that element used for covering must be firm enough compared to surface measurement. It is also necessary that forming of it makes sure it would not shift.





Signal bars

Application of signal bar may be enough on floors 2,0 m being over altitude, on roofs flat and with low slope (20o), in as much the site of working may be more distant than 2,0 m from edge of level difference. In a case like this, signal bar must be placed on the borderline 2,0m from the edge of danger source.

Signal bar can be applied in case of work trench between 0,25 -1,25 m of depth, in case of lined facility in open country under 0,25 m of depth.

Working on roof

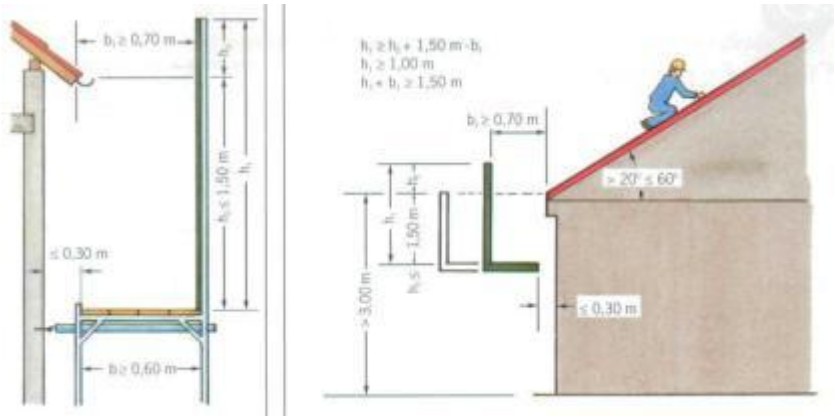
In case of working on roof with slope less than 20o and the site of work may be of 2,0m more distant from the edge of level difference, then placement of signal bar on the borderline of 2,0m may be enough.

In case of wet, slippery or fragmented roof cover, employees must be provided with protection against falling no matter inclination is lower than 20o.

In case of work carrying out on roofs with inclination 20o being over, but up to 45o, employees must be provided with protection against falling with technical solutions and safety equipments. The simplest and safest solution is to build scaffolding.

In the course of placement of scaffolding it is necessary to take into consideration, that:

- Between the edge of scaffolding floor and building the distance at most 30 cm may be;
- Between lower edge of roof plane and railing the distance may be maximum 0,7 m;
- Altitude of railing must stretch out lower edge of roof plane to make sure employee sliding down roof plane cannot get through;



- length of railing must stretch out of latitude of working with minimum 2,0 - 2,0m.

In case of applying railing and safety fender, safety devices are needed to develop and measure so that they would prevent employees from falling (18-19-20. figure).

Railing, safety fender built upon roof plane must stretch out cca. 2,0 - 2,0m of borderlines of working area (green) (figure 19.).

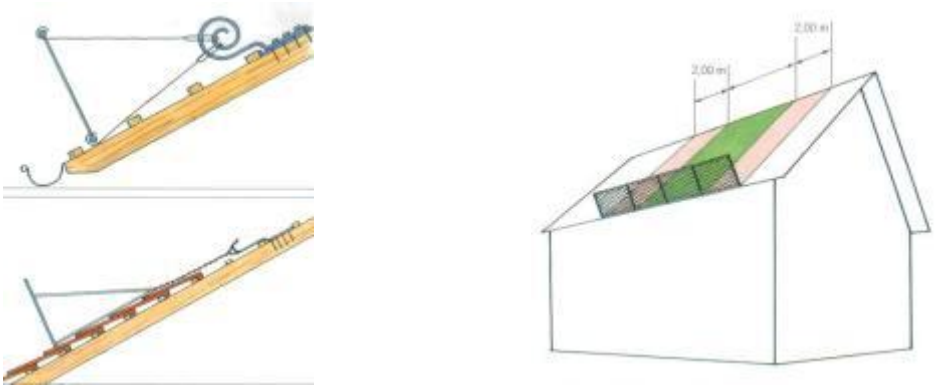
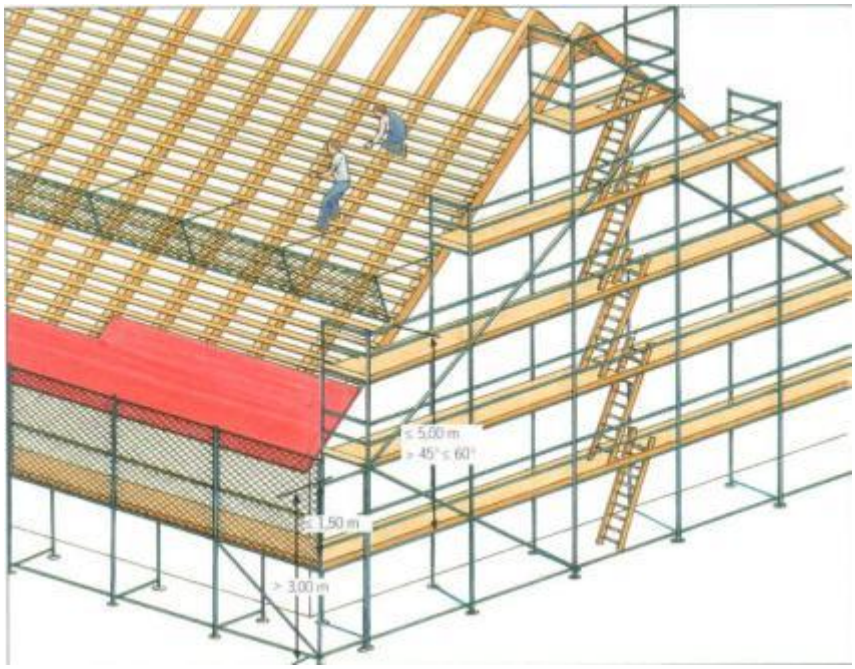
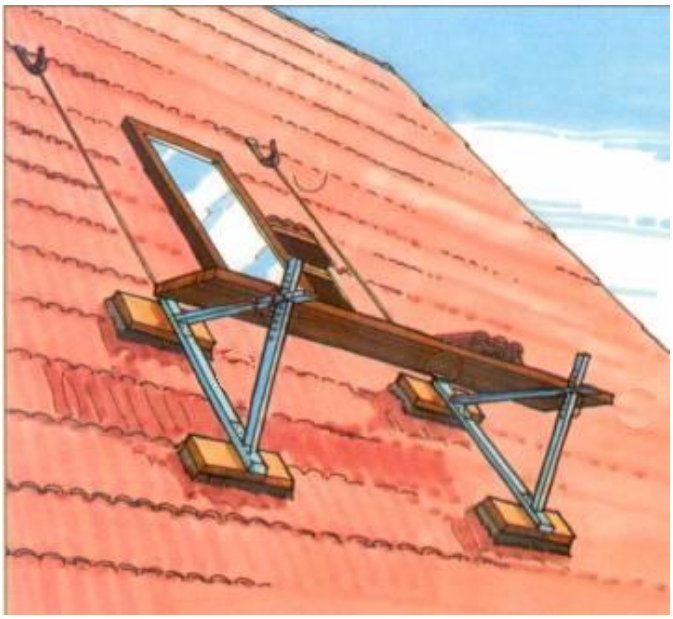


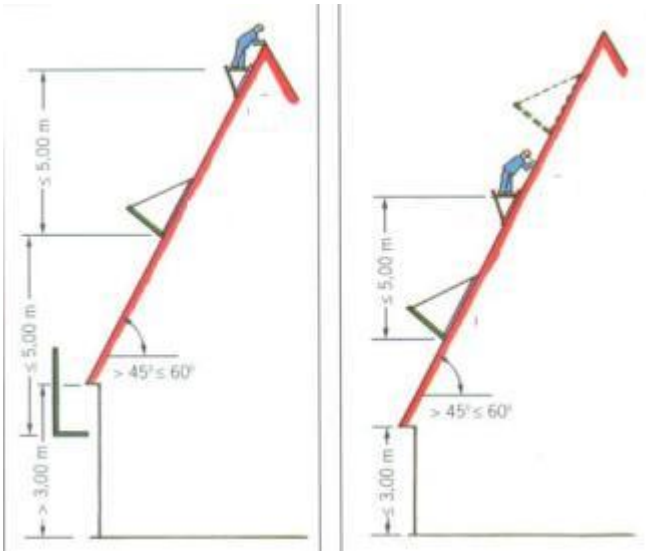
Figure shows an example of protection against falling, applying scaffolding, safety fenders built upon roof plane.



If inclination angle of roofing exceeds 45o, fixed work seat must be applied.



In case of applying fixed work seat, employee has to be provided with safety fender or railing to prevent falling.



Placement of prefabricated roof plates

In the course of roofing with thin, rigid, big surfaced plates, or demolition of them, extra attention must be paid to prevent employees from stepping on fragile surface. Because of this, corrugated slate placement works must be only permitted from non-skid, fixed flooring, made from at least 2nd class planks (minimum 30mm thick and 50cm wide), placed longitudinal and cross direction.

Other rules concerning working on roofing

- If protection against fall may not be developed with safety devices, employee must be provided with individual safety equipment. Rope of safety belt is needed to fix to a place, which can endure potential dynamic surplus load. It is necessary to define fixing points beforehand, and if necessary to measure them.

- In case of working on roof, if employee is exposed to particular danger, it is necessary to entrust at least two persons performing work. Particular danger is considered to work on snowy, wet, slippery roof, and with inclination angle higher of 45o.
- It is necessary to fix roof ladder in all cases.
- Before roof work, roofing lathing must be checked, faulty, dangerous and decayed planks have to be exchanged, and start of work, only after this, is allowed. Going up to unstable (inadequate) roofing is strictly forbidden!
- Before start of work, it is necessary to make sure that wires (crossing roof) devoid of voltage
- Working on roof is only allowed wearing footwear with non-skid sole.
- If work is performed on roof, a signal board 'Watch out, work on roof!' must be placed. If necessary, roof area must be enclosured to make sure nobody can get close to work area to be jeopardized of falling tile or tool.

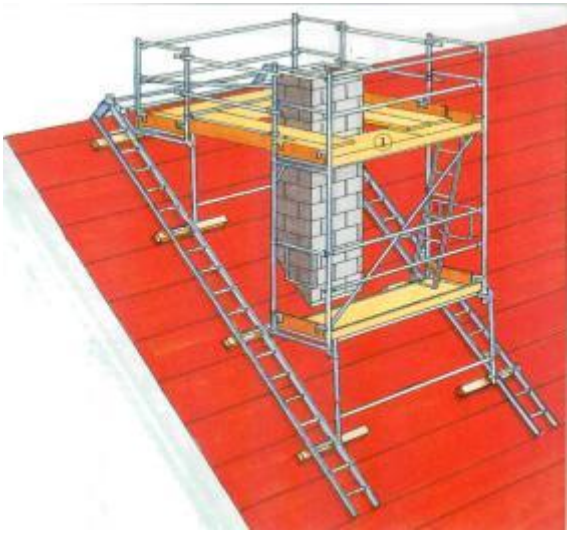
Making of slabs

- In course of making vaults between beams, it is necessary to prevent beams from turning away. Vaults can only be burdened after solidification of constructions.
- To place prefabricated joists, proper receiving stand must be ensured. To place joists elements, lining bodies, plank (of at least 1,0 m wide) must be provided. It is required to establish firm surface, devoid of trip.
- Roof can be only cradled for instruction, and stability of new roof must be checked before.

Mason, locksmith, insulating works on roof

Construction of chimneys, ventilators, engineering systems out of roof plane is one of the most dangerous work activities, since underestimating danger, it is often executed from workplace of a plank wide with no railing.

In the course of these constructions, scaffolding built upon roofing might protect against fall.

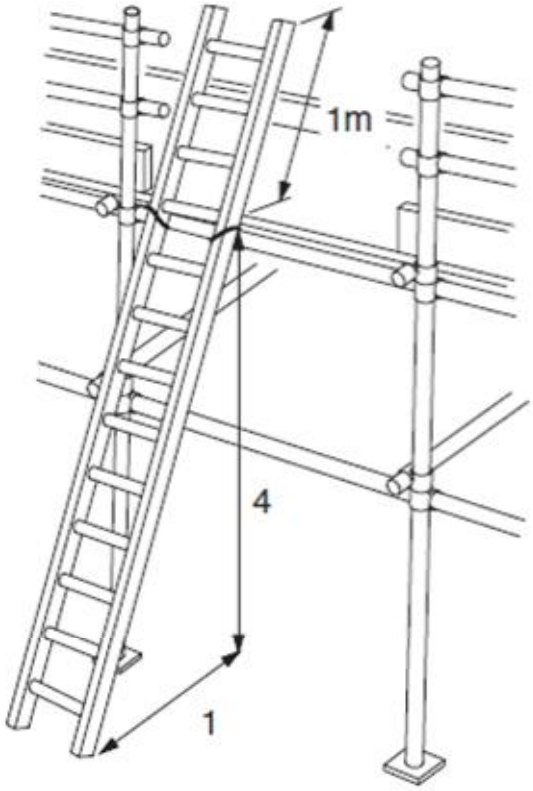


- Observing of safety technology requirements of masonry in full work area or on all constructions of it, must be checked. (comparing with regulations, with survey). Requirements defined with measures must be checked with measuring.

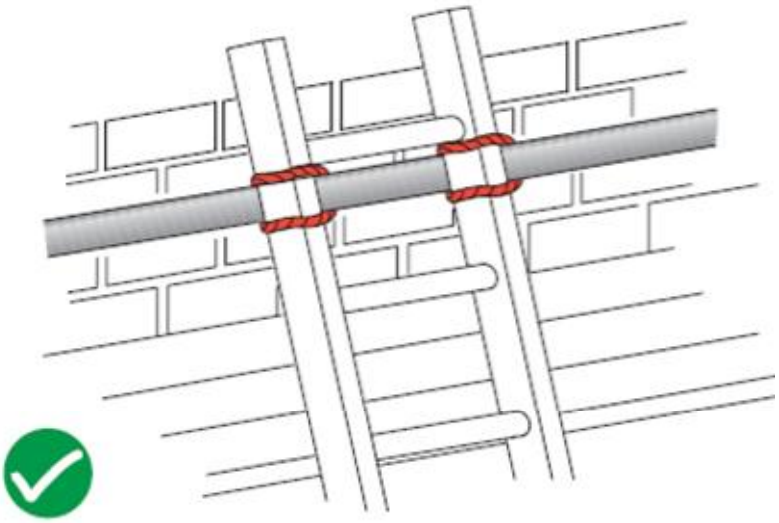
Fundamental requirements relating to ladders used for bridging level differences

- Before usage it is necessary to examine ladder with survey;
- Faulty ladder is prohibited to use (pl. rung deficiency, broken rung)!
- It is necessary to stand ladder to make sure it will be standstill steadily in use;
- It is prohibited to lean ladder against place or substance with no bearing capacity!
- Ladder must be placed on firm foundation to make sure rungs will stay in horizontal position;
- Before usage it has to be made sure ladders will be devoid of shift or slip;

- Length of ladder must be selected to stretch out (at proper altitude) of work level, and in this way it makes possible to step out and clutch safely; so the last 3 top rungs of normal ladder are not allowed to use!



- Ladders fitted into each other (consisting of several parts) are allowed to use only, if it is ensured that in use, elements cannot move away from each other;
- Ladders are necessary to be ensured not to move away before their usage;
- Only one person may work on ladder at one time!
- In the course of continuous work on ladder - if it is needed - it is necessary to rest!
- Using ladder, possibility of clinging and stable position must be ensured;



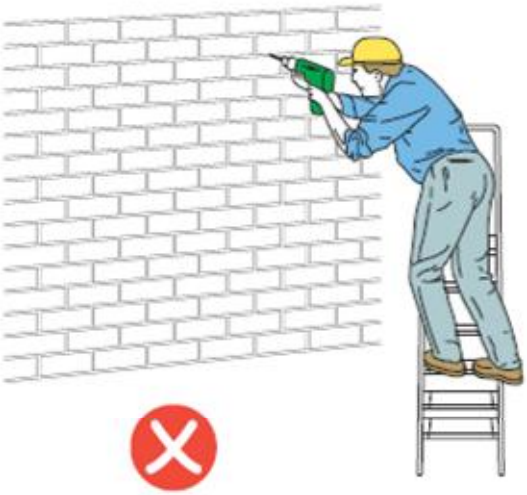
- If it is necessary to go up ladder with burden, possibility of clinging cannot be hindered.
- It is forbidden to climb up ladder, which can slide away. Ladder containing two parts must be fixed with chain or rope to prevent sliding!
- It is necessary to delimit work area and provide constant supervision, if ladder is used near traffic road, door, or in passage!

Performing hot work from ladder

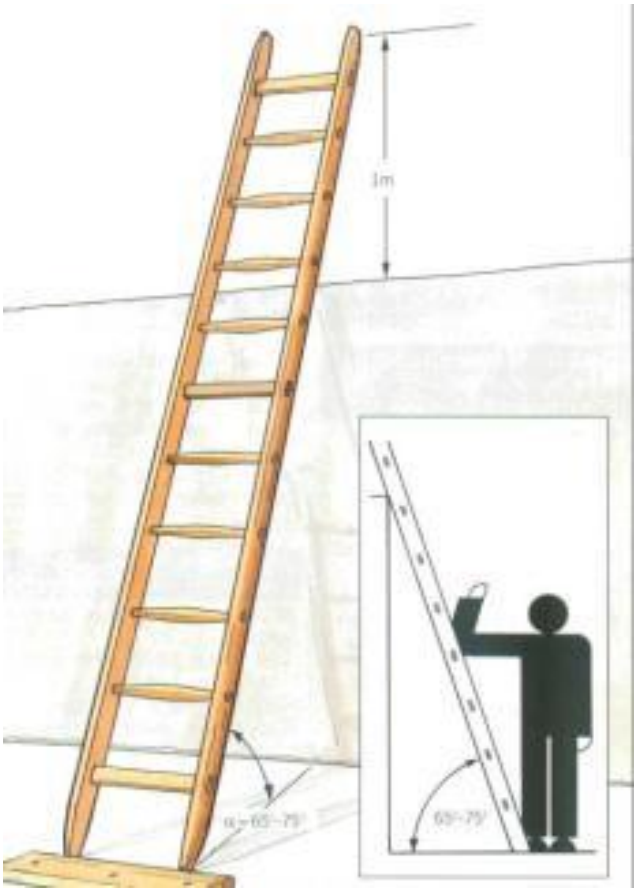
Ladder set up incorrectly

Standing on top plate of stepladder

Facing away from the ladder to descend, over-reaching



- If necessary traffic must be diverted!
- It is allowed to use ladder properly only! It must not be used for storing substances.



The inspection of ladders should include checking for the following:
• damaged or worn stiles (vertical components)
• worn or damaged shoes or feet
• broken, missing, loose or worn rungs
• mud and grease on the rungs
• rungs supported only by nails, spikes or screws
• movement in the rungs or stiles
• decayed or cracked timber or corrosion of fittings-do not paint wooden ladders as the paint will conceal cracks etc.
• insecure tie wires
• warping or sagging or distortion.

The Ladders shall ensure that regular inspection e.g. every 6 months and that they are tagged to indicate that they have been inspected.

Dismantling of structures, transformation of existing buildings

Personal conditions:

- it is allowed to start and to go on under supervision of authorized person only!
- Demolition must be executed with direction of qualified and experienced person.
- Employees performing demolition and reconstruction must be informed about technology applied and operations.

- In the course of demolition and reconstruction person directing has to stay on work site continuously.

Objective conditions:

- To perform demolition and transformation work, a plan has to be made, which has to imply:
  - the order of demolition and transformation;
  - the technology of demolition and transformation;
  - necessary devices;
  - applicable auxiliary constructions;

Before start of transformation:

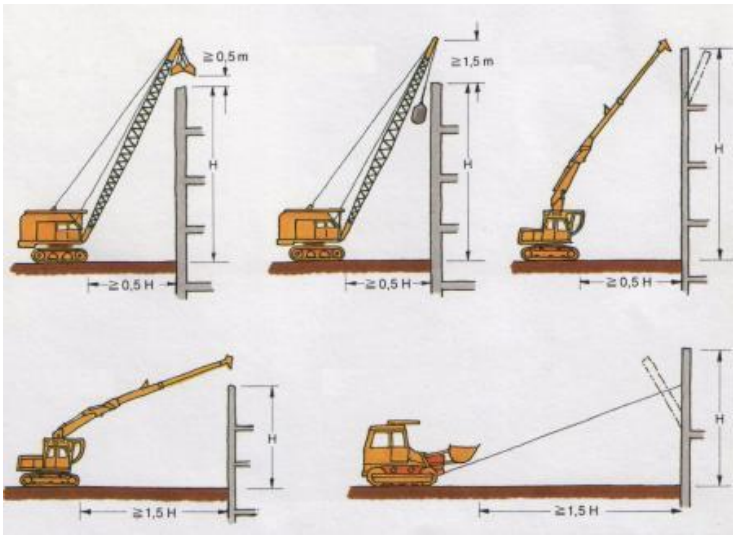
It is necessary to examine what kind of materials the building is made from. (If asbestos can be found on or in the building, special demolition plan has to be made to observe relevant measures, and it has to be approved by regional Health Office.)

- State of building to be demolished, or to be reconstructed is needed to examine, and in the course of developing the order of demolition, result of examination must be taken into consideration.
- It is necessary to check state of joining-in cables, their kind and their position, and it is necessary to make sure whether cables themselves were detached or their content was detached.
- Area of demolition, reconstruction must be enclosured and anauthorized person cannot get in.

Most important rules of demolition work:

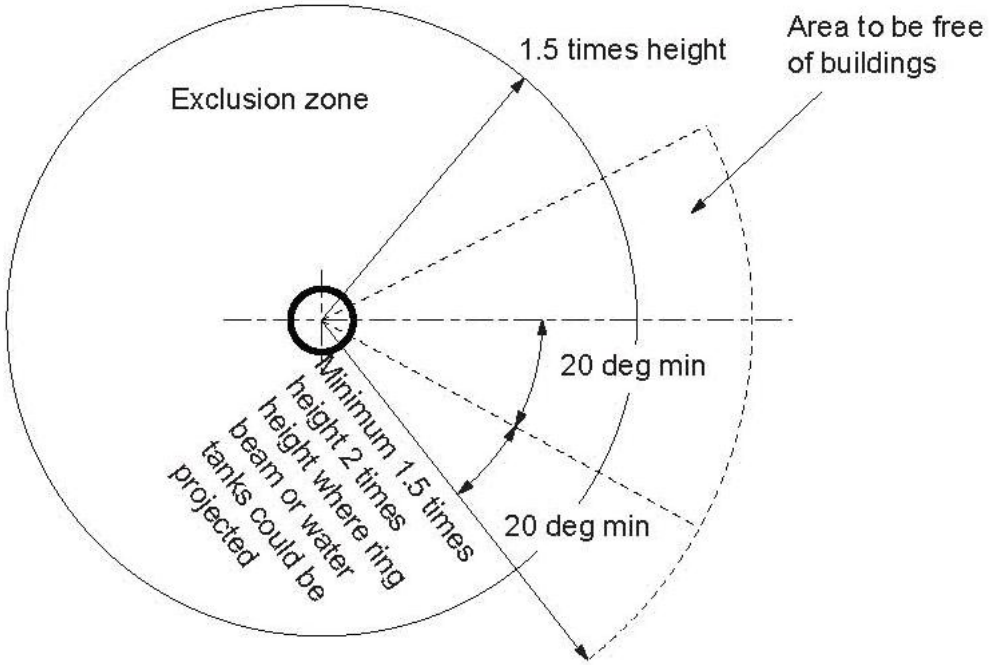
- It is not allowed to demolish coherent structural parts of buildings on more than one level at one time.
- The building is forbidden to be tilted using the method of undermining or any other method jeopardizing stability.
- Area of direction of tilting must be emptied and enclosured.
- In the course of demolition by tilting, inhabitants concerned of area must be informed about time of it.
- It is necessary to make the area falling into the direction of the decision free one, and it is necessary to fence it.
- In the course of pulling down of wall wire rope must be applied only.
- Against rope hitting it is necessary to protect employees with defensive position.
- Employees must be protected against stroke back of rope with protective stand.

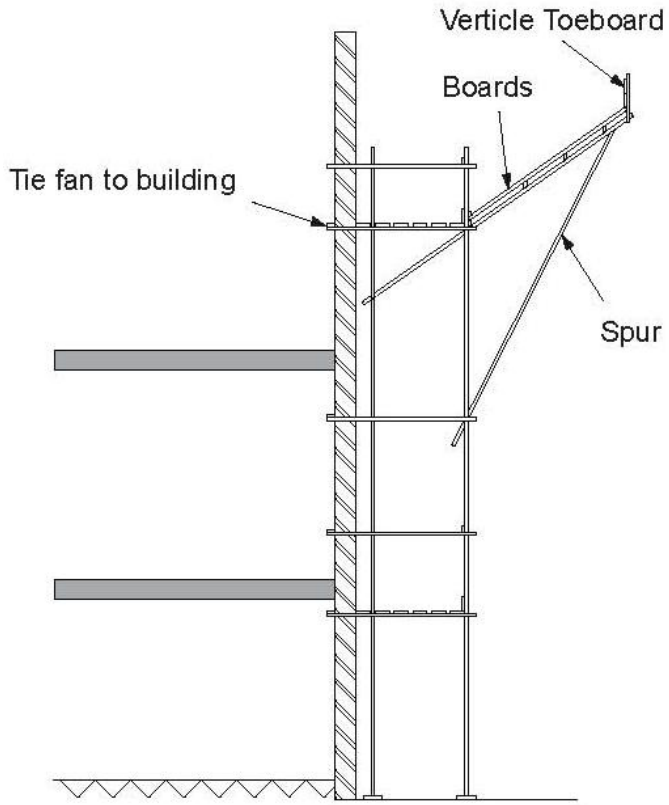
- Demolished wall parts can be approached only after checking stability of wall parts remained upright.
- In case of demolition with excavator the distance between excavator spoon hoisted and the upper level of building to be demolished may be 0,5m.



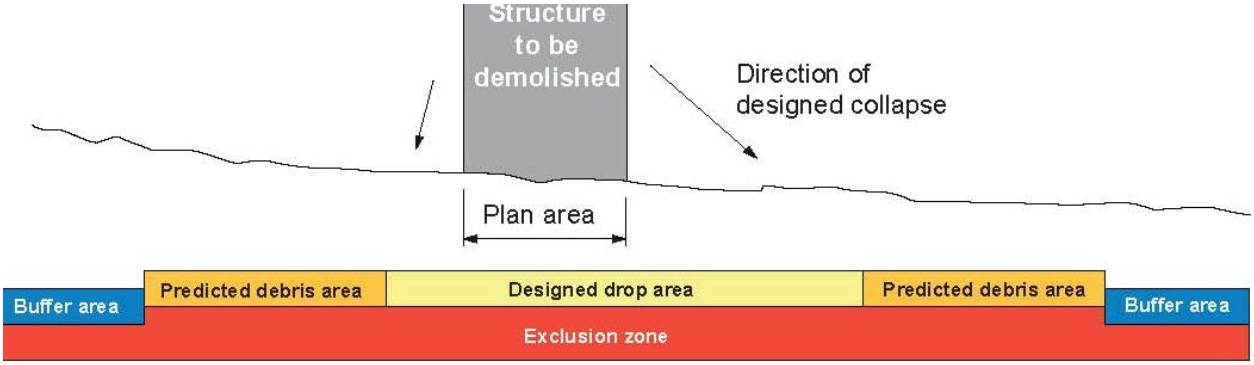
- In case of tilting with weight, the position of spoonbill must be selected so that the upper level of spoonbill would exceed the upper level of building to be demolished by 1,5 m.
- In case of interruption of demolition work, stability of constructions under demolition and remaining must be ensured.
- Scaffolding, props must not be placed on weakened constructions or on roofs of unstable capacity.
- It is necessary to scale propping and underpinning used in the course of the demolition.
- It is necessary to remove demolished substance so as not to cause dusting or any effect, which would be harmful or unpleasant to environment, building workplace or the ones staying nearby.
- Traffic and escape roads must be free of debris.
- In the course of demolition a zone being double of the wall altitude must be considered a danger zone.
- It is necessary to enclosure demolition work area, to prevent unauthorized persons from getting in.
- If unauthorized persons cannot be prevented to stay near demolition work area, then on the border of danger zone a watching man must be assigned, who has to stop people getting into demolition area.
- Demolition work must be done under direction of skilled, qualified and experienced person.
- In the course of demolition a zone being double of wall altitude is considered to be danger zone.

- In the course of demolition debris must be transported continuously.
- To protect environment it is necessary to build dust-protection wall.
- Employees doing demolition must be provided with safety helmet, closed safety wear, safety boots with steel, safety glove and dust mask.
- In case of demolition work done at high altitude it is necessary to wear safety belt fixed to safety rope, which must be connected to fix fastening point.
- Constructions with weakened stability (due to demolition work) must be ensured with propping and support.
- Before demolishing walls or wall parts burdening constructions, these burdened constructions (console, balcony, edge, etc.) must be supported or demolished first.





Where there is a public interface then lighting will be required during the hours of darkness.



Groundwork

Before starting of groundwork:

- Safety technologic and health care requirement of groundwork considering geologic, hydrologic, and soil mechanic examination data must be planned. It is not necessary to make soil mechanic examination if support or propping is done considering the most adverse soil specifics (loos, granular) or if slope gradient is applied.

- In the area of groundwork trace of cables and place of equipments and necessary protection zone must be indicated on the implementation plan.
- Before starting groundwork under field level, in building area it is necessary to explore unknown or hidden trace of cables, and objects, cables found in the course of work, must be identified. Identification must be executed with instrumental examination, test trench or with test hole. Test hole must be at least 1,8 x 0,8 m. Test trench or test hole must be formed manually step by step.
- If in building area unidentifiable substance or cable is found (hazardous waste, ammunition, etc.), it is allowed to be working then only, if it is confirmed – if necessary, by expert – substance makes no harm.

In the course of doing groundwork

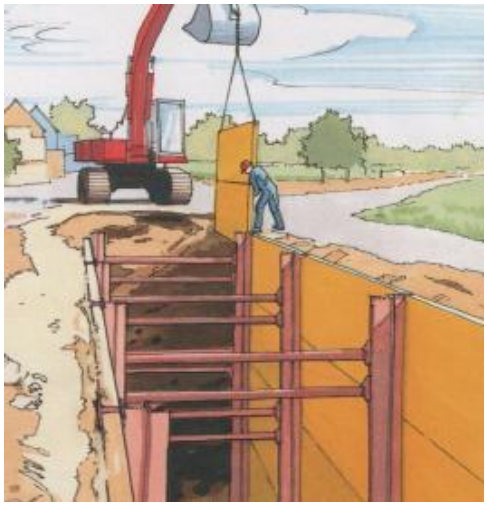
- The edge of trench (work ditch) can be burdened then only if propping is measured for surplus burden.
- In case of manual groundwork it is necessary form 0,5 m of wide berm on the edge of work ditch.
- It is necessary to prevent land from falling back to work ditch.
- It is not allowed to exploit by undercut.

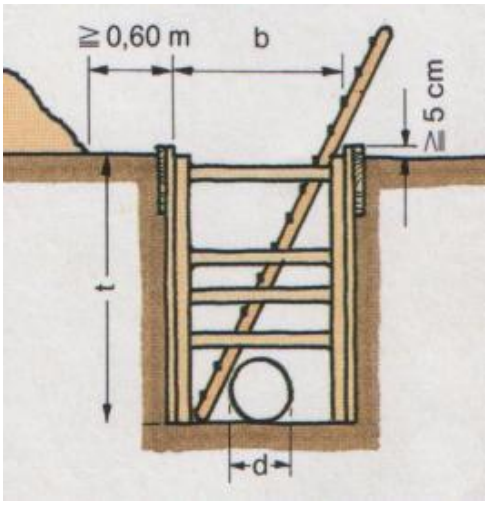
In case of unburdened field level, different soils and different slope inclinations the depth of trench (work ditch) with no propping is the following:

The soil		In case of vertical wall	The permissible depth of ground exploitation (m)					
name	Method of exploitation		2 4	3 4	4 4	5 4	6 4	7 4
Loose, granular soil	Dryly	0,8	1,0	1,2	1,5	3,0	3,0	
	As well as having open water	0,8	1,0	1,5	2,5			
massive, granular soil and mud which can be twisted	Dryly	0,8	1,0	1,2	1,5	2,0	2,5	3,5
	As well as having open water	0,8	1,0	1,5	2,0	3,0		
Hard mud and thin substance, which can be twisted	Dryly	1,0	1,2	1,5	2,0	2,5	3,3	4,0
	As well as having open water	0,5	0,8	1,0	1,2	1,5	2,0	3,0
Fat substance, which can be twisted	Dryly	1,5	2,0	2,5	3,5	5,0	7,0	7,0
	As well as having open water	1,0	1,5	2,0	3,0	4,0	4,0	4,0

Hard substance	Dryly	1,7	3,0	4,0	5,0	7,0	7,0	7,0
	As well as having open water	1,0	1,5	2,0	3,0	4,0	4,0	4,0

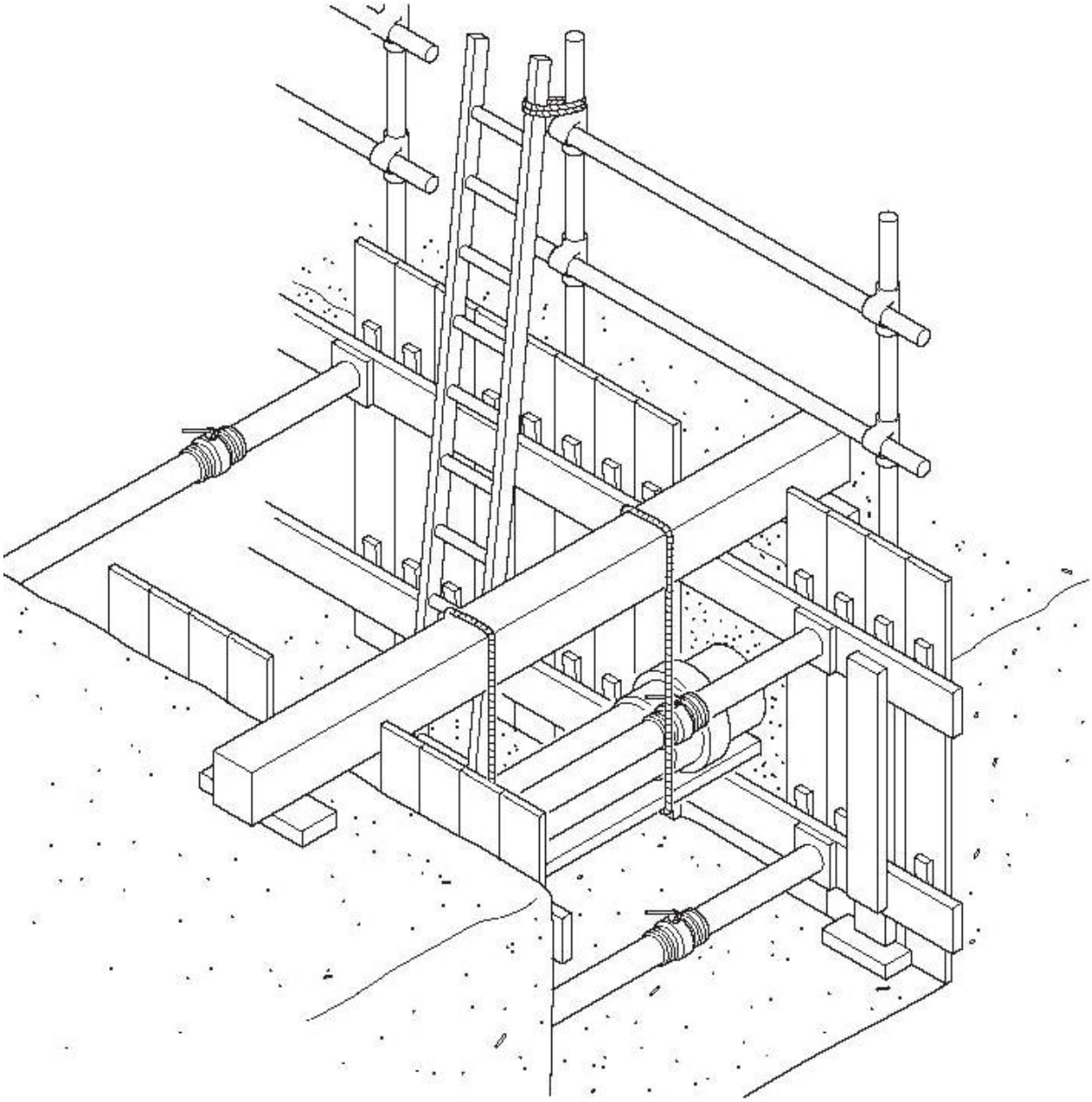
- In case of manual work slopes must be exploited step by step considering quality and stratification of substance. In case of stepped exploitation height of berms may not exceed 1,0 m. Width of berms (stairs) may not be smaller than its altitude.
- To ensure safe traffic, trench (work ditch) deeper of 1,0 meter must be equipped with ladder (fixed not to move away up to depth of 5,0m), a deeper trench must be provided with steps. For slope exploitation way up must be provided.





- Propping has to make sure that it would protect stability of propped soil mass, and safety of employees. But it also has to ensure that exploited ground could be removed and work could be done in this area.
- Propping must be developed considering stability of soil, depth of work level, and potential bearing forces.
- It is necessary to justify safety of propping with calculation if trench is deeper of 5,0m or dynamic or static bearing can be expected.
- Before propping is done, going into trench (work ditch) is strictly forbidden!
- Bottom width of propped trench (work ditch) may not be less of 0,8 metre. It is allowed to differ from this only then, if there is no manual work performed in work ditch and designer regulates requirements of safety work considering applied technology, pipe diameter, etc.
- Going through propping, storing materials on them, using them as work stand are not allowed.
- Above the buttress frameworks the constructions of transition bridges with the buttress framework cannot be joined.
- Holes formed behind propping must be filled in.

- Deepening of propped trench (work ditch) can be only executed by extra propping. Extra propping must be done in every 1,0 m in solid soil and it has to be carried out every 0,5m in unstable soil.
- In case of work ditch passage must be built every 200m, and it is necessary to build a passage with railing of double-line and footboard in front of entrance of buildings.
- Bearing capacity of bridges established temporarily for motor vehicle traffic must be indicated.
- In case of groundwork done with machine, stability and bearing capacitiy of movement area must be examined beforehand.
- In the course of groundwork protection against falling into work ditch, or trench must be developed. Necessary protection must be established 0,5m of horizontal distance from the edge of ditch.
- If trench, work ditch dug out is condidered to be dangerous, it is necessary to establish protection against fall. (railing, enclosurement, fence, etc.)
- If depth of trench is up to 1,25 m, - signalling bar – if depth exceeds 1,26m a signalling railing must be established.
- Stability of trench, work ditch at any work stage must be ensured with support, sloping or any other solutions. It has to be checked regularly.
- If work area if any suspicious objects turns up, work must be suspended immediately.



- Vehicle stop blocks shall be provided to ensure that vehicles do not approach too close to the excavation

Safety requirements of foundations

In case of foundations adequate propping must be ensured based on stages of soil exploitation at all times.

Building painting works

- In closed place in the course of walls being scraped, swept off, polished, rusted with grinding machine or wire brush, adequate airing, ventilation must be provided.
- In dusty workplace employees must be provided with dust mask.

Engineering fitting

- Generally, this work is done at high altitude from self-propelled elevating machines. (Regulations concerning hoists apply to them.)
- Objects, and materials are not allowed to be thrown down, if no other solution, a watchman has to be assigned to make sure nobody would stay nearby.
- Materials, objects thrown down must be collected immediately, and garbage must be cleaned up.
- In the course of tinware work, sharp tin sheet offcuts must be cleaned up immediately because they may cause accident.
- Moving, fitting of tin plates must be always done by more persons until it is fixed.

Safety regulations concerning welding

- Valid welding certificate and Fire Safety examination are needed. (valid for 5 years)
- It is obligatory to use individual safety device, proper protective wear, shoe, glove and safety shield!

- In case of combustible work activity, permit of fire lighting is compulsory and fire prevention training is too. It is issued by fire-safety representative or ABB Site Manager.
- Length of welding hose on is min. 5m up to max. 30m. Hose has to be undamaged. It is necessary to exchange faulty hose promptly.
- Hose is fixed to welding pistol with AWAB clamp.
- Hose pistol must be always provided with non-return flame valve.
- Hose must be checked with soapy water.
- Welding pistol must be checked periodically, but at least annually.
- Reductor (primarily gas escape) on gas bottle must be checked.
- Use of reductor injured is strictly forbidden.
- It is necessary to protect gas bottles against mechanic injuries.
- If possible, gas bottles may be stored on trolley, or if not, they must be fixed not to fall.
- It is necessary to follow Welding Safety Regulation and OTSZ instructions.

The nominations of gas bottle

Gas, gas mix	Old nomination		New nomination	
Industrial oxygen	 /	blue blue	 /	white blue
Acetilén (DISSOUSGÁZ) Acetylene (DISSOUSGÁZ)	 /	yellow yellow	 /	chestnuts brown chestnuts brown
Acetylene (DISSOUSGÁZ) D3 mass	 /	rusty yellow rusty	 /	chestnuts brown yellow
Argon		grey grey		deep green grey

	/		/	
Argon	 /	grey white white	 /	deep green grey
Nitrogen	 /	deep green deep green	 /	black deep green
Nitrogén **Nitrogen**	 /	deep green white	 /	black deep green
Synthetic air	 /	deep green deep green	 /	green zöld
Xenon, neon	 /	grey grey	 /	zöld green
Hydrogen	 /	red red	 /	red red
Shapinggáz	 /	red deep green	 /	red grey

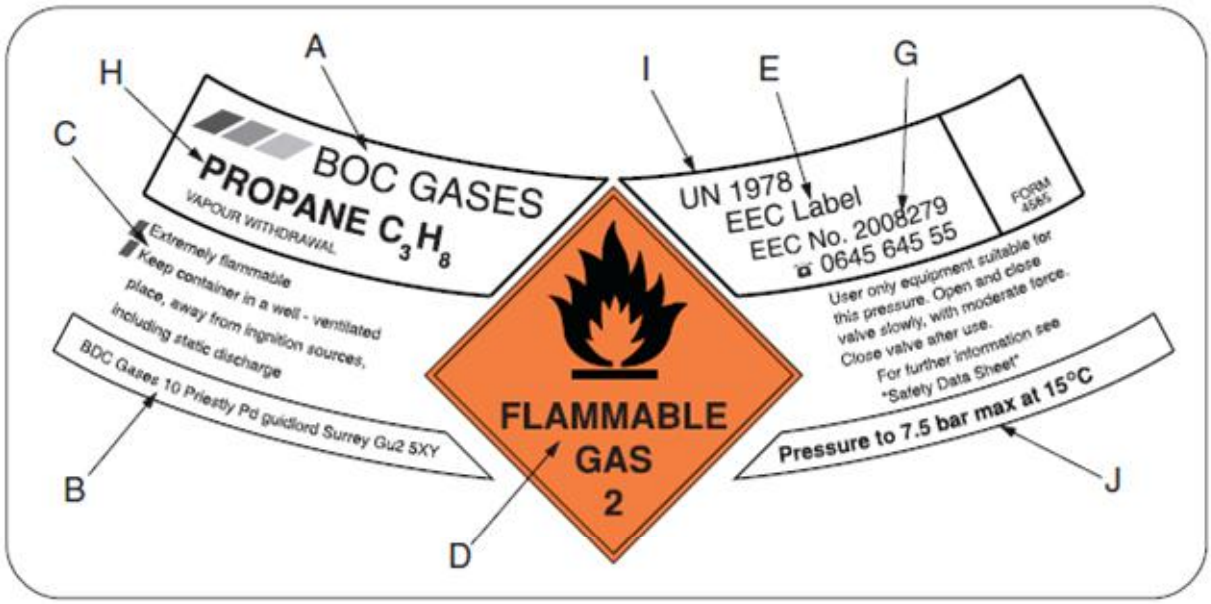
Ar/CO2 mix	 /	grey grey	 /	green grey
Compressed air	 /	purple purple	 /	green purple
Carbon dioxide	 /	grey grey	 /	grey grey
Helium	 /	grey grey	 /	brown grey
Chlorine, ammonia, sulphur dioxide	 /	brown brown	 /	yellow brown

Examples the nominations of color - onto the presentation of a change Medical and/you are inhalational gases being used for an aim, a gas mix

Gas, gas mix	Present nomination		New nomination	
Md. oxygen	 /	white blue	 /	white white
Md. dinitrogén-oxid		blue		blue

	/	grey	/	white
Md. carbon dioxide	 /	grey grey	 /	grey white
Md. air/level. air	 /	coffee/white deep green	 /	coffee/white white
Md.Huh /O2 mix	 /	brown/white grey	 /	brown/white white
Md. O2/CO2 mix	 /	grey/white grey	 /	grey/white white
Md. O2/N2O mix	 /	blue/white blue	 /	blue/white white
Md. nitrogen	 /	coffee deep green	 /	coffee white

The table of gas bottle

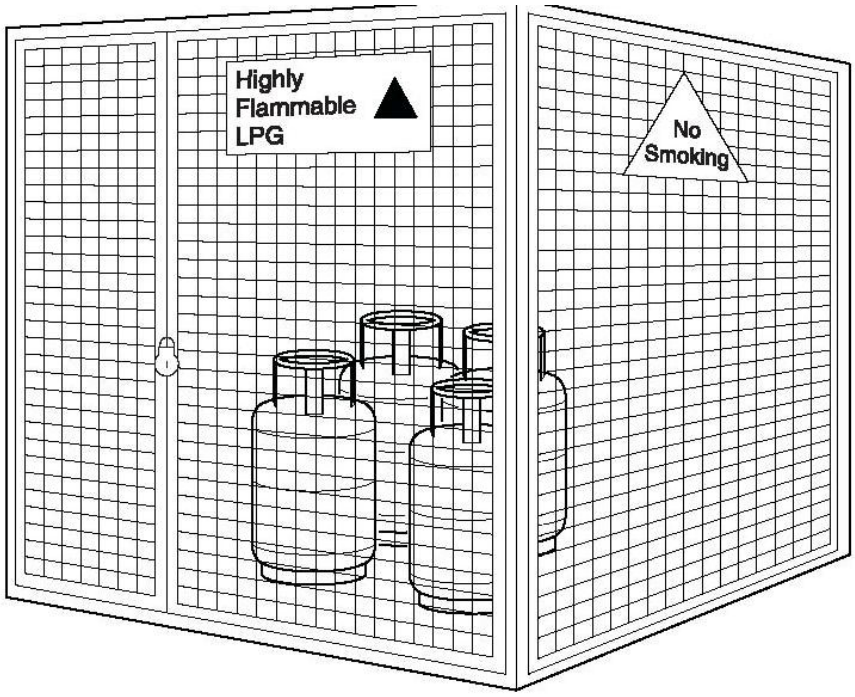


- A - Company name
- B - Address of the company
- C - Risk and safety phrases relating to the product
- D - Hazard symbols
- E - EEC label (for pure substances only)
- F - Revision number
- (gas company use to identify label revision)
- G - EEC number, if applicable
- H - Product name
- I - UN identification number and proper shipping name
- J - Any additional company information

The LPG gas cylinders requirements relating to storage

- cylinders are kept in a well ventilated place such as the open air and away rom any sources of ignition or heat.
- cylinders are kept secure and upright.
- combustible material is kept away from cylinders.
- there is no smoking when changing cylinders.
- flexible connections are in good order and are inspected periodically.
- In the event that there is a leak then ventilate the area by opening all windows and doors.
- that fire fighting equipment is readily accessible.
- where cylinders are used for cooking / heatingthe cylinders should be located in a safe place.

- There should also be provided suitable supply of fresh air to ensure that adequate combustion is obtained.

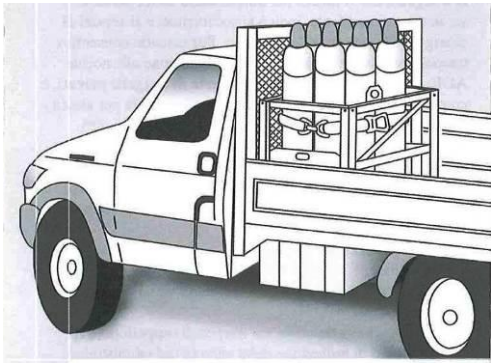


Transport of Compressed Gases

In European Community Gas transportation falls under the effect of ADR as Class 2 Dangerous Goods. ADR. (Agreement Dangerous Road) is an international agreement about the road transportation of dangerous goods.

Present instructions must be regarded as clarification of basic safety rules and supplement to existing local regulations for transportation made by ABB employees or contractors by means of standard vehicles of small amount of compressed gas, “below free limits” in accordance to regulations.

In case of transportation of large amount of dangerous gases by specialized companies, additional specific rules apply; that is out of the scope of the present document.



ADR „Below free limits”

The "free limit" up to which this is possible transport compressed gas in a simple way according to ADR regulation depends on the type of gas, anyway for most gases you are below the free limits if you are transporting:

- without limits and possible free transporting for the bottle if, the pressure of bottle less than 200kPa (2bar) on 15^0C the gas will remain gaseous under the carriage fully,
- less than 333 liters of total volume, for non toxic and flammable gas, for toxic and non flammable gas, for dangerous gas,
- less than 1000 liters of total volume of other non dangerous gas,

In such a case of exemption:

- Only general training is required to the driver (not the ADR certificate of training)
- No special transport documents and instructions in writing (tremcards) are required.
- No necessity of carrying self-standing warning signs on the vehicle

A few preconditions should be anyway fulfilled:

- General safety recommendations must be followed
- The gas receptacles must carry the necessary markings
- If the transport is not carried by a private person or to a construction site, then a 2kg or larger dry powder (class ABC) fire extinguisher is needed.

Transportation to and from construction sites, so as other cases of service and maintenance activity are in total exemption of ADR rules below mentioned free limits.
Unlimited amounts of empty cylinders can be transported below free limit.

Risk assessment

In general the dangers involved in handling and transportation of gases derive essentially from their chemical and physical properties as well as from their packaging. Compressed gases can be inert, flammable, combustive, oxidizing, toxic and corrosive:

- Inert gases: asphyxia (suboxygenated atmosphere).
- Combustive and flammable gases: fire
- Toxic gases: poisoning (toxic atmosphere)
- Corrosive gases: chemical burns

Dangers from physical properties:

Because the gas is compressed in cylinders, with pressures of up to 300 bar, the risk of explosion is real, due to the pressure energy that can be released by a sudden gas leak.

Dangers from packaging:

Containers commonly used are cylinders and large cylinders for compressed gases: drums and tanks. Dangers that can derive from the handling of these containers are:

- Impact and crushing in case cylinders and/or accessories fall
- impact from the projection of objects
- Contact/exposure of body parts to cold
- Exposure to smog and /or steam
- Back or neck injuries from lifting heavy cylinders.

- Abrasions to the hands from handling the cylinders

Control measures

Road vehicles such as trucks, works vehicles, estate cars, normal automobiles and trailers are only suitable for transporting gas receptacles if:

- they can be suitably ventilated
- the receptacles can be reliably secured to prevent them rolling away or falling.

Receptacles

Only equipment designed for use with the appropriate gas cylinders should be used and this will need to be maintained in accordance with the recommendations of the supplier. Appropriate making and labels must be present and readable.

Load protection

To prevent the receptacles themselves being damaged or damaging other goods in the event of breakage, turning a curve or accidents, they must be secured by suitable means. Fasten able belts are examples of fixtures which have proven to be suitable for securing loads. These must be attached to sufficiently stable parts of the vehicle. Gas cylinders must always be loaded perpendicular with respect to the direction of travel (standing up or preferably lying down).

CYLINDERS MUST NEVER BE EFT FREESTANDING!
Adequate spacing, or segregation by partitioning shall be provided to group cylinders by hazard class. When oxygen and any fuel gas are stored, they shall be separated by suitable distance or by a non-combustible barrier with a fire rating of one half hour.
Full and empty cylinders should be separated.

Ventilation

The loading area must be sufficiently ventilated. This is in any case no problem if the loading bay is open. If the loading bay is covered, it should be possible to provide diagonal ventilation at the front and rear, preferably at the top and bottom. It is more difficult to ventilate a delivery truck, an estate car or even the boot of an ordinary car. But this problem too can be solved: In each case, provide 1/10 of the area of all gas cylinders being transported at the same time as the incoming and outgoing air opening. (Normally, a ventilation opening of approximately 100 cm2 is sufficient). If both openings are diagonal, this can be regarded as sufficient ventilation. Permanently installed gill-type or rosette ventilation openings are advantageous. But beware: The openings must not be closed (e.g. stuck together). In exceptional cases, open windows or an open boot can also be used for ventilation, but these must not be closed when the vehicle is parked.

Requirements for journey

Before starting the journey

Before loading gas cylinders into the vehicle, pressure reducers and other fittings must be unscrewed from the cylinder valves. Cylinders must NEVER be transported with their regulators in place.
It is necessary to check that the valves are free of leaks. This can be done with, for example, leakage spray. Oil or grease must never be used, especially on an Oxygen cylinder: the oil or grease may ignite or explode, also PTFE tape or jointing compound should never be used to attempt to seal leaks.

All cylinder valves must be protected against damage by screwing on cylinder caps, with the exception of those cylinders on which the valves are protected by a permanently installed cylinder collar. Small gas cylinders on which no permanent valve protection is fitted and those onto which no cylinder cap can be screwed must be transported in cylinder cases or boxes designed for that purpose in order to protect the valves.
Open cryogenic receptacles (e.g. for nitrogen and other inert low temperature gases) must not be sealed gas-tight during transport. This is to prevent dangerous overpressures from building up. Only the correct dispensing fixture, the cover cap or the original plug for the neck pipe may be fitted on the cryogenic receptacle.
Material Safety Data Sheets (MSDS) must be obtained (preferably before the gas arrives on site) and be available to all persons required to work with compressed gases. The cylinders should be checked to ensure that it contains the expected gas by examining the label and (less reliable) the colour code.
Cylinder trolleys to be supplied for transport and manual handling. The cylinder must be transported on an approved trolley by pushing and not by pulling. If the trolley shows signs of wear or damage, it must be taken to the workshop where it may be repaired or replaced.

After the journey

When loading and unloading, please switch off the engine. This reduces environmental damage and saves you from being fined. Always apply the hand brake when stopping and parking.
Unload the gas receptacles from estate cars and automobile boots immediately after the journey because sufficient ventilation cannot be guaranteed if the vehicle is stationary. To remove the gas, always remove the gas cylinders from the vehicle and only after you have done this fit them with pressure reducers. The gas cylinders may remain in the vehicle only in workshop vehicles which are specially equipped to do so..
The cylinder must be handled after unloading the vehicle, check that you can use the correct trolley for the size of the cylinder that are transported. Specific two-wheeled trolleys are available for the small and medium size cylinders and for the medium size 'cylinders. Four-wheeled trolleys should be used for large cylinders. Check that the trolley is in good working order and that the pneumatic wheels are inflated, or the solid wheels are intact.
Transfer the cylinder onto the trolley. Position the trolley close to the cylinder that is required, so that it need only be shifted a small distance onto the cylinder. Roll the cylinder on the rim of the base – do not drag the cylinder. Take care not to open the cylinder valve when handling the cylinder.
Secure the cylinder in the trolley. Use the chain or strap that is attached to the trolley to ensure it is firmly secured.

Parking

Vehicles with gas containers may only be parked in garages if

- the loading room in which the receptacles are located remains ventilated

and

- the garage is also well ventilated.

This is normally the case in large garages (e.g. multi-storey car parks), but not in small garages (up to 25 m2) or in underground car parks. In particular, note that there may be restrictions on parking with hazardous materials in some public or private garages or multi-storey car parks. In all cases protect gas cylinders to prevent:

- excessive heat, fire, dangerous
- corrosion, mechanical damage or
- access by unauthorized persons

Driving to other countries
When driving to other countries, besides the free limit you always require a transport document, instructions written in all languages of the countries through which you are passing and at least one fire extinguisher (minimum 2 kg). Above the free limit, you also require all other items printed in bold type in the section "Transport above the free limit".

Further regulations

Training
Newcomers must attend training before starting the job. Supervisors should ensure that persons using compressed gases have received training, which includes hazards of the gas/gases and selection and use of all equipment involved.

Smoking and naked flame
Smoking and naked flame are not recommended in and around the vehicle as long as it contains gas receptacles, irrespective of which ones and how many. The instructions outlined so far always apply, no matter whether you are on a business or private trip with one or more gas receptacles.

Regulations for emergency

P.P.E.

- Safety glasses or face shield should be worn when locating or removing the pressure regulator and when opening the spindle valve.
- Suitable closed-toe (with protector) shoes to prevent crushing when moving cylinders.
- Gloves for handling the gas cylinders.
- A work coat or overalls to protect your clothing.

Emergency procedures
Equipment for an emergency should be readily available, e.g. respirator, breathing apparatus, according to the risks connected to the transported gas.
It must be taken in account that: Escape of gas: specific procedures for the escape of toxic materials should be followed. Flammable leaks from a high-pressure cylinder may ignite spontaneously. Even an inert gas escape can be dangerous because it can kill by asphyxiation.
The vehicle crew must be trained on “what to do if” in case of an emergency, according to a written internal procedure.
In the event of an accident or emergency that may occur or arise during carriage, the members of the vehicle crew shall take the following actions where safe and practicable to do so, according to the nature of the event.

Falling Cylinder:
If a cylinder falls over, no one should EVER attempt to catch it. It is much too heavy and will cause serious injury. It is also very robust and is unlikely to be damaged although it may make a loud noise. Competent help should be called to assist in setting it upright.

In all cases of a major incident during carriage:
- Apply the braking system, stop the engine
- Avoid sources of ignition, in particular, do not smoke or switch on any electrical equipment; Inform the appropriate emergency services, giving as much information about the incident or accident and substances involved as possible;
- Put on the warning vest and place the self-standing warning signs as appropriate;
- Keep the transport documents readily available for responders on arrival;

In case of gas leaking
Before handling leaking compressed gas cylinders, find out which gas is escaping! Labels indicating contents, hazardous substance ADR class, hazard symbols according to hazardous substance regulations and cylinder colors may provide information.

Leakage of inert gases
nitrogen or pure SF6) In closed room:
- Ventilate the room thoroughly. (Open doors and windows.)
- Enter the room only if it is absolutely certain that the concentration of the inert gas is not dangerous.
- If in doubt that the oxygen concentration has dropped below 17%, only enter the room wearing self-contained breathing apparatus. If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, move the cylinder out into the open or close off the room again and ventilate it thoroughly.

In the open:

- If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, cordon off the area if necessary and allow the gas to blow off.

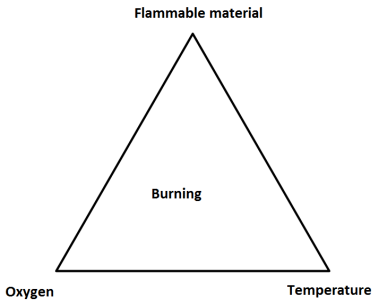
Leakage of oxidizing gases (oxygen)

In closed room:

- Close off the room and ventilate it thoroughly.
- (Open doors and windows.) Beware of the increased risk of fire.
- Enter the room only if it is absolutely certain that the concentration of the gas is not dangerous.
- If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, continue to ventilate the room thoroughly or move the cylinder into the open and allow the gas to too oxidise off in a safe, cordon off area.
- Keep open fire away.

In the open:

- If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, cordon off the area if necessary and allow the gas to oxidise off.



Leakage of flammable gases

(e.g. hydrogen or propane)

In closed room:

Without combustion

- Close off the room and ventilate it thoroughly (open doors and windows) in order to inhibit the existence or formation of an explosive gas/air mixture (risk of explosion in the room).
- Remove sources of ignition (open light, fire, cigarettes, etc.) and do not use electrical switches or equipment.
- Do not move near or touch the area around the cylinder valve outlet as the possibility of ignition cannot be excluded with certainty.
- In the case of hydrogen a flame may not be visible. Therefore check (e.g. with a broom) whether gas is leaking without combustion.
- To discharge a possible electrostatic charge, earth the cylinder by making a conductive connection to the lower part of the cylinder. In an emergency it is sufficient to touch the lower part of the cylinder with your hand if you are wearing conductive safety shoes.
- If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, move the cylinder into the open and allow the gas to blow off in a safe, closed off area or continue to ventilate the room (and nearby area if necessary) thoroughly and close it off.

With combustion

- Cordon off the room.
- If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, prevent danger to the surroundings, e.g. heating of other cylinders.
- Extinguish the flame only if this is absolutely necessary and only if, by thorough ventilation of the room, the formation of an explosive gas/air mixture can be excluded with certainty (risk of explosion in the room). Also check whether channels or other depressions are present in which the gas (e.g. propane) could "flow out".
- After extinguishing the flame, move the cylinder onto the open if possible and allow the gas to blow off in a safe, closed off area or continue to ventilate the room (and nearby area if necessary) thoroughly and close it off.

In the open: Without combustion

- Close off area and access.
- Do not move near the area around the cylinder outlet as the possibility of ignition cannot be excluded with certainty. In the case of hydrogen a flame may not be visible. Therefore, check (e.g. with a broom) whether gas is leaking without combustion.
- To discharge a possible electrostatic charge, earth the cylinder by making a conductive connection to the lower cylinder valve. In an emergency it is sufficient to touch the lower part of the cylinder with your hand if you are wearing conductive safety shoes.
- If possible, close the cylinder valve.

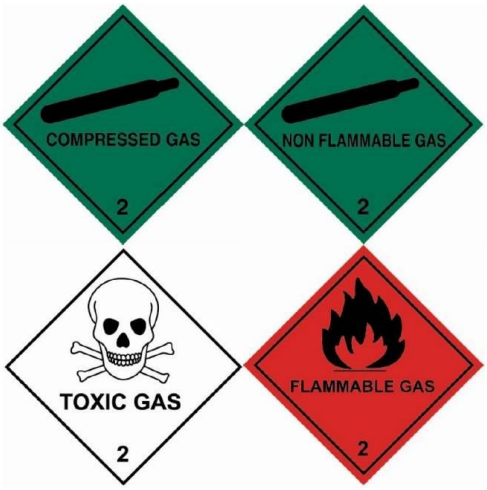
- If the cylinder valve cannot be closed, allow the gas to blow off. Beware of danger to the surroundings.

With combustion
- Close off area and access.
- If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, prevent danger to the surroundings, e.g. heating of other cylinders.
- Extinguish the flame only if this is absolutely essential. Also check whether channels or other depressions are present in which the gas (e.g. propane) could "flow out".

Leakage of toxic or caustic gases
(e.g. partially decomposed SF6 spilled from used circuit breakers).
In closed room:
- Close off room and access.
- Consult safety data sheet and available specific procedures for advice on special risks.
- Only enter room wearing self-contained breathing apparatus.
- Depending on the type of gas, wear protective overalls (information e.g. in the safety data sheet).
- If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, ventilate the room and continue to keep room or area closed off.
- Immediately after action, remove protective clothing and take a shower.

In the open:
- Close off the nearby area and clear in particular the area behind the cylinders and protect it.
- Consult safety data sheet and tremcard for advice on any special risks.
- Only approach the cylinder using suitable breathing apparatus. If in doubt, wear self-contained breathing apparatus. Small apparatus designed for escape and rescue and approved for minor handling procedures can also be used.
- Depending on the type of gas, wear protective overalls if necessary (e.g. if caustic gas is leaking).
- If possible, close the cylinder valve.
- If the cylinder valve cannot be closed, continue to keep access to the area closed and allow the gas to blow off.
- Immediately after action, remove protective clothing and take a shower.

Gas Danger labels (ADR CLASSII)



Flammable liquid (fuel) danger label (ADR Class III)

Confined Spaces

Typical hazards associated with such work include

- presence of a hazardous gas, vapour or fume;
- lack of sufficient oxygen or air due to displacement by another gas e.g. carbon dioxide.
- oxygen has become depleted owing to corrosion over time.
- noxious fumes are generated as a result of disturbance of residues;
- plant or processes are not properly isolated.
- dangerous or hazardous conditions can arise directly as a result of the work activity itself.
- heat exhaustion is also a possibility.
- The most of gases or vapours are heavier than air and hence will tend to collect at the bottom of a container or collect in low lying areas.

Types of confined spaces

- vats
- combustion chambers in furnaces

- ductwork, silos etc
- rooms or areas where there is no ventilation or poor ventilation e.g. cable ducts.
- basements, vaults and cellars
- transformer tanks

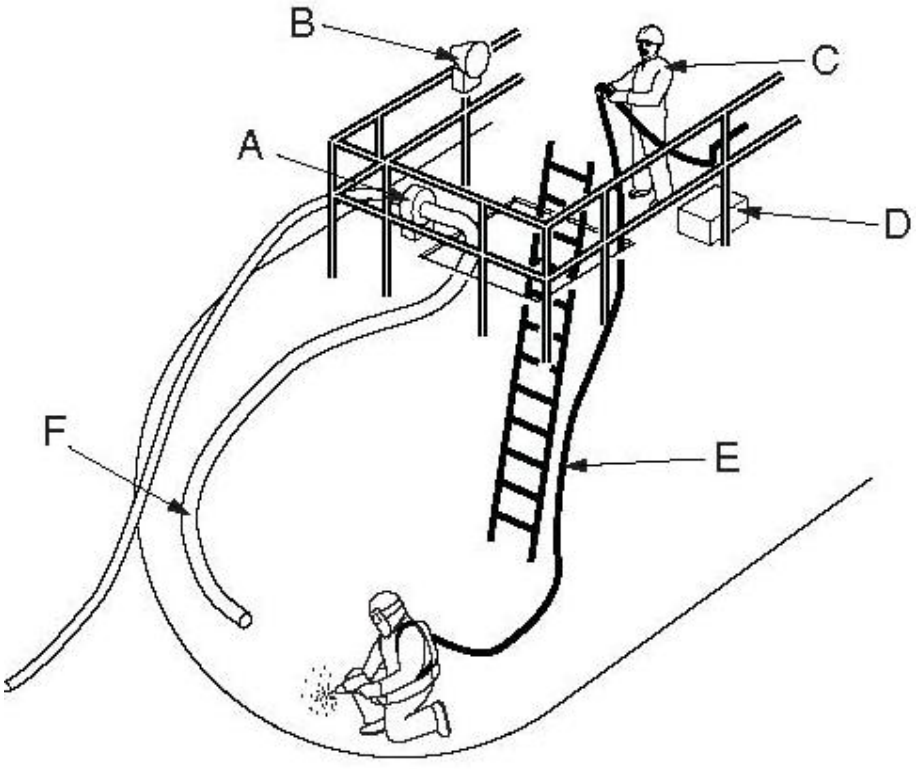
All work within confined spaces shall be avoided where this is practicable. Where work has to be carried out within a confined space then a PERMIT TO WORK must be issued. Rigorous risk assessment shall be carried out and the work may only proceed once the supervisor has established and witnessed that the correct safety controls are in place. Once they are in place the permit to enter may be issued to allow the work to proceed.

General Effects	%	
Oxygen enriched-possible fire	22.0	
Normal condition		20.8
Oxygen deficient		19.5
Impaired judgement & breathing		16.0
Faulty judgement & rapid fatigue		14.0
Difficulty in breathing & death	11.0	

The system of work shall be based upon a risk assessment and the control measures identified:

- isolate and ensure vessel or space is free of contents likely to contain or generate any noxious gas or vapour.
- Ensure tank or vessel or area is cleaned.
- check that the openings or access into the confined space is sufficiently large.
- provide suitable ventilation both extraction and/or dilution ventilation
- measure the atmosphere to check for the presence of hazardous gases etc and presence of sufficient oxygen. Ensure instruments are maintained and calibrated,

- If results show that the atmosphere is safe then proceed to prepare for work. If not then full self contained breathing apparatus will be required.
- special tools (non sparking) and flame proof lighting may be required.
- the operator and any second man shall be trained and competent to carry out the task safely including the use of self contained breathing apparatus or air lines,



A - Gas and Fume Extractor
B - Alarm Horn
C - Standby Worker
D - Emergency (SCBA) self contained breathing apparatus
E - Lifeline to Safety Harness
F - Gas and Fumes collected at source

- before entry the operator will require a harness and a lanyard and a second person will need to positioned outside of the confined space to assist in the event that the operator gets into difficulties,

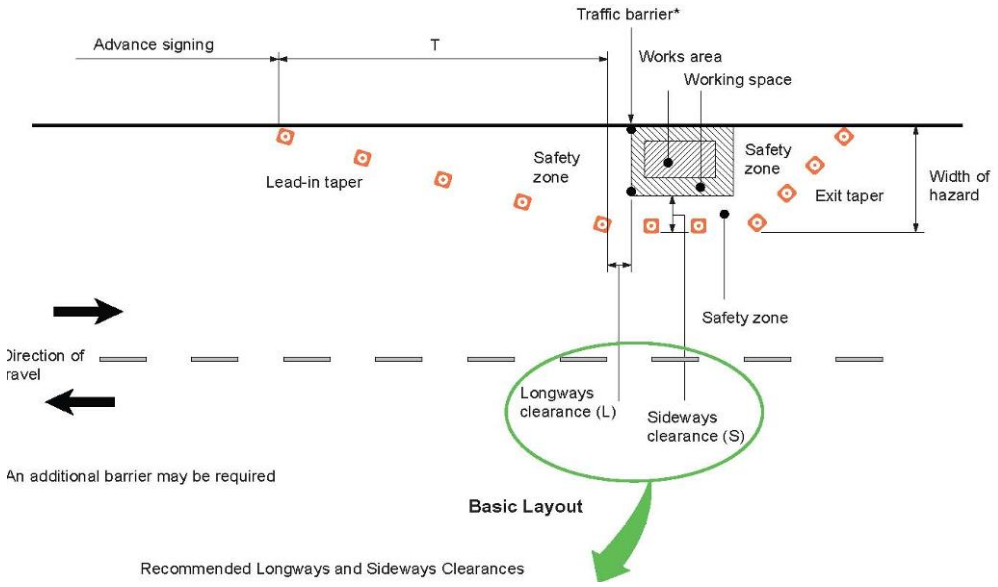
Rescue Equipment

- additional personal protective equipment will also be required including safety boots, safety helmets, gloves and eye protection.
- a supervisor shall be appointed who is competent to oversee the operation to ensure that all the safety measures are in place prior to entry.
- an emergency procedure shall be prepared in case the operator is overcome. Such a measure shall include communications, first aid and resuscitation equipment.
- a PERMIT TO WORK shall be prepared and issued to the persons who will undertake the work once all the precautions have been applied.
- routine checks shall be carried out periodically to ensure that the conditions laid down in the permit are being followed.

Work on Highways, and on puplic road

The work affected to roads of puplic is needed the provisional traffic plan what signed by traffic supervision, or other situations concerned shall be approved National Traffic Authorty.

Basic site layout



Speed Restriction (mph)	Minimum Longways clearance (L) meters	Minimum sideways clearance (S) meters
50	0,5	0,5
65	15	0,5
80	30	1,2
95	60	1,2
110	10	1,2

Driving and Transport Safety

The requirements below apply to all vehicles that are owned, leased, or hired by ABB, or privately owned but used for business by ABB employees. The use of a privately owned car is subject to approval by the manager.

Vehicles should be hired from ABB preferred (there are is agreement between ABB Group and the rental company) rental companies.

And applies to vehicles used by contractors to transport their workers to and from site.

In some countries it is not advisable to drive by your own. The vehicles shall be leased with driver or if the vehicle is an ABB car it should driven by a local. In case of an accident it can cause significant difficulties whether you are the cause of the accident or not. Local ABB office can normally advise.

The Vehicles Used

- Ensure that all vehicles are fit for purpose;
- Ensure that all vehicles and fittings meet appropriate safety standards & laws;
- Ensure that all vehicles are suitably inspected and maintained;
- Ensure that all vehicles have front and rear fitted seat belt.
- Ensure that all vehicles are insured for driver, passengers, damage to the car and third person.
- Ensure that the vehicles are common in the country in order to get reliable support of services and spare parts

Specifically Vehicles shall:

- The vehicle should not be older then 3 years and with a weight above 1200 kg
- Have at least two airbags “driver and passenger”.
- Be fitted with seatbelts for all seats, in the front and at back or for buses on all seats.
- Be fitted with head rests at seats in the front and at back.
- Have standard, ABS and Power Steering.
- Be fitted with a fire extinguisher and a First aid kit.
- Only vehicles specifically designed for passenger use shall be used for transporting workers e.g. mini bus, coach etc
- If the vehicles are supposed to be used for transporting goods they should be fitted with devices to secure the load.
- Air-conditioned, this will be recommended (long distances on hot summer days can cause fatigue to the driver.
- Canopies are not required, as ABB will not tolerate employees to be transported on the back of any vehicle. The sole purpose of a canopy will only be for the protection of transportation of goods against rain etc.

The Driver, and Passengers

- Comply with all national road laws, and site speed limits;
- Seat belts are worn by all occupants;
- Be suitably trained, licensed and medically fit to operate the class of vehicle;
- Report any medical or physical condition that would impair ability to drive safely;

- Not drive under the influence of alcohol or drugs, or when suffering from fatigue;
- Do not use hand-held cell (mobile) phones, or radios when driving;
- Comply with procedures for safe operation and maintenance of their vehicle;
- Ensure the manufacturers limit for passengers, and load to be carried are not exceeded;
- Report all motor vehicle incidents even where minor injury, or damage.
- Employees that drive more than 30,000 km for business per year or in an area with a Risk Level status shall attend a suitable advanced driving course.

Taxis

The use of 'spot' or hire direct hire taxis should be avoided in high road risk countries (ref: ABB Road safety standard). Where possible in high risk countries local management should set up contracts with one or more light vehicle rental companies that can provide vehicles and drivers that meet the ABB standard.

Motorcycles

If motorcycles are used by employees for business travel then safety helmets are worn by the riders, and passengers.

Fatigue Kills

It is important that the risks of fatigue are reduced as far as practicably possible, whilst allowing reasonable discretion to be exercised by the driver. To avoid fatigue, adequate rest should be taken on long journeys; it is recommended that a short break, say of at least 15 minutes, should be taken after about 2 hours driving and a longer break, say of about 60 minutes, after 4 hours.

As an indication of the daily limits for the distance or time that should be driven, the following guidance is offered. Many factors affect fatigue so that limits in terms of mileage or time are difficult to set, except perhaps for very specific situations. Examples of recommended maximum distances set for some specific situations are 400 km (250 miles) for driving on generally good roads and 600 km (375 miles) for mainly motorway driving. However, any such recommendations should be regarded as exceptional journeys, not the norm.

After completing long haul flights employees should not drive, alternatives should be used e.g. host pickup, appropriate taxi or public transportation.

Travelling to high risk countries

Typical risks that could be encountered include:

- social unrest;
- kidnapping & extortion;
- theft;

- armed robbery;
- piracy;
- terrorism;
- transport and traffic situation;
- natural disaster.

Before travelling to high risk country, please inform the ABB Project Manager and determine the necessary safety steps.

Extreme weather conditions

Planning for Hazard Identification, Risk Assessment, and Control
Each ABB worksite shall implement a site specific cold or hot weather stress hazard assessment and have the control plan approved by the Field Service OHS Specialist or another authorized employee.

This hazard assessment shall:

- Identify the tasks and occupations where there is the potential for extreme weather stress (hot or cold);
- Implement and/or provide controls (engineering, administrative or personal protective equipment) to minimize the cold or heat stress;
- Provide training and education regarding cold or heat stress, including early signs and symptoms of exposure.
- Include the use of the Cold Stress Equation or the Heat Stress Chart, as warranted.

The customer site contact shall be consulted during the risk assessment/job hazard assessment process to ensure that all site risks are identified and controlled.

Facilities for cold-related weather

- Regularly used walkways and travel ways shall be no sleepy or cleared of snow and ice as soon as practicable.
- Workers will be informed of the dangers associated with working around unstable snow and ice build-ups, sharp icicles, ice dams and know how to prevent incidents caused by them.
- When dangerous overhead build-ups of snow or ice are present, barricades will be used to prevent workers from walking or driving into potential fall zones.

Clothing, PPE and Supplies for cold-related weather:

Proper cold weather protection must be worn by workers when working in cold, wet and windy conditions. Protective clothing is the most important way to avoid cold stress. The type of fabric also

makes a difference.

Cotton loses its insulation value when it becomes wet. Wool, silk and most synthetics, on the other hand, retain their insulation even when wet. The following are recommendations for working in cold environments:

- Wear at least three layers of clothing. An inner layer of wool, silk or synthetic to wick moisture away from the body – a middle layer of wool or synthetic to provide Insulation even when hot - an outer wind and rain protection layer that allows some ventilation to prevent overheating. To maintain ABB Field Service requirements in extreme cold conditions, FR clothing options are available to maintain required protective status while working in extreme cold.
- Wear a hardhat liner or head band. Up to 40% of body heat can be lost when the head is left exposed.
- Keep a change of dry clothing available in case work clothes become wet.
- With the exception of the wicking layer do not wear tight clothing. Loose clothing allows better ventilation of heat away from the body.
- Do not underestimate the wetting effects of perspiration. Oftentimes wicking and venting of the body's sweat and heat are more important than protecting from rain or snow.
- Wear insulated boots or other footwear. Felt-lined, rubber bottomed, leather-topped boots with removable felt insoles are best suited for heavy work in cold since leather is porous, allowing the boots to "breathe" and let perspiration evaporate. All footwear shall be compliant with safety requirements and electrical hazard rated (EH).
- Liner socks made from polypropylene will help keep feet dry and warmer by wicking sweat away from the skin. Always wear the right thickness of socks for your boots. Obey all FR requirements.
- In extremely cold conditions, where face protection is used, eye protection must be separated from the nose and mouth to prevent exhaled moisture from fogging and frosting eye shields or glasses.
- Clothing must be dry. Moisture should be kept off clothes by removing snow prior to entering heated shelters.

Cold weather supplies shall be regularly inspected and restocked when necessary by ABB. Regular inspections on cold weather supplies, such as hand warmers, jackets, shovels, etc. shall be carried out to ensure that supplies are always in stock. All clothing shall comply with FR requirements.

Facilities for hot-related weather

- Inform workers of areas where cool-down and/or break periods can be taken.
- Inform workers where to obtain water and electrolyte solutions, as warranted, as well as proper sanitation and emergency facilities.

Protecting Workers from Heat Stress

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

Risk Factors for heat:

- High temperatures and humidity, direct sun exposure, no breeze or wind.
- Low liquid intake.
- Heavy physical labour.
- Waterproof clothing.
- No recent exposure to hot workplaces.

Symptoms of heat exhaustion:

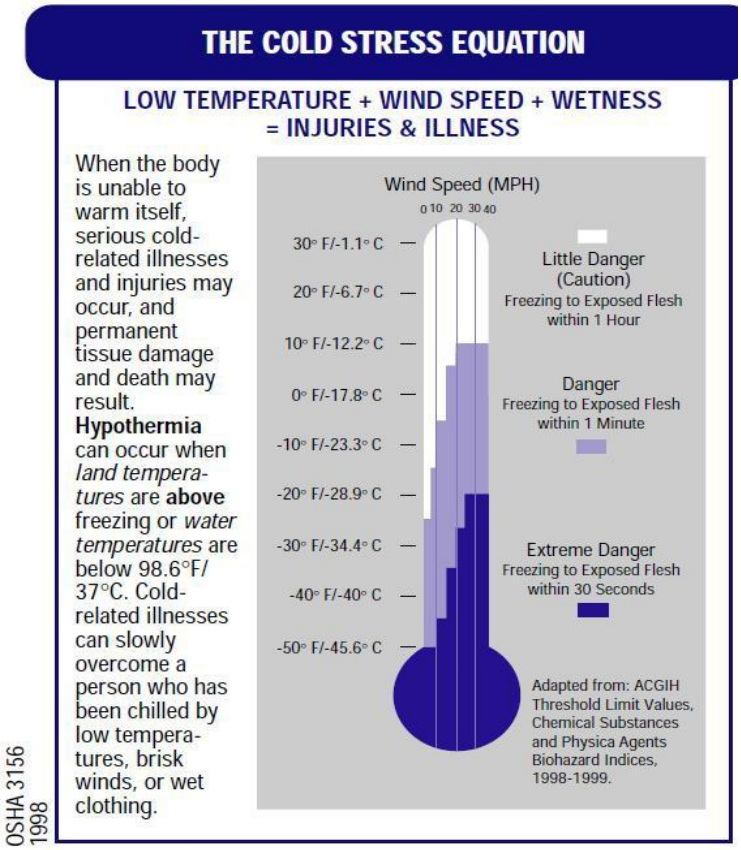
- Headache, dizziness, or fainting.
- Weakness and wet skin.
- Irritability or confusion.
- Thirst, nausea, or vomiting.

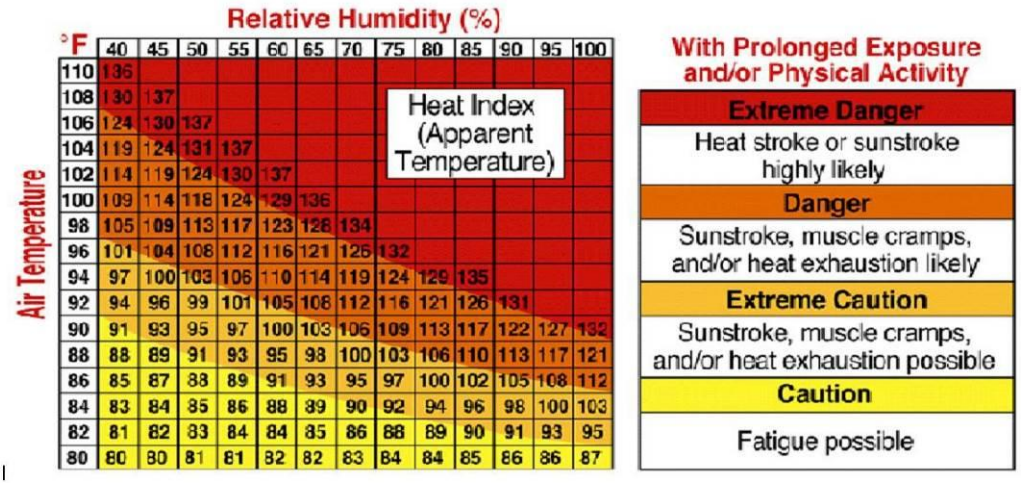
Symptoms of heat stroke:

- May be confused, unable to think clearly, pass out, collapse, or have seizures.
- May stop sweating.

Controls for extreme heat

- Cover up from the sun. Wear loose-fitting shirts and long pants. FR clothing options are available to maintain required protective status while working in extreme heat.
- Use sunscreen with a sun protector (SPF) of at least 30.
- Wear a hardhat with a wide brim to protect the neck, ears, eyes, forehead, nose and scalp.
- Wear UV-absorbent sunglasses.
- Limit direct sun exposure. The most intense UV rays are between 10 a.m. and 4 p.m.


THE COLD STRESS EQUATION
LOW TEMPERATURE + WIND SPEED + WETNESS
= INJURIES & ILLNESS
When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result.
Hypothermia can occur when land temperatures are above freezing or water temperatures are below 98.6°F/37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.
Wind Speed (MPH)
0 10 20 30 40
30° F/-1.1° C
20° F/-6.7° C
10° F/-12.2° C
0° F/-17.8° C
-10° F/-23.3° C
-20° F/-28.9° C
-30° F/-34.4° C
-40° F/-40° C
-50° F/-45.6° C
Little Danger (Caution)
Freezing to Exposed Flesh within 1 Hour
Danger
Freezing to Exposed Flesh within 1 Minute
Extreme Danger
Freezing to Exposed Flesh within 30 Seconds
Adapted from: ACGIH Threshold Limit Values, Chemical Substances and Physica Agents Biohazard Indices, 1998-1999.
OSHA 3156
1998


Relative Humidity (%)
°F
40 45 50 55 60 65 70 75 80 85 90 95 100
110 136
108 130 137
106 124 130 137
104 119 124 131 137
102 114 119 124 130 137
100 109 114 118 124 129 136
98 105 109 113 117 123 128 134
96 101 104 108 112 116 121 126 132
94 97 100 103 106 110 114 119 124 129 135
92 94 96 99 101 105 108 112 116 121 126 131
90 91 93 95 97 100 103 106 109 113 117 122 127 132
88 88 89 91 93 95 98 100 103 106 110 113 117 121
86 85 87 88 89 91 93 95 97 100 102 105 108 112
84 83 84 85 86 88 89 90 92 94 96 98 100 103
82 81 82 83 84 84 85 86 88 89 90 91 93 95
80 80 80 81 81 82 82 83 84 84 85 86 86 87
Air Temperature
Heat Index (Apparent Temperature)
With Prolonged Exposure and/or Physical Activity
Extreme Danger
Heat stroke or sunstroke highly likely
Danger
Sunstroke, muscle cramps, and/or heat exhaustion likely
Extreme Caution
Sunstroke, muscle cramps, and/or heat exhaustion possible
Caution
Fatigue possible

Inspections of Plant and Equipment

An important part of site safety is ensuring that regular and routine checks are carried out on certain items of plant and equipment. An inspection is something that would be carried out on site by someone who is competent and an examination is something that would generally be carried out by a competent person.

Recommended Inspection Requirements

Item	Before first use	After alteration, addition etc	After an event likely to affect stability e.g. fall of material or performance	Before start of shift	Every 7 days & record required	6 monthly Record required	12 monthly Record required
Working platform including guard rails and toe boards	X	X	X	X	X		
Mobile scaffold	X	X	X	X	X If in use for more than 7 days		
Mobile elevated working platform (MEWP)	X	X	X	X	As per manufacturer's recommended requirements		
Personal suspension e.g. bosun's chair, cradles	X	X	X	X	X		
Fall arrest equip e.g. harness and lanyard	X	Not likely unless temporary lifelines are in use		X			X
Ladders				X		X	
Supported excavations	X		X	X			
Cofferdam (water tight enclosure)	X		X	X			
Caisson	X		X	X			
Lifting tackle e.g. slings, chains, hooks etc						X	
Lifting machines e.g. cranes, hoists	X						X

etc							
Lift trucks				X		Lifting chains	
Air receivers							X
Portable electric tools Non battery operated (110 and 220v)	check & register		X	X		X	
Vehicles & mobile plant		Not applicable		X Tyres, brakes lights, mirrors etc	As per manufacturer's recommended requirements		

Installation from labour safety point of view

- To install equipment preliminary labour safety examination is needed.
- In case of workequipment it is obligatory to present labour safety aptitude certificate and in case of facility,workplace,workequipment under supervision of the authorities, it is compulsory to present authority permit.
- Cooperation of expert, labour safety special activity and preliminary examination are needed.

Registers of machines

It is compulsory to keep records (by employer) of work equipments operated on and brought into implementation work area in the form mentioned below:

Sub-contractor: ----------company name

Number	Name of equipment	identification data	arrival	removal	Review, check			Comment
			date		necessity	kind	date	

Safety regulations concerning Housekeeping

- All offices, work locations, work areas, passageways, storerooms, restrooms, and service rooms shall be kept clean, orderly, sanitary.
- b) The area of every work location shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained.
- To facilitate cleaning, every floor, working place, work site and passageway shall be kept reasonably free from obstruction and maintained in a clean condition. On project sites particular attention shall be paid to protruding nails, objects, splinters, holes, or loose boards or other hindrances that might represent a tripping hazard.
- All waste materials shall not be allowed to accumulate except in suitable containers. Containers shall be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Containers used for waste and other oily, flammable, or hazardous wastes, such as caustics, acids, harmful dusts, etc. shall be equipped with covers. Waste and other waste shall be disposed of at frequent and regular intervals. Disposal of chemical substances shall be carried out in compliance with local regulatory requirements.
- Sufficient illumination will be provided in all areas at all times. Where permanent lighting is not available then temporary lighting systems shall be provided.
- All workers are responsible for maintaining their immediate work areas in a clean and orderly manner, and for notifying their supervisor or site lead person of conditions beyond their control.
- Supervisor will ensure that machines and equipment under their control are maintained in a clean and orderly manner and that the work area generally is maintained in a clean condition.
- Spillages will be immediately reported to the supervisor by any worker discovering the spill. Where he has received suitable instruction he should take remedial measures in accordance with the spill control procedure.
- Under the housekeeping working care must be taken the safety requirements: protection against falls from ladders, and protection of open holes and roof.

Fire safety regulations

Fire alarm, alarming

- The person observing fire on the establishment's area is required to signal fire with device available, or with a loud cry.
- It is necessary to report all fire cases to Fire Brigade on the phone number of 105 or on other phone numbers - see on Project Information Board and to security and the Project Manager of ABB.

Equipments for fire alarm

- Office telephones.
- Mobile telephones

Fire extinguishers in work area

- Workplaces must be provided with fire extinguishers on the basis of character, size of rooms, usage, equipment, devices applied, and chemical and physical specifics of substances stored and of the potential highest staff number staying on site.
- Fire extinguishers must beregularly (quarterly) reviewed and annually it is necessary to check them by expert.

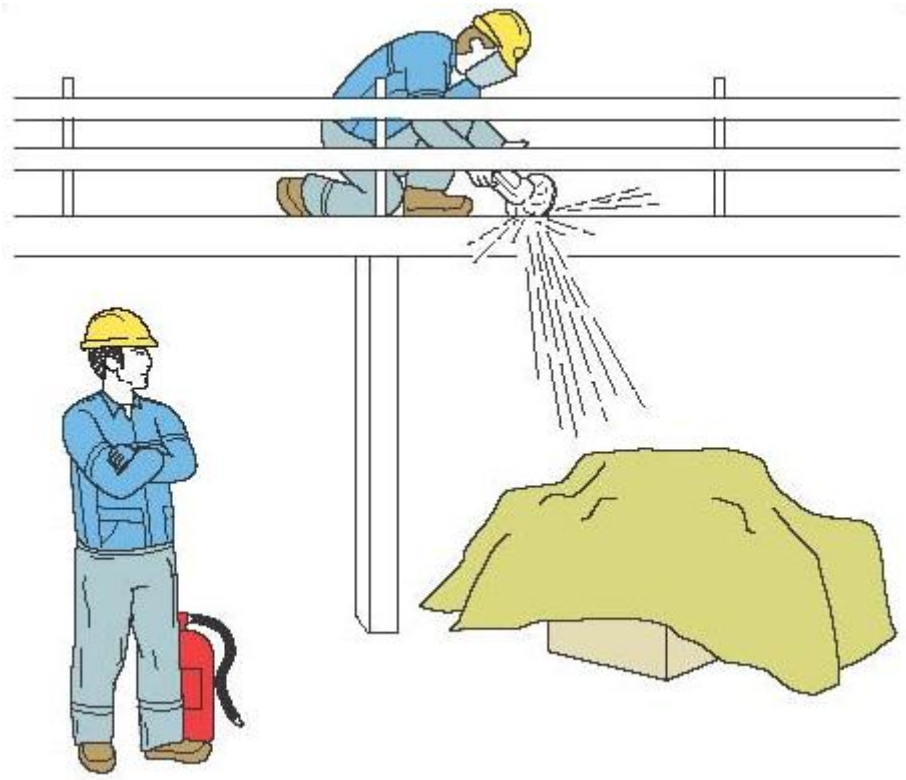
- It is necessary to mark storing place of apparatus and equipments in a way defined in regulations! Signs must be fixed permanently. The extinguishers keep visible!

Type of manual fire extinguiser	Fire class				Comment
	A	B	C	D	
Dust	limited	+	+	+	depend on Voltage
Water	+	-	0	0	Prohibited
Foam	+	+	0	0	
CO2	-	+	+	0	

- Around the fire extinguisher it is necessary to insure 1m2 free place and minimum 0,9 m wide approach road.

Conditions of combustible work activity

- Sub-contractors are responsible for fire safety of building area.
- In single rooms and in open spaces, those materials and equipments can be stored exclusively, which are necessary for activities to be carried out there.
- To perform combustible work ABB may prescribe permit of fire lighting, everybody will be informed about it later on at weekly coordination meeting. If it is so, safety engineer entrusted by may issue ot the ABB project manager or to authorized firm by him. In all cases, time and work area of combustible work activiy is accurately circumscribed.
- In case of combustible work activity, permit of fire lighting is compulsory and fire prevention training is too. It is issued by fire-safety representative or ABB Site Manager.
- In rooms only the minimal quantity of flammables can be stored. (the quantity used during working hours)
- Combustible waste polluted with oil, grease must be collected in metal bin with tight-fitting cover. It is necessary to write on it ‘combustible waste’, (it must be seperated from communal waste.)
- Collected waste must be transported regularly. It is necessary to develop waste container to make sure it may not be danger to environment.
- Flammables cannot be stored in places visibly not well, or under open platforms.



- After finishing work, workplace must be checked and all irregularities must be stopped, which may cause fire or explosion. Every person has personal responsibility for checking.
- If danger is detected, project supervisor must be reported promptly.
- Near combustible materials, it is prohibited to do cutting, grinding, welding activity. If it is inevitably necessary, project supervisor's preliminary approval is needed and it is necessary to take steps to prevent fire.
- Sub-contractors working in work area have to follow fire safety rules and to keep adequate number of fire extinguisher on area.
- It is necessary to make sure fire extinguishers are in active condition and validity of them can be checked.
- To ensure efficient fire safety all employees must be given fire safety training.
- it is necessary to replace used fire extinguishers promptly, and to send if for corrcection.
- It is necessary to report all fire promptly to project manager, saying what burns, how big the fire is, and whether human life is in danger.
- Gas bottles are needed to be kept in container locked. Bottle container must be placed far from buildings, out of danger zone (5m zone). On the side of bottle container one extinguisher of 12kg must be placed.

Hot work activities

- flame cutting
- burning

- welding
- grinding
- soldering
- working with angle grinder

Contents of Hot Work Permit

1. Checks are carried out to ensure that compressed gas equipment is in good order with flashback arrestors fitted and hoses in good order.
2. Adequate portable fire extinguishing equipment is provided.
3. A person is appointed to act as fire watch person until X hr after the work has been completed.
4. Adjacent structures are suitably protected by using wet sand or something equally effective.
5. All waste is removed to the open air at the end of the work
6. The area is dampened down and inspected on completion of the work.

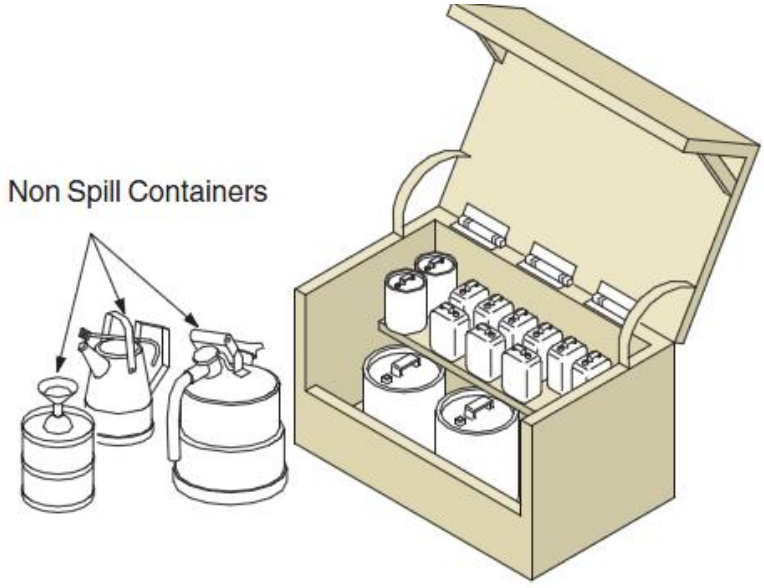
Work with dust on site with fire alarm

- In case of dusty working the fire alarm has to have a fire system disabled on the working area, this the working with dust it is needed to hot work permit

Flammable Liquids

- Flammable vapours and gases are generally heavier than air & hence they tend to collect in low lying areas.
- Their flash point is a measure of their flammability and hence the lower the flash point the more flammable they are.
- A source of ignition is required and this can be a flame, hot surface or an electrical spark including static discharge.
- They will only ignite if the concentration in air is above the lower explosive limit (LEL) about 2%.
- Important to avoid the use of flammable materials whenever it is practicable. If not then materials with a high flash point shall be favoured over liquids with low flash points.
- Store the bulk containers away from the work area in a store or cupboard of fire resisting material. It shall have some natural ventilation or air flow present at high and low level to allow any vapours that may be present to be diluted and dispersed.

- Only allow quantities equivalent to day's supply to be present in the working area. A fire resisting container shall be provided for this purpose.
- Where storage is less than 50 litres, metal lockable bins may be used.
- All containers must be properly labelled and must be kept with their lids on when not in use.
- A spill control kit shall also be available to deal with any spillages and prevent any contamination of surface water drains.
- Non spill containers or dispensers should be used if possible.



- In situations where decanting is carried out this shall be carried out in the open air and placed in non spill safety containers.
- No sources of ignition shall be present where flammable liquids are either stored, handled, dispensed or used.

- All bulk containers of flammable liquids shall be sited within a bund sill arrangement or a bunded store capable of holding 110% of the largest container.
- Highly flammable liquids such as paints etc with low flash points typically below 32°C in bulk should be stored in a suitable building as shown in the diagram below.

Rules concerning emergency and evacuation

Rescue - evacuation of work area

Building work area can be evacuated with a cry, or the help of megaphone situated at reception.

After evacuation instruction all employees must:

- Switch off equipments in use;
- Help the ones staying in work area, or people in need leave the place calmly, with no panic as soon as possible;
- Direction of escape is through exits and windows, to outside of work area fence, to get to Industrial Park road without disturbing Fire Brigade and the ones traveling on road.

Escape routes

- Escape routes and emergency exits must not be blocked not even temporarily.
- Escape routes and emergency exits must be marked in a way defined in regulations. In places, where lighting is necessary, emergency light must be provided.

A fire evacuation drill shall be carried out at least once a year, or once during the execution of the project.

Emergency equipment and procedure

- fire detection
- fire alarm
- fire fighting equipment
- spill kits
- medical emergency equip including electric shock

A site emergency procedure shall be drawn up to include the following:

- what to do in the event of an emergency
- who to contact and tel number
- where to go and assemble
- roles of key personnel

The emergency procedure shall be posted in all key areas and shall be briefed to all persons during the site induction.

First aid

Definitions

Emergency medical care: Emergency medical care is the provision of skilled medical help at the scene of an accident, medical emergency, or during transport to hospital. It consists of recognition, resuscitation and stabilization of the seriously injured and it extends beyond the preservation of life to the prevention of complications and the relief of suffering.

First Aid Treatment: (a) treatment for the purpose of preserving life and minimizing the consequences of injury or illness until help from doctor, nurse/medical professional is obtained. (b) treatment of minor injuries which do not need treatment by doctor, nurse/medical professional.

Provisions shall be made so that:

- an injured person will be treated by a first aider within 5 minutes of incident.
- a seriously Injury person will be treated by a Medical professional within one hour of incident. This will normally be at hospital, or suitable trauma centre.

To achieve the response time for seriously injured persons at remote sites/locations it may be necessary to make additional medical provisions at site including:-

- Ambulance, or vehicle capable of taking full length stretcher
- Medical professional, and trauma facilities
- Helicopter evacuation

Where there is up to 50 workers there should be at least one qualified first aider present ALL the time. A further first aider is required for every additional 50 workers. It may be that additional qualified first aiders are required to achieve the response times detailed in this sheet. Also if there are additional hazards and risks.

In the course of construction work, all employees primarily must make use of first aid provided by their own employer.
In case of need, designated first aid places are the followings:

- In office building
- If ambulance is directly notified, security still must be informed as well! All employees must take care of safety of others and report all accidents, sickness.
- Employer has to provide first aid opportunity, and has to ensure trained employee to perform first aid among staff.
- First aid kit must be at disposal of any workgroup so as to be able to treat small injuries.
- First aid kit is placed in ABB office building as well.
- First aid kit and fire extinguisher are fundamental accessories of machines.

- If somebody falls sick or has accident, immediate step must be taken.
- In case of serious injury it is necessary to call ambulance, and it is obligatory to give first aid until ambulance arrives. It is necessary to define punctual arrival place of ambulance, to define which part of work area it should go. It is necessary to appoint a person who waits and directs ambulance.
- If in building area more than 50 persons work at the same time, it is obligatory to provide first aid place. Information from place of fist aid kits, firt aider/doctor' phone numbers is available on Project Information Board.
- It is necessary to investigate all accidents. In case of accident Labour safety engineer/coordinator of ABB must be informed on the phone (See Project Information Board). In case of serious accident it is necessary to close the site of injury and, to suspend work, and project manager of ABB has to take photos or to make drawing of accident site. Accident is considered to be serious if resulting in death, amputation, loss of sense organ, loss of major parts of several fingers, paralysis and if physician says so.
- Accident, injury must be registered in Accident Report within 24 hours.
- Employer has to prepare report of injuries recovering over 3 days and it must be sent to Nemzeti Munkaügyi Hivatal Munkavédelmi és Munkaügyi Igazgatóság by the 8th of given month.

First Aid Kits Minimum Contents according to EN 13553 standard Class II (till 50 person). A further first aid kit is required for every additional 50 workers. If the local legal requirements may have different requirements, this shall be checked local and agreement on contents made.

Course of labour safety and fire safety training

At the start of implementaion in connection with work, it is obligatory to give labour safety and fire safety training to all employees of ABB and all employees of external employers (entrepreneurs) and training must be given yearly executing on the basis of this document.

In the course of implementation ABB may demand extra requirements from sub-contractors, safe work activities are priorities. Besides requirements defined in regulations all participants have to follow internal regulations as well.

The aim of ABB is to identify all risks potentially occuring in the course of implementation of work– before starting the activity – to make all risks safe! We expect everybody to collaborate in this activity, no matter in what position and who they work for.

General topics for fire- and labour safety training

1. General Labour Safety Law in Hungary, organized working on the site
2. The personal condition of the safe working

3. Personal Protective Devices & Equipements
4. The employees' and employer rights, obligations
5. The general regulations of the constuction work area (e.g. smoking and alcohol rules, traffic), special dangers
6. Medical suitability examinations
7. The accident and work accident
8. Health and Safety Plan and content
9. The special labour protection tasks on the contstruction site,
10. First aid
11. Fire prevention regulations
12. Fire alarm,
13. Manual fire alarm
14. Fire extinguishers and these usage
15. Emergency procedure, escape rules
16. Rescue, evacuation
17. Evacuation plan
18. Waste treatment
19. Contacts (Ambulance:104 or 112, Fire Dep. 105, Police 107)

Legal regulations of labour safety concerning building work areas

Besides this order the following regulations remain effective:

- Hoist Safety Regulation
- Welding Safety Regulation
- Iron- and Metal Fitting Regulation and several other major regulations concerning labour safety, fire safety, environment protection and waste management.
- How to establish building workplaces is detailed in 4/ 2002. (II. 20.) SZCSM-EÜM collective order, it contains the minimal labour safety requirements to be accomplished in the course of building processes and in building workplaces.
- Hungarian authorities (location based responsible Kormányhivatal Népegészségügyi Szakigazgatási Szerve, fővárosi, ill. megyei Kormányhivatalok Foglalkoztatási Főosztályának Munkavédelmi Ellenőrzési Osztálya, Katasztrófavédelem, Tűzoltóság, Biztonsági Felügyelet, Környezetvédelmi Felügyelet, etc.) request measures on the basis of effective regulations. Authorities in the course of their procedures – in minor cases (e.g. jeopardize of employee)- may oblige to take action, may suspend activity, may impose fine (max.:200.000.-HUF), labour safety fine may be imposed (max.: 10.000.000.-HUF/site), chemical and environmental fine may be imposed, and criminal procedure may be initiated (negligent endanger of employee may be sufficient legal ground). We would emphasize regular authority check can be expected even though there is no accident or health impairment in the course of building activity. But in case of accident occuring or reported regular authority check is guaranteed.
- In the course of implementation activity ABB would like to protect all employees against any kind of losses concerning safety and factors, which may impede or hinder construction activity, therefore it is expected to follow all regulations.. Besides providing professional assistance and safety coordination, observation of regulations will be continuously checked. In case of irregularity step will be taken, in case of serial irregularity contract will be terminated.

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