HSE
HEALTH, SAFETY & ENVIRONMENT

HEALTH AND SAFETY STANDARD

06 May 2017

RISK ASSESSMENT

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QUALITATIVE RISK RANKING

1/1

Risk Ranking Table to Classify Worker Scenarios Based on Likelihood and Consequence

SAFETY		Consequences				
		Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Likelihood	A - Almost certain	L	M	E	E	E
	B - Likely	L	M	H	E	E
	C - Moderate	L	M	H	E	E
	D - Unlikely	L	L	M	H	E
	E - Rare	L	L	M	H	H

Legend:

E: extreme risk; immediate action required.

H: high risk; senior management attention needed.

M: moderate risk; management responsibility should be specified.

L: low risk; manage by routine procedures.

GENERAL RISK ASSESSMENT 1/3

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Hazard	Likelihood	Consequences	Risk
Traffic accidents.	D	5	E
Falls of people at different levels by working at height.	E	5	H
Falls of persons at the same level by lack of housekeeping.	D	3	M
Falling objects.	E	5	H
Hit with fixed or moving objects.	C	3	H
Injuries in the use of tools.	C	2	M
Projection of fragments or particles.	C	3	H
Entrapment between objects.	E	4	H
Over stressing.	C	3	H

RISK ASSESSMENT 2/3

Hazard	Likelihood	Consequences	Risk
Thermal contact with hot or molten metals.	D	3	M
Electric shock.	E	5	H
Exposure to harmful substances. Welding fumes.	D	3	M
Arc eye, welder's flash, flash burns, etc.	C	3	H
Explosions and fires: gas to preheat and cutting. Fall projections of welding and cutting.	E	5	H
Noise and vibration. Use of grinding machine.	C	3	H
Lack of LOTO; working on energized equipment, or in its proximity; pressurized facilities; high temperatures; moving parts of equipment; classified areas (flammable gases, chemical contaminants, deficiency of oxygen...).	D	5	E

RISK ASSESSMENT 3/3

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Hazard	Likelihood	Consequences	Risk
Falling objects in lifting operations; lashes for breakage of cables or slings; use of a non-locking snap hook; lifting lugs, shackles, etc. in poor conditions...	E	5	H
Severe impact after cutting an stressed element.	E	4	H
Cuts, pinches and punctures when handling cables, slings and accessories.	C	3	H
Entrapment in lifting operations.	E	5	H
Crane overturns.	E	5	H
Animals and poisonous insects	C	4	E
Adverse meteorological conditions	C	4	E

OBJECTIVES 1/2

- Ensuring the proper authorisation of designated work. This may be work of certain types, or work of any type within certain designated areas other than normal operations.
- Making clear to people carrying out the work the exact identity, nature and extent of the job and the hazards involved, and any limitations on the extent of the work and the time during which the job may be carried out.
- Specifying the precautions to be taken, including safe isolation from potential risks such as hazardous substances, electricity and other energy forms.

OBJECTIVES 2/2

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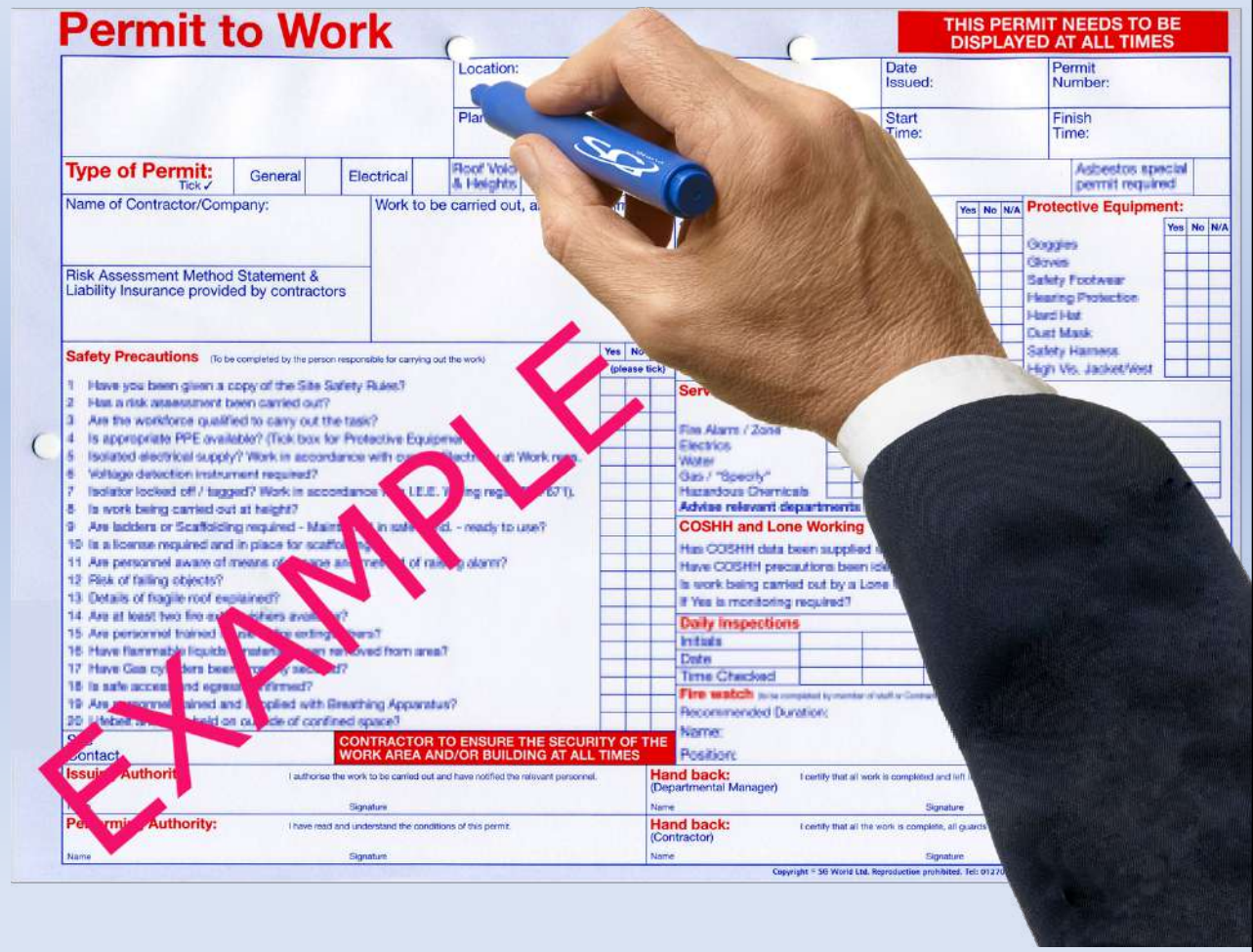
- Ensuring that the person in direct charge of a unit, plant or installation is aware of all hazardous work being done there.
- Providing for the suitable display of permits.
- Providing for the control of work activities that may interact or affect one another.



DRIVING POLICY | TRAFFIC MANAGEMENT PLAN

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Vehicle entry permit is required.

Drivers must not be allowed to operate the vehicle unless they are fully trained, qualified and medically fit to drive and operate the vehicle.

Respect traffic signs and speed limits.

Fasten Safety belt all the time.

Do not use mobile phones while driving or operating equipment.

All Engine driven equipment must have portable Fire Extinguisher available.

Consider employing a trained **signaller (a banksman)**, both to keep the reversing area free of pedestrians and to guide drivers. Banksmen must wear high visibility clothing.

DRIVING POLICY | TRAFFIC MANAGEMENT PLAN 2/5

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- Self-propelled mobile equipment shall have an automatic reverse-activated **signal alarm**. Alarms shall be audible above the surrounding noise levels.

- Self-propelled mobile equipment shall have a **beacon light**.

- In case of huge equipment, small vehicles must use a Buggy Whip Flag as an effective tool to make them more visible.

DRIVING POLICY | TRAFFIC MANAGEMENT PLAN 3/5

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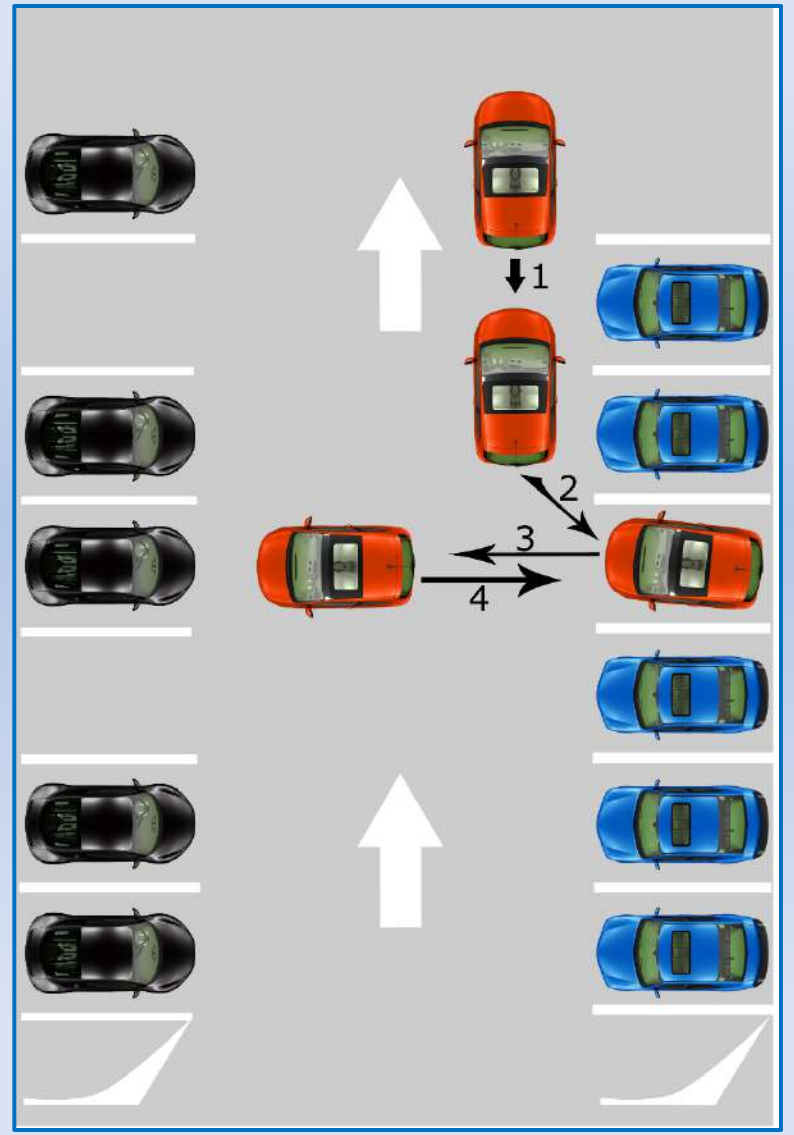
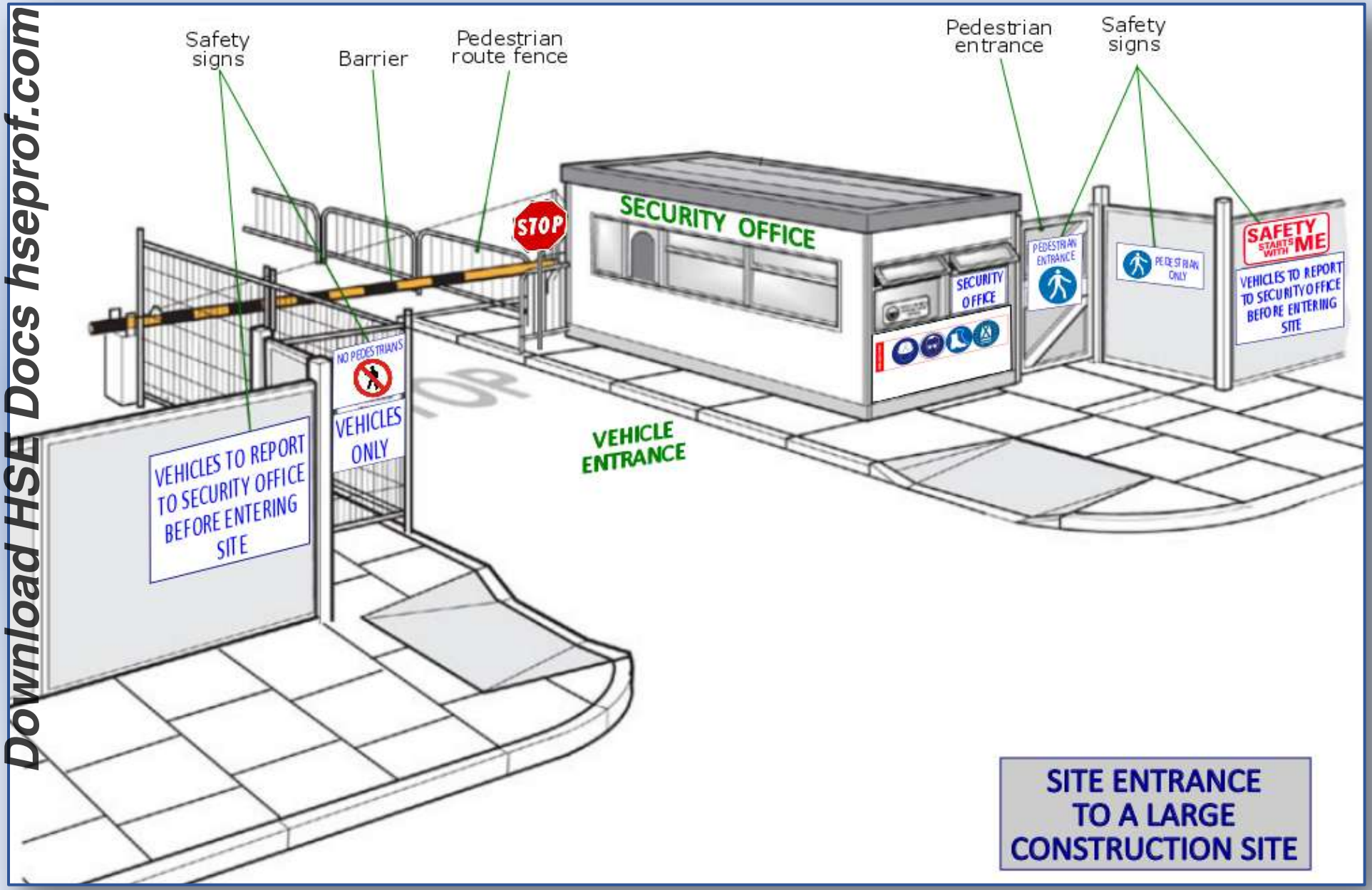
- Reverse or BAY PARKING must be used.
- No mobile equipment shall be parked in any place where it may interfere with the safe movement of persons, materials, goods or things.
- Vehicles or mobile equipment must not block any fire protection system and emergency routes or any building access.



DRIVING POLICY | TRAFFIC MANAGEMENT PLAN 4/5



Entrances and exits

Provide separate entry and exit gateways for pedestrians and vehicles.

DRIVING POLICY | TRAFFIC MANAGEMENT PLAN 5/5

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Walkways: Provide firm, level, well-drained pedestrian walkways that take a direct route where possible.

Barriers: Think about installing a barrier between the roadway and walkway.

Footpaths and roads will always be kept clear of obstructions, including parked cars. Materials will not be stored on or near roadways, paths or other areas where they may constitute a hazard.

Traffic control and warning lights will be made available for use where thoroughfares are obstructed.

PERSONAL PROTECTION EQUIPMENT - PPE

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When necessary: Clothes for ATEX areas; electrical PPE; harnesses and fall arresters; welder clothes; safety gloves; welding helmet; safety goggles; face shield; respiratory protection; safety masks; ear protections; brace; life-jackets; etc..

Preventing eye injuries when welding, cutting, grinding...

Safety glasses must be worn under shields

GENERAL RISK CONTROL

- Before starting any work **all necessary measures must be in place**.
- Everybody present at the workplace must **immediately report any unusual occurrences**, incidents and every accident, every fire, or flame, however small, to the Main Contractor HSE Department (fire, smell of gas, abnormal odour, abnormal noise or whistling, sparks, flames, explosion, ejected soil, water and fluid leaks, liquid splashes, etc.).
- All staffs present on the construction site are duty-bound to **ensure the maintenance of the collective protective equipment**.
- The system of established **permits to work** has to be fulfilled and respected.

GENERAL RISK CONTROL 2/4

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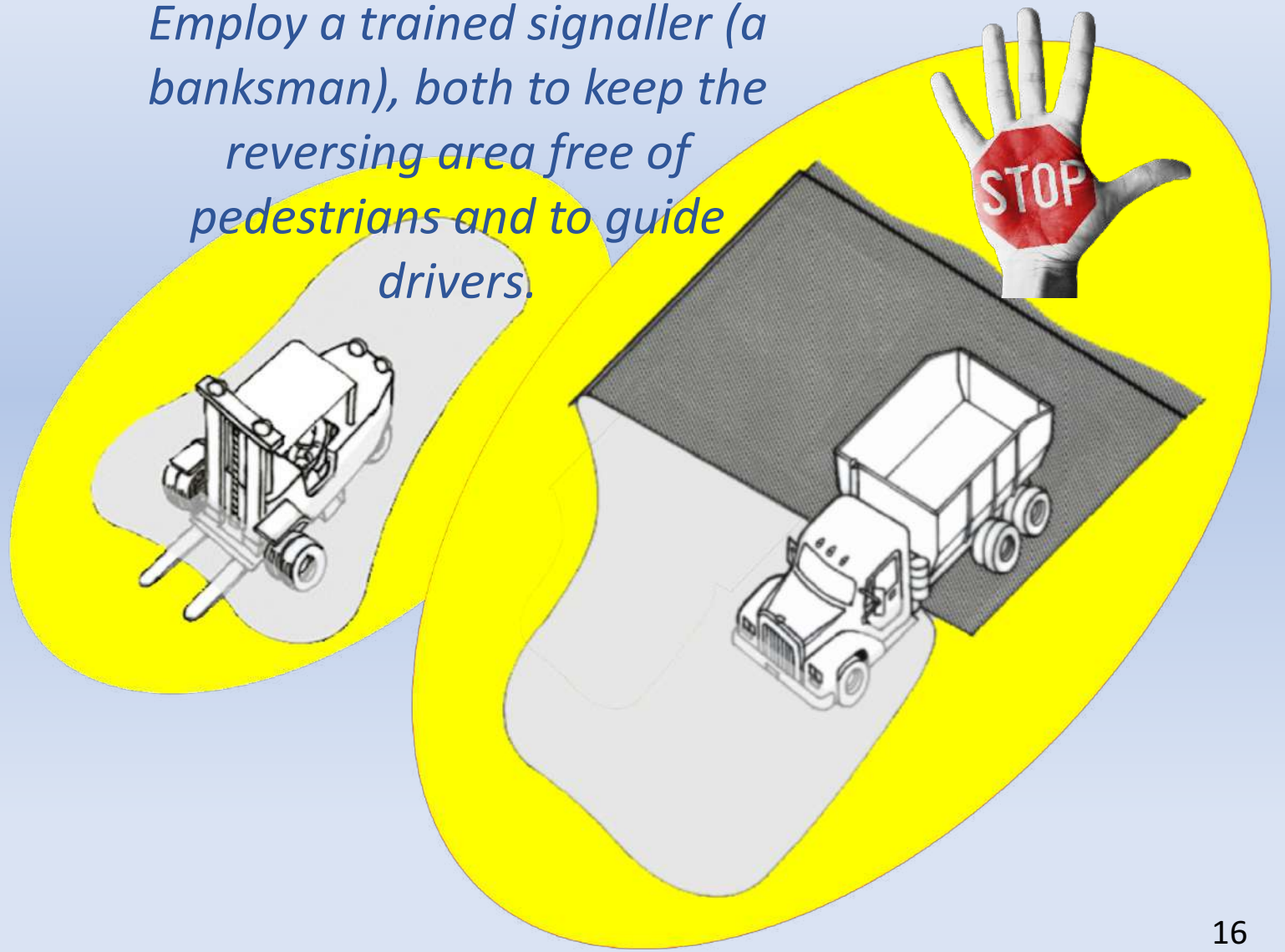
Take care while moving through the works. Don't transit below **suspended loads** or through areas with **risk of falling objects**; don't stay close to the **machinery** or vehicles **range of action**, nor remain behind them or rest in its shade.

There must be **fire extinguishers** in all the working areas. No hot work will be done without having a dry powder fire extinguisher around.

Caution, do not get caught! Keep a safe distance!

- Before passing the vehicle, make eye contact with the driver.
- In the grey areas, the operator has a poor view of their surroundings.
- In the dark grey zone, the operator can't see.

Employ a trained signaller (a banksman), both to keep the reversing area free of pedestrians and to guide drivers.



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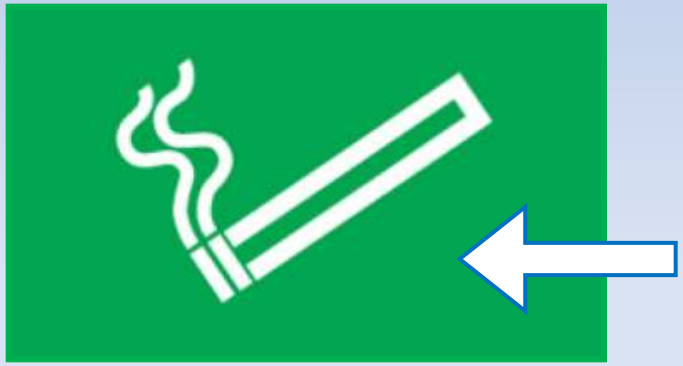
Respect the signals while driving or those related to the safety at work on the construction site.

It is **forbidden** to possess or use **alcohol** or **drugs** during the workday. The same with **any work activity** to do **under their effects**.



Only smoking in designated outdoor areas is permitted.

HOUSEKEEPING

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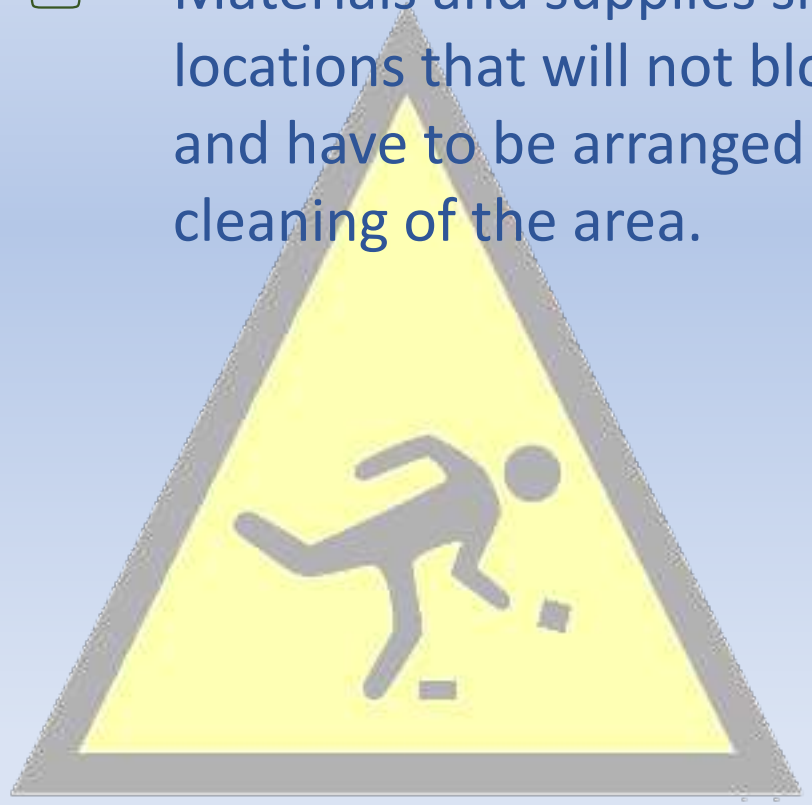
- Work areas shall be kept clean and free of trash, rubbish and debris at all times.
- Materials and supplies shall be stored in locations that will not block access ways and have to be arranged to permit easy cleaning of the area.



- All hoses, cables, extension cords and similar materials shall be located, arranged and grouped so that they will not block any access way and will permit easy cleaning and maintenance.

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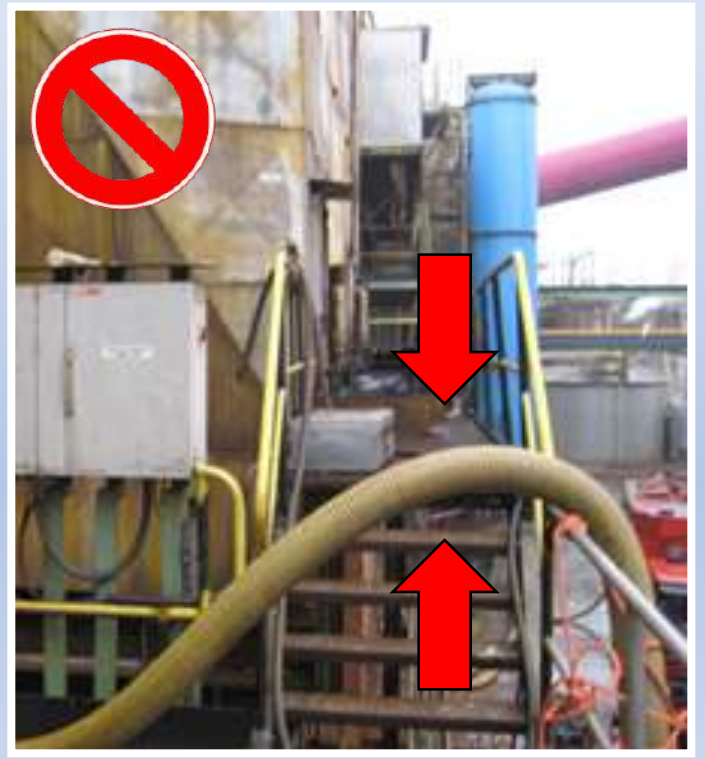
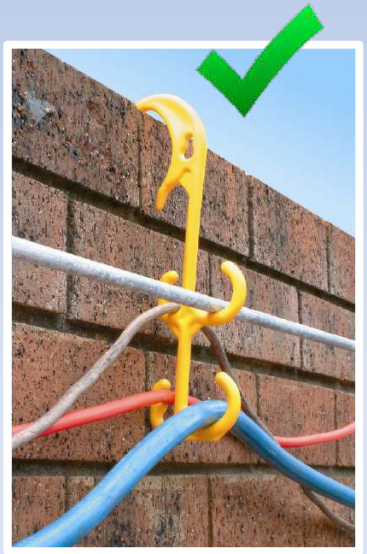
- Walkways, stairs and the bottom of ladders shall be kept clean and clear of tripping hazards.
- Tools, hoses, extension cords, chokers, welding leads, etc. have to be properly rolled up and stored when not in use. All such equipment shall be routed out of walkways and traffic.
- Cords and leads should be suspended at least 2 m overhead by means of S-hooks.





HOUSEKEEPING 3/5

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- Stockpiles shall be stable and organized.
- Pipes shall be well wedged.

HOUSEKEEPING 4/5

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Safety containers shall be provided for flammable or harmful substances with contents plainly marked. **Separate containers shall be provided for different types of refuse**, i.e. oily rags, steel, waste paper, lumber, etc. **Eating and drinking will only take place in designated areas**. Trash containers shall be placed adjacent to all drinking water locations and areas used for employees for lunch and/or break areas.

Welders shall have **waste tins for electrodes, disks**, etc.

- Housekeeping activities shall be undertaken everyday, minimum at the end of work and if necessary in between the activities, leaving work areas clean and tidy.
- Besides, if necessary, every Thursdays the contractor and subcontractors will perform thoroughly housekeeping.

SAFETY WALKWAYS

SAFETY WALKWAYS 2/2

TEMPORARY ELECTRICAL FACILITIES

- **Only competent persons** are authorized to perform work on any electrical system; they must be competent through adequate **knowledge, ability, training and experience**.
- Marking all energized electrical **devices and lines** with **warning signs**.
- **All works will be carried out on dead systems. When strictly necessary, live works shall always require a Permit To Work (PTW).**
  - **Locking out** (de-charging and leaving open with a controlled locking device) and **tagging-out** (warning sign placed on the lock) devices during service or maintenance.

There must be earth, electrical protection as less as IP-45 or **IP-67 with water around**, **30mA protection**, **circuit breakers**, **electrical hazard signals...**

IP Code			
Solid particle protection		**Liquid ingress protection**	
4	> 1 mm [object size protected against]	4	Splashing of water
5	Dust protected	5	Water jets
6	Dust tight [no ingress of dust]	6	Powerful water jets
 		7	Immersion up to 1 m
		8	Immersion beyond 1 m [continuous immersion in water]

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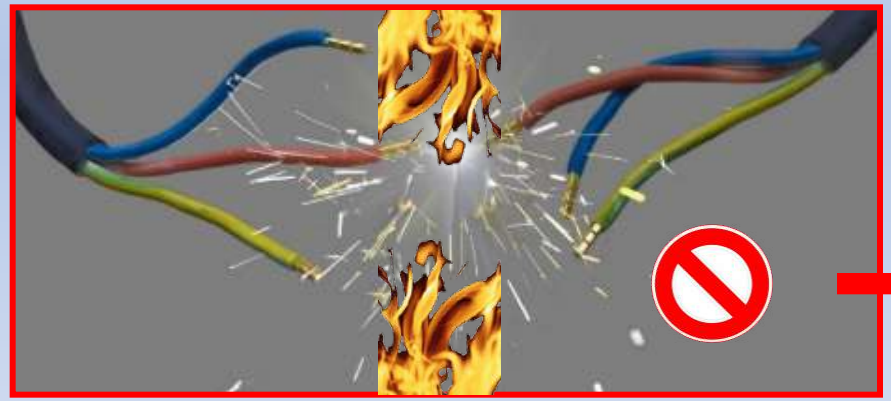
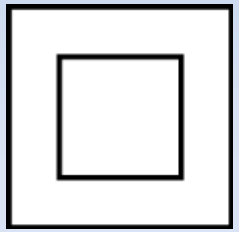
- Must be inspected by a competent person prior to be taken in service and are subject to **periodic checks**.
- **Check the power cables** condition periodically.



- Electrical tools must have **double insulation or grounding**.



TEMPORARY ELECTRICAL FACILITIES 4/4

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- **Avoid** the presence of electrical **cables in transit zones**; cables have **to be suspended** or protected by routing them in the ground in a protective sleeve. Additional protection has to be provided when cables are routed on the ground surface.

- **Electrical wires and hoses** with flammable gases **can't be** routed **together** to prevent the risk of fire or explosion if there's a leak.

- The use of improvised connections is forbidden.

MANUAL HANDLING

1/2

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Injuries due to manual handling, take prolonged and repeated exposures to develop, and typically require periods of **weeks to months for recovery**. **Controls** may include:

- Use of **mechanical assists** to eliminate or reduce exertions required to lift materials, **hold tools** and work objects, and requiring multi-person lifts if weights exceed thresholds.
- Selecting and designing **tools** that **reduce force** requirements **and** holding **times**, and improve **postures**.
- Incorporating **rest** and stretch breaks into work processes, and conducting **job rotation**.
- Implementing quality control and **maintenance** programs that reduce unnecessary forces and exertions.
- **Training** of workers in lifting and materials handling techniques.

MANUAL HANDLING 2/2

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Caution: This technique may be effective only if loads are small, light weight, and can easily fit between the knees.

Avoid lifting from the floor whenever possible. If you must lift from the floor, do not bend at the waist. The techniques shown below help the worker to keep the spine in a safer position while lifting from the floor.

Keep the load close to your body and lift by pushing up with your legs.

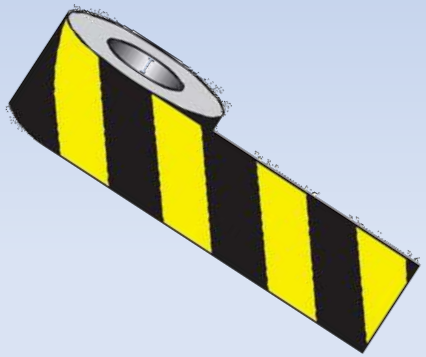
COLLECTIVE PROTECTIONS

Examples:

To remove any protection, it must ask authorization on the Safety department. Meanwhile, an alternative safety measure shall be used, per example harnesses, fall arresters, lifelines, anchor points, etc. Barriers and safety signs must be placed to avoid any entrance. Completed the work, the removed safety measures must be reinstalled.

Never trespass barriers without permission.

Remove all barriers and signs when the work is completed or when they are no longer required.



Pipes, equipments, structures, etc. located at a height lower than 2 meters should be properly signed to avoid hit them.

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Temporary edge protection

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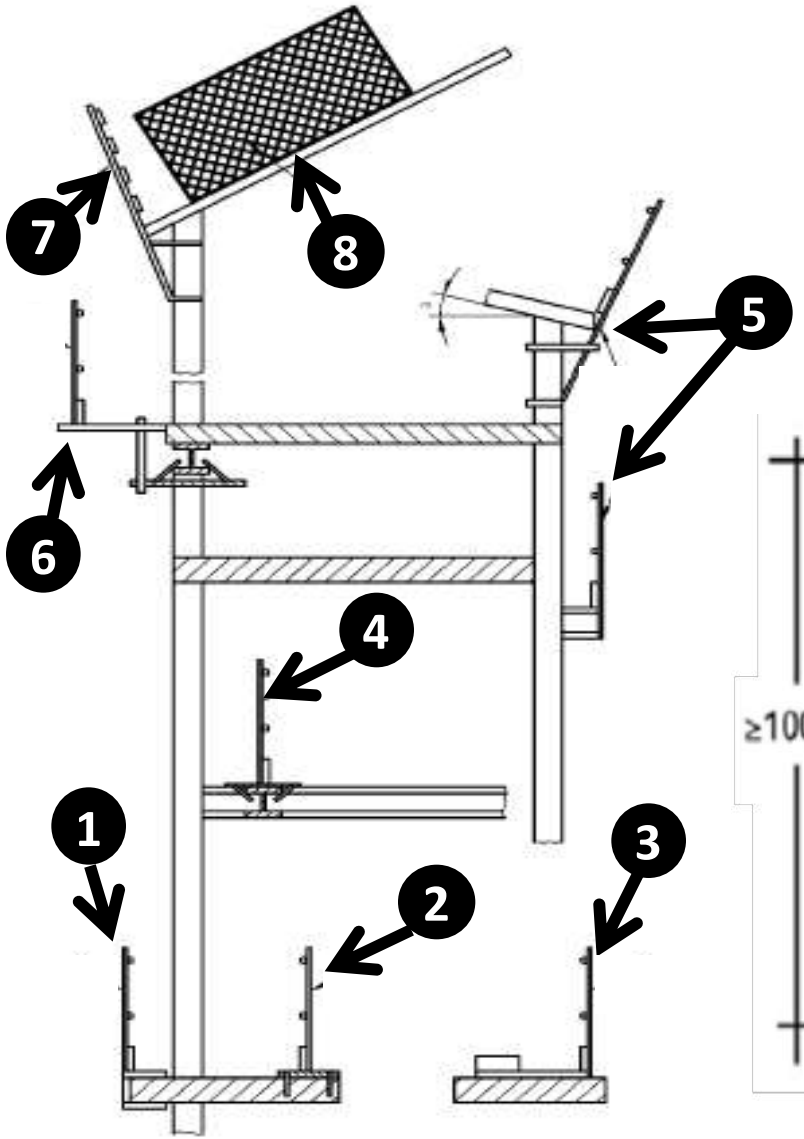
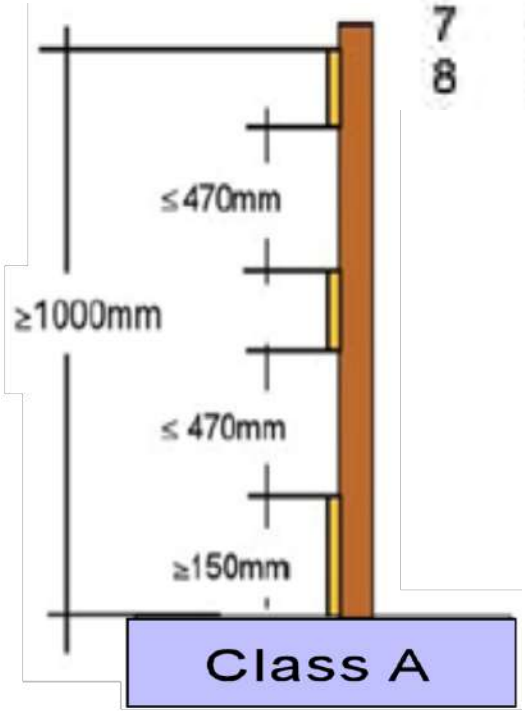


1 Slab edge clamp system
2 Fixed to floor type system
3 Counterweighted system
4 Beam top flange clamp system

5 Column clamp system – floors and flat roofs
6 Beam bottom flange clamp
7 Column clamp system – sloping roof
8 Fencing system



EXAMPLES OF TEMPORARY EDGE PROTECTION

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Safety nets

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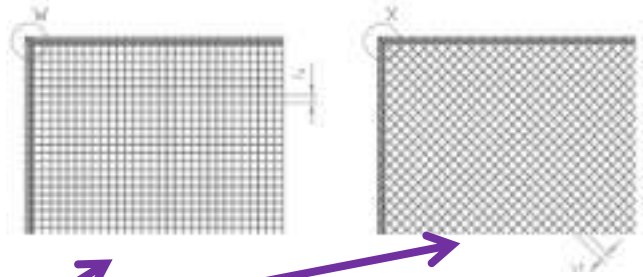
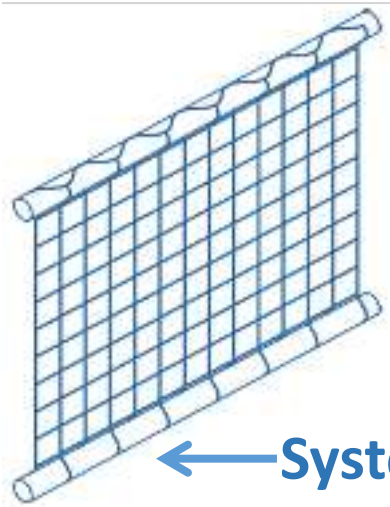
Examples of safety nets

System T: Safety net attached on brackets for horizontal use.

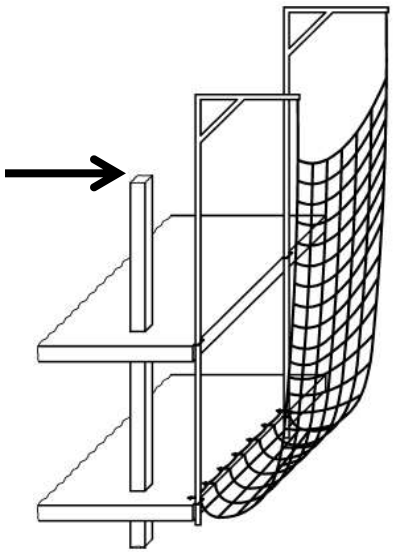
System S: Safety net with border rope.
The distance between the anchorage points shall be less than 2.5 m.





System U: Safety net attached to supporting framework for vertical use.

System V: Safety net with border rope attached to a gallow type support.



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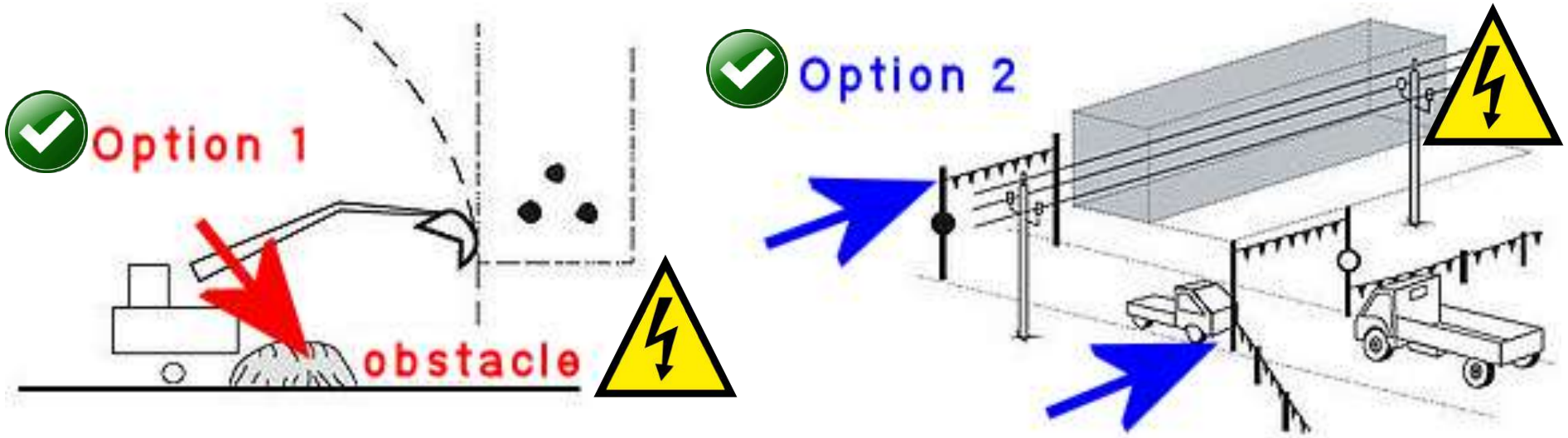
Falling objects areas

Safety measures in potential falling objects areas:

- Horizontal safety nets.
- Roofs.
- Barriers and safety signs preventing entry.
- Use of tool lanyards.

Establishing **"No Approach" zones** around or under high voltage power lines:



No Approach Zones for High Voltage Power Lines	
Nominal phase-to-phase voltage rating	Minimum distance
750 or more volts, but no more than 150,000 volts	3 meters
More than 150,000 volts, but no more than 250,000 volts	4.5 meters
More than 250,000 volts	6 meters

EXCAVATIONS

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LOCATION OF UNDERGROUND SERVICES

1/1

Underground utility maps

Ground penetrating radar (GPR)

Trial pit excavations

Accurate marking of services and utilities.

EXCAVATIONS

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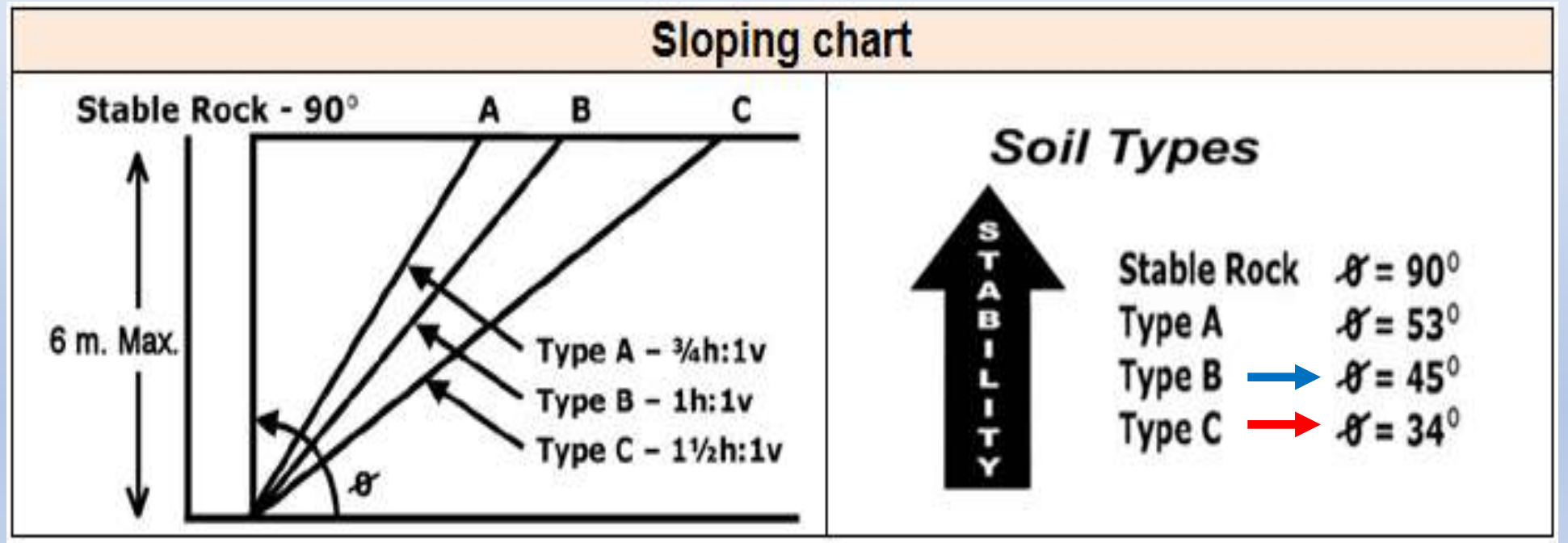
CAVE-IN

A person working in an unprotected excavation 2.4 m. deep on a sewer main could easily have 2.3 - 4.6 m^3 (3.650 -7.300 kg.) bury him in a cave-in.

The force of that impact could snap bones like matchsticks and crush soft tissue like gelatin. Even if the employee were to survive the initial impact, the weight of the soil on the chest and abdomen would typically prevent them from breathing, resulting in what is known as "compression asphyxia"; the leading cause of death in cave-ins.

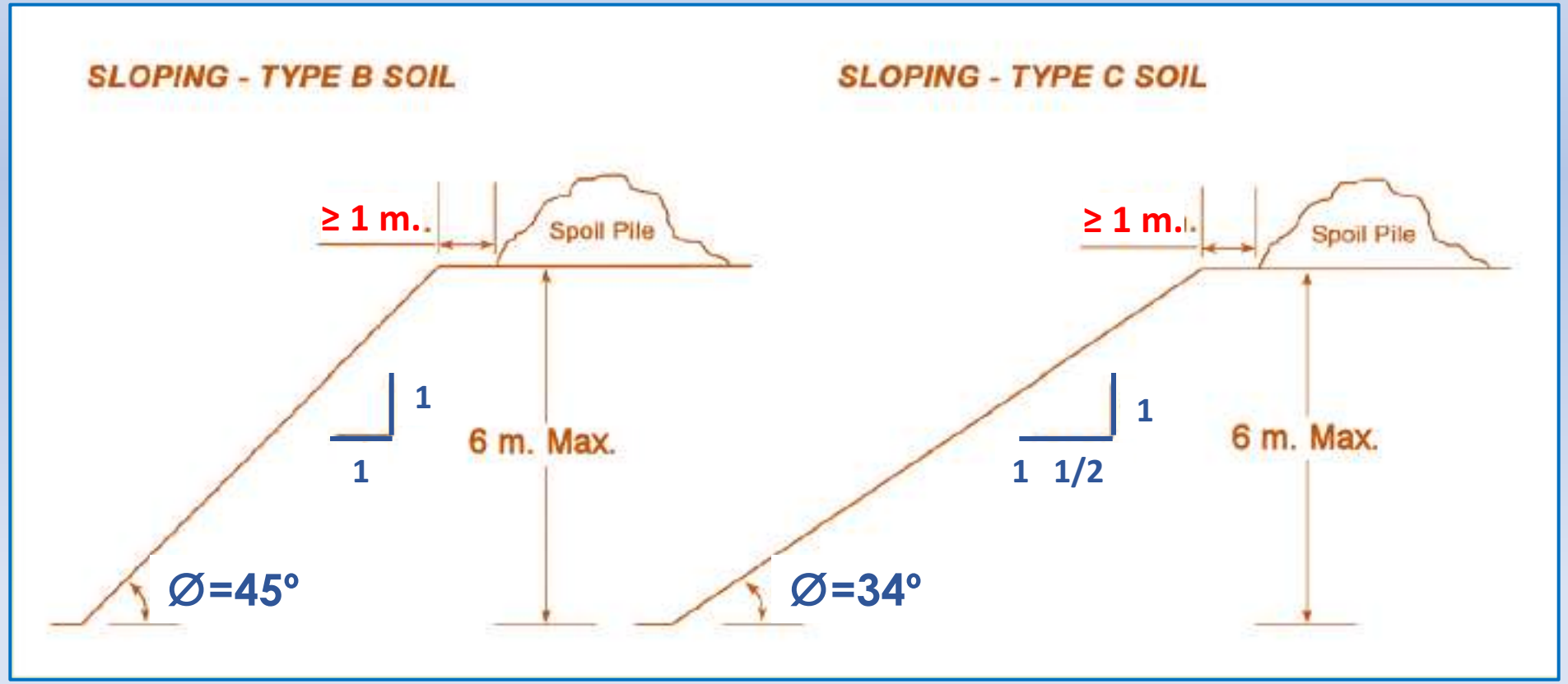
Additionally, there are those who survive the initial impact and are caught in a position where they can breathe long enough to be rescued, but sometimes die after extrication from complications resulting from trauma, or from the sudden restoration of blood circulation in what is known as "crush syndrome".

Practically speaking, there are only two soil types that can be present on a jobsite; Types B and C. Relatively stiff cohesive (clay rich) soils, or cemented soils that are free of fissures or layers dipping into the excavation at a slope of 4 horizontal to 1 vertical or greater are **Type B soils**.



Loose granular soils such as sand or gravel, soft wet clays, or cemented or clays soils with fissures that dip into the excavation on a slope of 4 horizontal to 1 vertical or greater are **Type C soils**.

In **excavations from 1.20 meters of depth**, leave the stable slope determined in the Geotechnical study of the Project. The **safe angle** is the angle at which the soil will stand.



EXCAVATIONS 4/7

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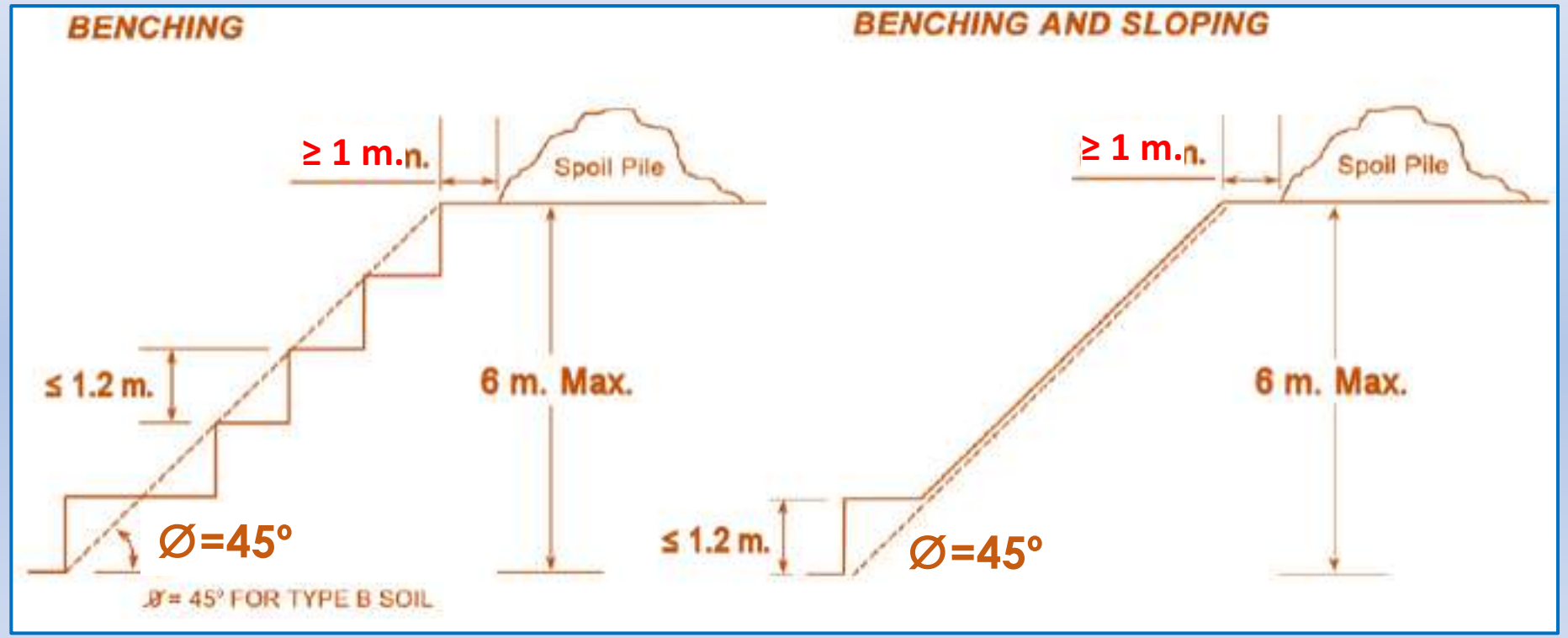


NOTE:

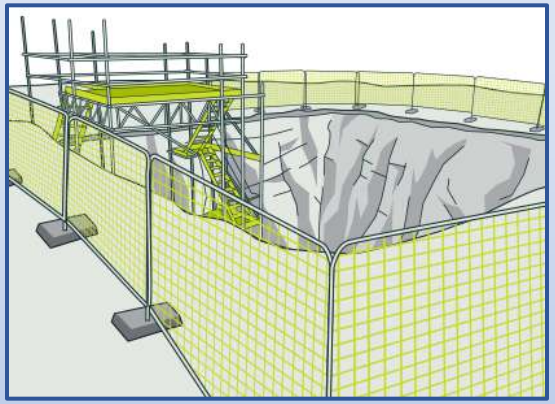
BENCHING IS NOT PERMITTED IN TYPE C SOIL, **ONLY TYPE B**

These guidelines are taken from **OSHA**.

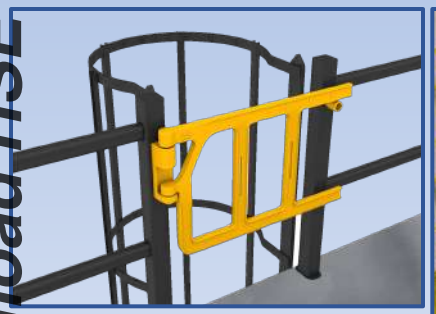
Occupational Safety and Health Administration [USA].

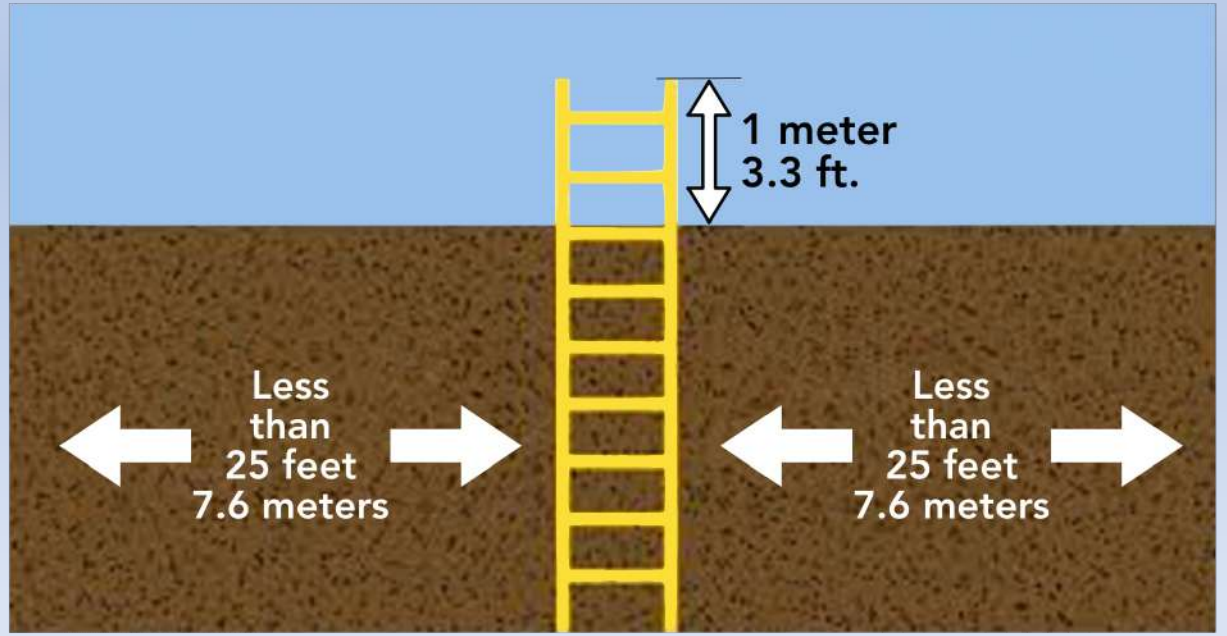
If using shoring **patented shoring systems** should be considered.

Access and Egress



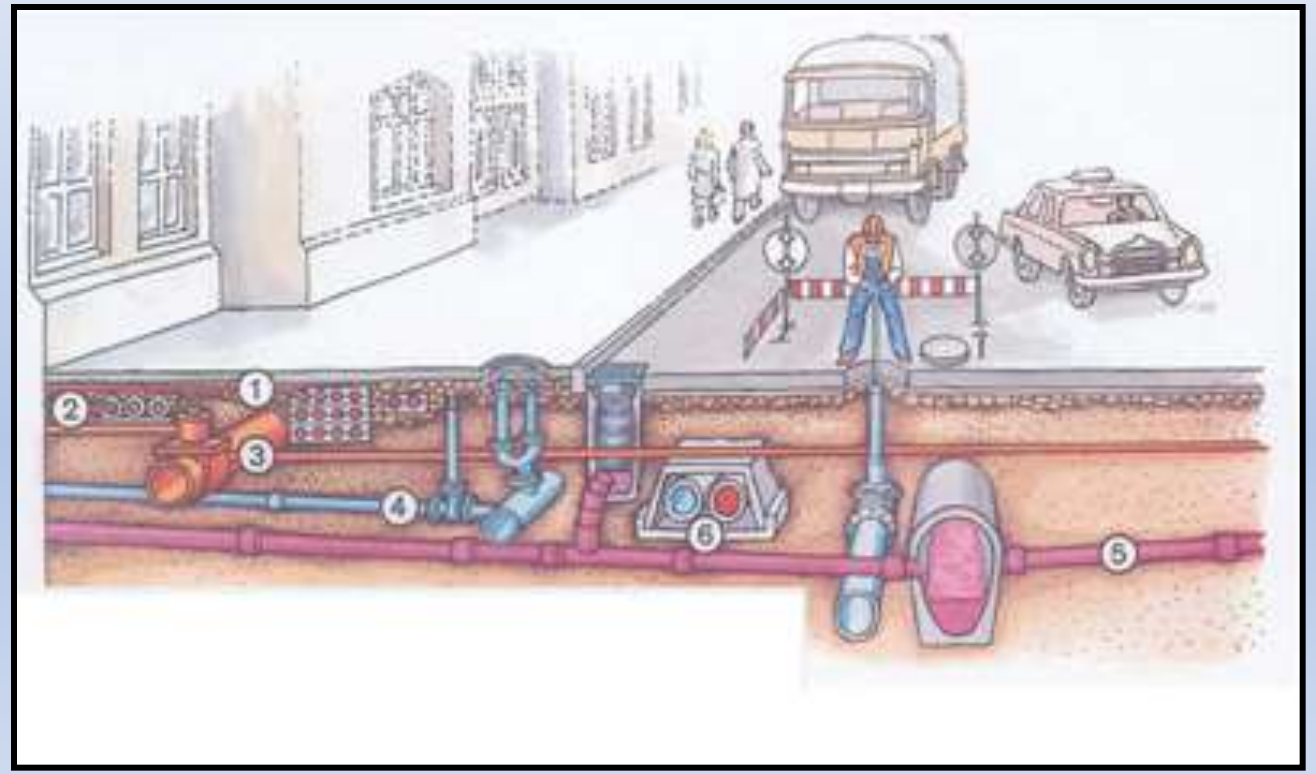
- OSHA standards require safe access and egress to all excavations, including ladders, steps, ramps, or other safe means of exit for employees working in trench excavations 4 feet (1.22 meters) or deeper.
- These devices must be located within 25 feet (7.6 meters) of all workers.

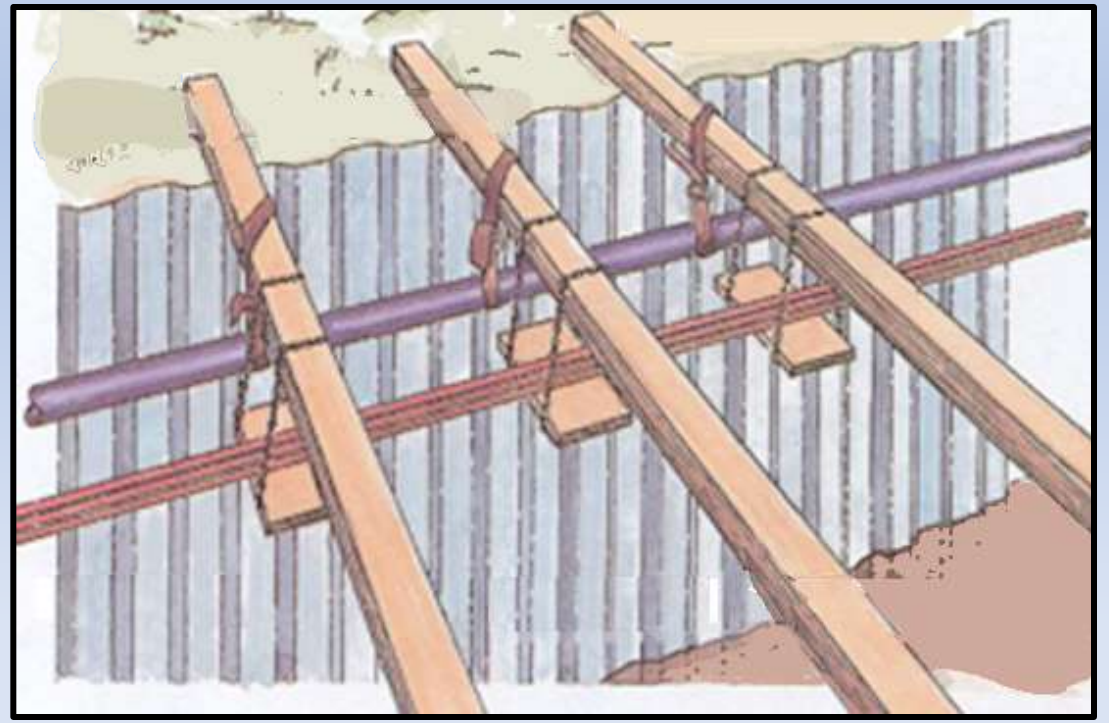




Employees working in trench excavations 4 feet (1.22 meters) or deeper

Temporary support for underground services





WORK EQUIPMENT

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Tools, equipment or machinery whose certificates have expired or which cannot be used safely shall be removed from site and/or placed in quarantine areas/containers and have to be labeled “Do not use”.

PROJECT	WORK EQUIPMENT INSPECTION	MONTH 1	7
	Company		
	Equipment		
	Serial number		
	Inspection date		
	Checked by		

PROJECT	WORK EQUIPMENT INSPECTION	MONTH 2	8
	Company		
	Equipment		
	Serial number		
	Inspection date		
	Checked by		

WORK EQUIPMENT INSPECTION	MONTH 3	9
Company		

WORK EQUIPMENT INSPECTION	MONTH 4	10
Company		

WORK EQUIPMENT INSPECTION	MONTH 5	11
Company		

WORK EQUIPMENT INSPECTION	MONTH 6	12
Company		

Work equipment must:

- Comply with the provisions of any relevant rule which is applicable.
- Be subjected to programmed inspections as required to ensure that health and safety conditions are maintained.

INSPECTION REQUIRED BY REGULATIONS.

AS RECOMMENDED BY THE OPERATION AND MAINTENANCE MANUAL.

EQUIPMENT INSPECTOR IS REQUIRED

- Be accompanied by physical evidence that the last inspection has been carried out.
- The use of work equipment is restricted to those persons given the task of using it.

Work equipment must:

- In the case of repairs, maintenance or servicing, the workers concerned are specifically designated to carry out such work.

- Have written instructions containing at least adequate safety and health information concerning the conditions of use. Workers shall have at their disposal written instructions on the work equipment used at work. Workers given the task of using work equipment must have received adequate training. → **Manufactures Manual**.

- Driving license or equivalent if applicable.

PIPE STANDS

Pipes and spools must be properly supported by means of pipe stools and have to be installed on the appropriate location to ensure stability.

HOT WORKS

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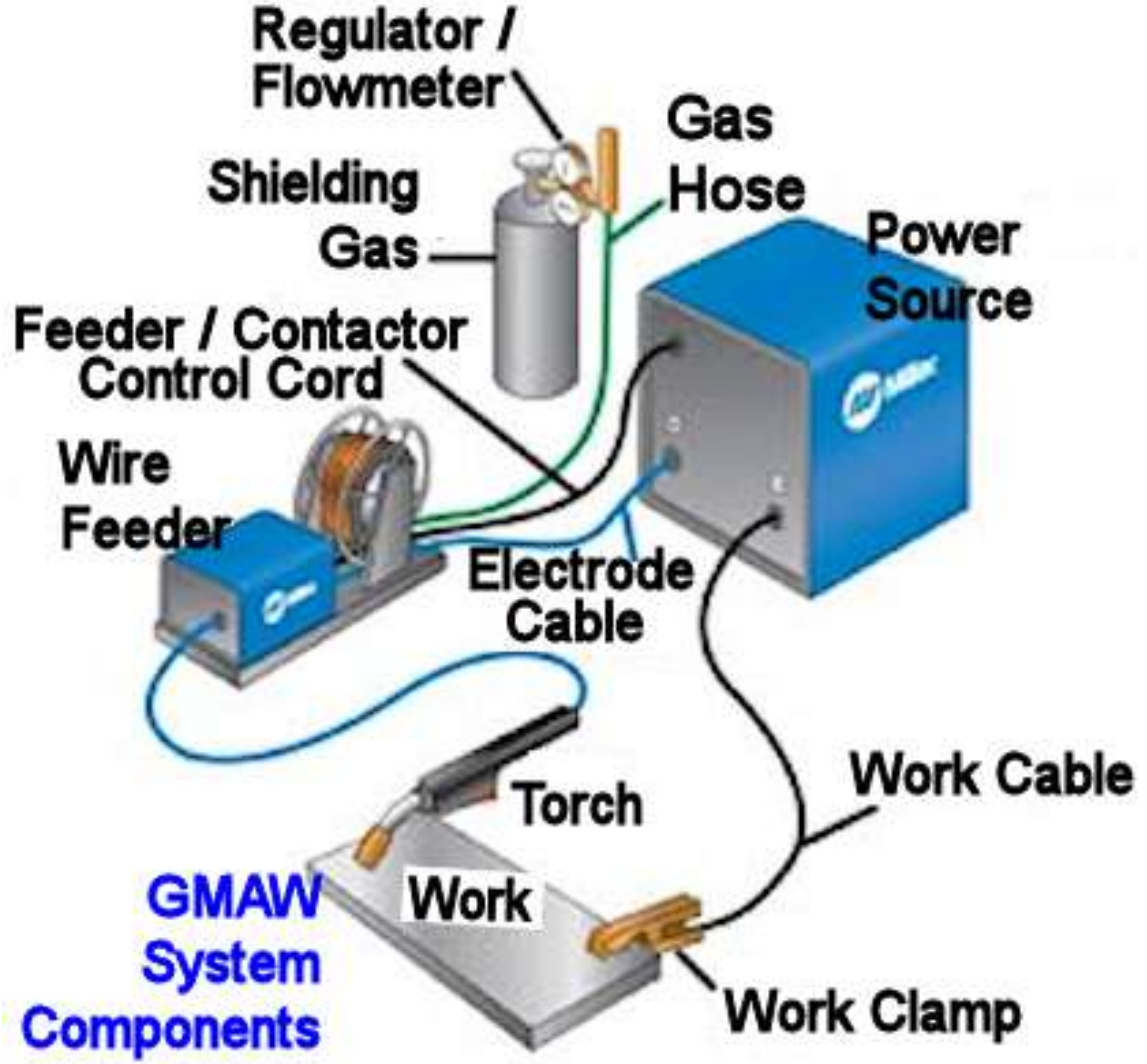
Welding, cutting, grinding, abrasive blasting...

- For work involving a risk of fire **a fire officer/watch must be present at all times** with the necessary fire-fighting equipment stand-by.
- **Hot work in an Ex-zone or a confined space requires a radio** connected to the **HSE Dept.**
- In the same way, it is required to monitor the working area using a proper **GAS DETECTOR**, with the calibration updated.

HOT WORKS 2/2

HSE Worldwide

- Special procedures are required for hot work on **tanks or vessels** that have **contained flammable materials**.
- Correct use of compressed gas is a must (**ventilated spots**, dry powder fire extinguishers around, **anti-recoil valves** in torches, **hoses in good condition**...).
- To avoid the accumulation of gases in case of leakage, **do not store torches in confined spaces , welding tents or toolbox**.
- While doing hot work, precautions shall be taken to eliminate the risk of fire or explosion, such as **removing materials and flammable products** from the working area, or **protect** them properly **with fire-retardant blankets** prior to start the work.



WELDING 2/4

HSE Worldwide

- Welding work spots need to be protected with fireproof blankets.
- Welding creates an extremely bright and intense light that may seriously injure a worker's eyesight.

  Helpers and other personnel will not look at the welding arc.
- Mobile screens must be used to avoid projections and welding radiations which could hurt other workers.

Welding may produce **noxious fumes** to which prolonged exposure can cause serious chronic diseases. Devices to extract and remove noxious fumes at the source may be required.

Welding & Safety Helmet with auto-darkening welding filter. Five levels of welder protection: head, eye, face, respiratory and hearing into one system.

Welding Fume Respirators
3M™ 9925 & 9928

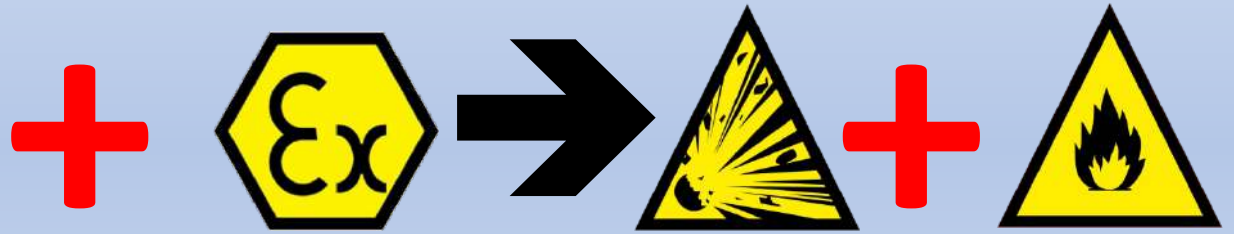
Every year, thousands of workers develop **occupational diseases** from breathing in certain dusts, fumes or other airborne contaminants at work.

WELDING 4/4

HSE Worldwide

If something is not safe, do not start work.

Welding Cable Coupling ←



Ground wire ←

Work Clamp

A spark could cause an explosion or fire. Cables, clamps, welding torches, couplings, hoses...must always be in good order. Always carry out a visual inspection prior to start.

GRINDING MACHINES

1/2

OH&S

HSE Worldwide

- Using disks according to the grinding machine velocity.
- Using the protection cover.
- It is mandatory to wear safety glasses under the face protection for grinding, welding...
- **As appropriate,** wear dust mask, hearing protectors, gloves and workshop apron capable of stopping small abrasive or workpiece fragments.

Angle Grinder

GRINDING MACHINES 2/2

HSE Worldwide

- Pull the plug of the electrical supply prior to install/remove a disc.
- Use the right type of disc for the work to be carried out.
- Check the expiration date on the disc prior to install it.
- Use flame retardant blankets to congest the sparkles.
- All grinding machines have to be equipped with a constant push button (deadman switch).

Angle Grinder

FLAME CUTTING EQUIPMENT

1/2

OH&S

HSE Worldwide

- The compressed gas cylinders must be in upright position and secured; in a cart, preferably. They should stay away from any electrical contacts, heat sources and protected from the sun.

- Anti-recoil valves for both manometer and torch are compulsory.
- The oxygen reacts violently with fats, oils or fuels. Clothing and equipment must not be cleaned with oxygen.

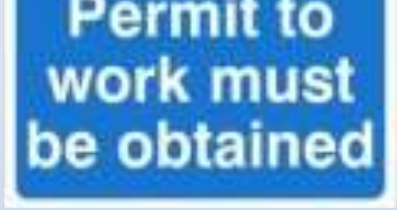
- Do not use oxygen to clean or blow parts, or to fan a place.
- **Spark igniters** will be used to light the torch.

Flashback Arrestor

FLAME CUTTING EQUIPMENT 2/2

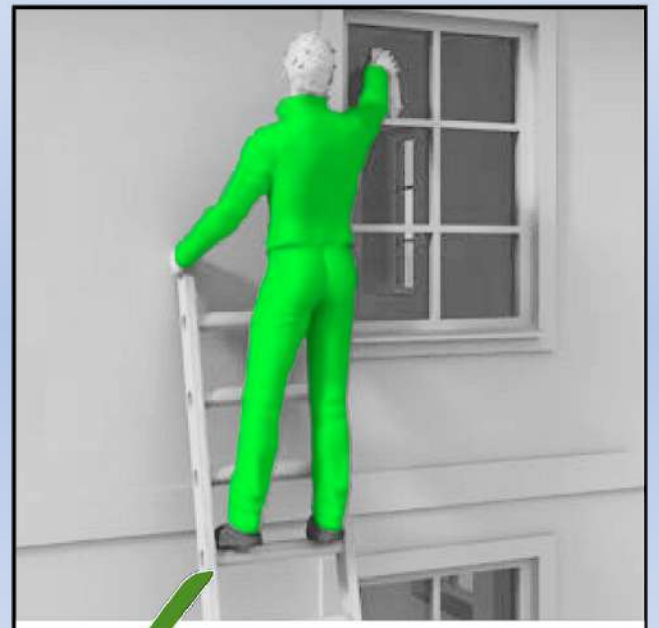
HSE Worldwide

- To keep hoses in good condition, the contact with chemicals, hot surfaces, sharp or pointed items must be avoided. Likewise, we must prevent the formation of loops or knots. Hoses must not leak: joints, fittings and faucets need to be checked periodically. Proceed to replace hoses if any damage is detected.
- Sparks produced by the torch must be kept away from gas cylinders and hoses.
- The spot must be well ventilated.



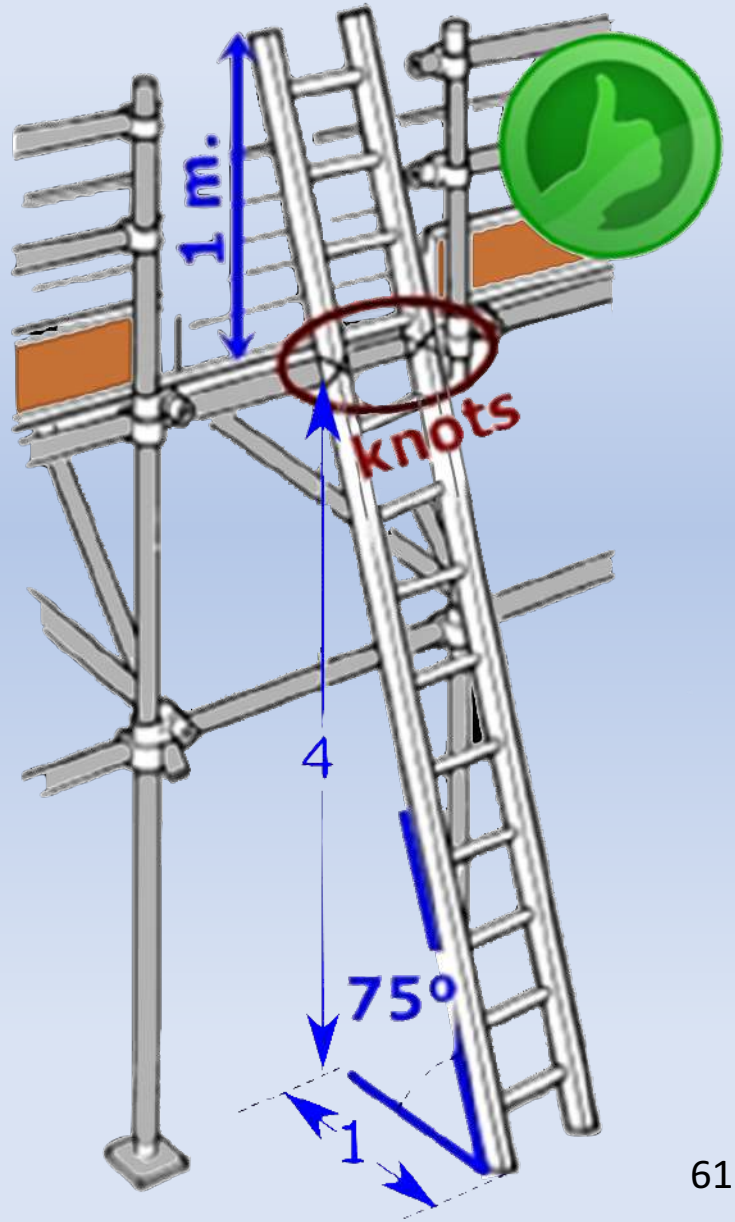
LADDERS

Ladders shall be standardized, in good conditions and properly inspected and used.



Correct – user maintaining three points of contact (means of securing omitted for clarity)

Incorrect – overreaching and not maintaining three points of contact (means of securing omitted for clarity)



SCAFFOLDING

1/4

OH&S

HSE Worldwide

Scaffolds must be standardized, in good condition and properly installed, inspected and used.

SCAFFOLDING 2/4

HSE Worldwide

- Scaffolds have to be erected by competent and approved scaffolders.
- **Modifications** on scaffoldings can only be done by the approved scaffolders**.**
- Any person modifying scaffoldings without authorization or the right competence will be immediately **removed** from site.
- All scaffolding structures will be **inspected** before their use is authorized, then **every 7 days** and after modifications or periods of inclement weather.

Scaffolds shall be tagged denoting their status.

- **Unless a scaffold is a basic configuration described in recognised guidance** for tube and fitting scaffolds or manufacturers' guidance for system scaffolds, the scaffold should be designed by calculation, by a competent person, to ensure it will have adequate strength and stability.

- Scaffolds shall be provided with an access ladder or equivalent safe access.
- Employees shall not climb or work form scaffold handrails, mid-rails or brace members.
- At no time shall any scaffold be overloaded.

Scaffolds shall be tagged denoting their status.

SCAFFOLDING 4/4

HSE Worldwide

All employees, when erecting or dismantling scaffolding above 1.5 meters in height, shall **wear safety harness with double safety lanyard**.

Scaffold towers on wheels will have **braking systems in every wheel**.

- The **wheels** will be **locked** or blocked before someone goes up.
- **No personnel** will be allowed on the scaffold while it is being moved.
- Before moving the tower, all **materials** on the platforms susceptible of falling **will be removed**.

Fall arrest harness

Energy absorber with integrated double lanyard

Retractable type fall arrester

Self-Retracting Lanyard

Non-Sparking Hammer, when necessary

CHEMICAL HAZARDS

1/3

OH&S

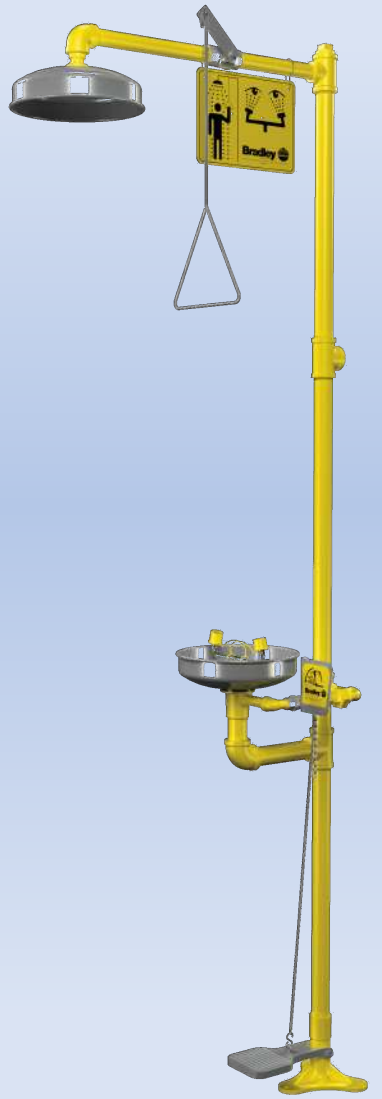
HSE Worldwide

- Materials Safety Data Sheets [**MSDS**] shall be available **on site**.
- **Replacement** of the hazardous substance with a less hazardous substitute.
- **Storing and handling according to the MSDS.**
- **Adequate containers.**
  The containers are kept closed except when in use.
  Products must never be transferred to bottles or canisters originally used for foodstuffs.
- Hazardous materials stored on site with potential gas emissions will be located in well ventilated secure areas.

HAZARDOUS SUBSTANCE CABINETS

CHEMICAL HAZARDS 2/3

- Implementation of engineering and administrative control measures to **avoid** or minimize **the release of hazardous substances into the work environment** keeping the level of exposure below recognized limits.
- Keeping the number of **employees exposed**, or likely to become exposed, to a **minimum**.
- **Communicating chemical hazards** to workers through **labeling and marking** according to national and internationally recognized requirements and standards.
- Providing specific worker **training**.



- **Corrosive, oxidizing, and reactive chemicals** present similar hazards and require similar control measures as flammable materials. They may cause **significant personal injury** upon direct contact.

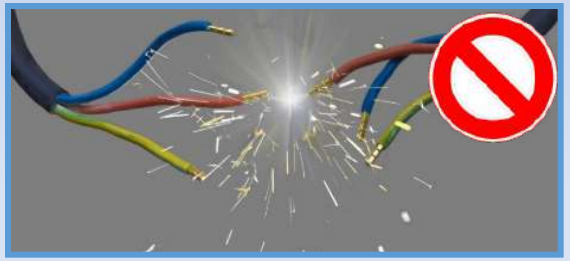
- In addition, an inadvertent **mixing or intermixing may cause serious adverse reactions, as the release of flammable or toxic gases, and produce directly fires and explosions.**

- Corrosive, oxidizing and reactive chemicals should be **segregated from flammable materials and from other chemicals of incompatible class** (acids vs. bases, oxidizers vs. reducers, water sensitive vs. water based, etc.), **stored in ventilated areas and in containers** with appropriate secondary containment to minimize intermixing during spills.

FIRE AND EXPLOSIONS

The prevention and control strategy includes:

- Storing flammables away from ignition sources and oxidizing materials.
- Using of spark-proof fixtures.
- Prohibition of potential spark generating equipment.
- Ventilation.
- PTW for hot work, etc.



FIRE AND EXPLOSIONS 2/2

	Density Water = 1	Vapour density or Gas density Air = 1	Flash point	Autoignition temperature	LEL % by volume of air Lower Explosive Limit	UEL % by volume of air Upper Explosive Limit
Gasoline or Petrol (100 octane)	0.71–0.77	3 - 4	-43°C	246-280 °C	1.4%	7.6%
Kerosene Jet A-1	0.78–0.81	4.5	>38°C	210°C	0.6%	5%
Diesel fuel	0.83-0.876	>3	>62°C	210°C	0.6%	7.5%
Fuel oil No.1	0.92-0.97		≥ 70°C		0.7%	5%
Acetylene		0.906	-18°C	300°C	2.5%	82%
Propane		1.5	Flammable gas	432°C	2.1%	10.1%
Butane		2.1	-60°C	405°C	1.6%	8.4%
Methane (natural gas)		0.6	Flammable gas	537°C	4.4%	17%
Hydrogen		0.07	Flammable gas	536°C	4%	75%
Hydrogen sulfide H_2S		1.19	Flammable gas	260°C	4.3%	46%

CONFINED SPACE

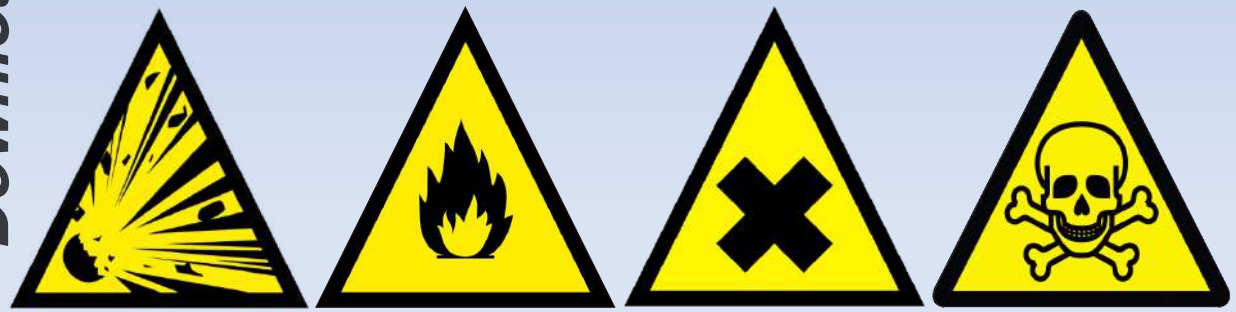
1/3

OH&S

HSE Worldwide

A confined space is defined as a wholly or partially enclosed space not designed or intended for human occupancy and in which a hazardous atmosphere is present or could develop as a result of the contents, location or construction of the confined space or due to work done in or around the confined space.

Rugged detector tests levels of LEL, oxygen, carbon monoxide, hydrogen sulfide and sulfur dioxide.



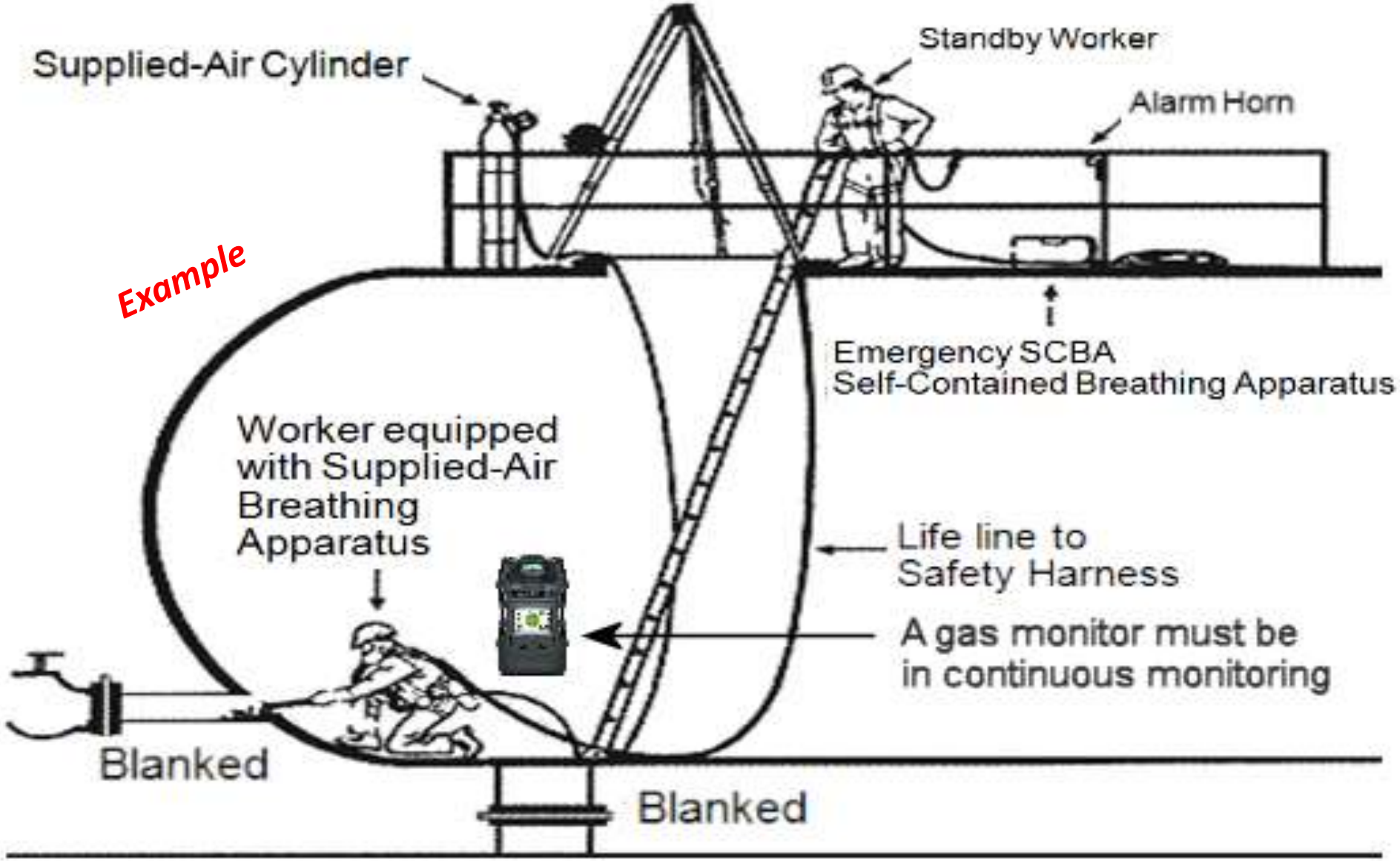
CONFINED SPACE 2/3

Serious injury or fatality can result from inadequate preparation to enter a confined space or in attempting a rescue from a confined space.
The PTW has to specify the precautions to be taken to control risks. E.g.:

Permit To Work must be obtained

- A **safety guard** must be stationed outside the confined space.
- The **safety guard** needs a **radio** to contact the control room/emergency service In case of emergency.
- Process or feed lines into the space should be disconnected or drained, and blanked and locked-out.
- The gas monitor must be in continuous monitoring.
- If the atmospheric conditions are not met, the confined space should be ventilated until the target safe atmosphere is achieved.
- The **emergency team** must have enough rescue equipment stand-by, and must be trained in the use of **breathing apparatus**.
- Trenches and other excavations may require to follow certain precautions that are similar to those required when performing work inside a confined space. In this case, OSHA does not require a permit for confined spaces but some clients do.

CONFINED SPACE 3/3



RADIOLOGICAL HAZARDS

OH&S

HSE Worldwide

- **Radiation exposure can lead to potential injury or serious illness to workers.**
- Places of work involving occupational and/or natural exposure to ionizing radiation should be established and operated in accordance with recognized **international safety standards and guidelines**.

NOISE

1. **Use** of acoustic insulating materials, **isolation** of the noise source, and other engineering controls.

2. **Limiting the duration of noise exposure**. For every 3 dB(A) increase in sound levels, the 'allowed' exposure period or duration should be reduced by 50 percent.

3. **Use of hearing protection** should be enforced actively when the equivalent sound level over 8 hours reaches **85 dB(A)**, the **peak** sound levels reach **140 dB(C)**, or the average maximum sound level reaches **110dB(A)**.

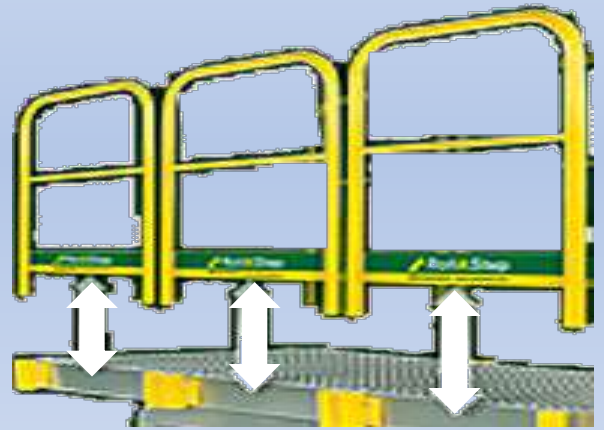
Where possible, the noisy equipment should be placed outside the workshops.

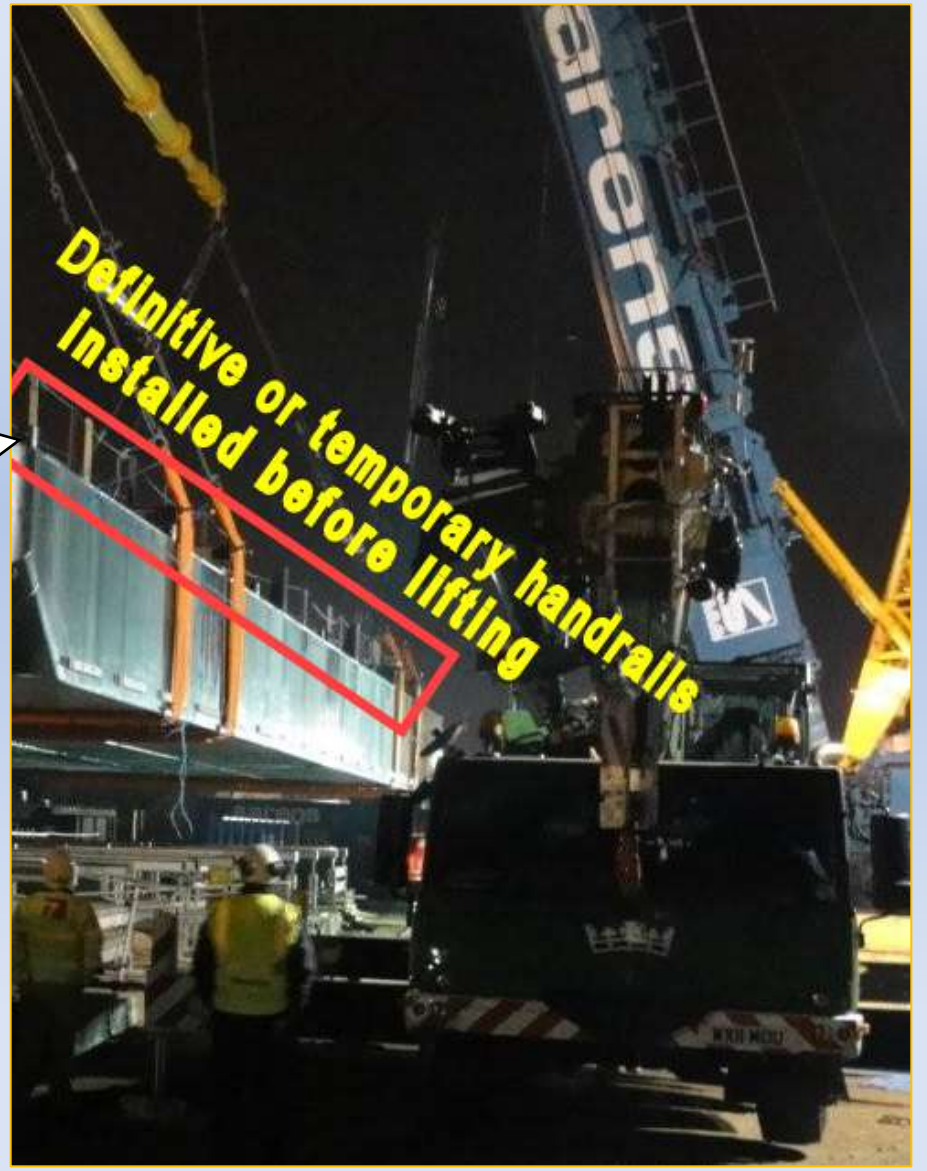
VIBRATION

Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure.

ASSEMBLY OF STRUCTURES

If applicable, the elements will have the definitive handrails installed (or in their absence provisional ones) before lifting and installing them in their permanent position.





In areas without protection must be used harnesses, fall arresters, lifelines, anchor points, etc.

Lift platforms are preferential. Personnel must be tied with a harness, particularly when working out of the basket. Personnel handling the platforms must be authorized and trained to do it.

Regarding the fall of objects when assembling and welding or cutting projections:

- Dry powder fire extinguishers, of at least ≈6 kg., above and under the structure.
- Whenever necessary, fireproof canvas covering welding posts.
- To prevent personnel from accessing areas at risk of falling objects or projections of welding or cutting, must be placed barriers.
- Under the same vertical area, works at different levels shall not be performed to prevent objects from falling over persons working on lower levels.

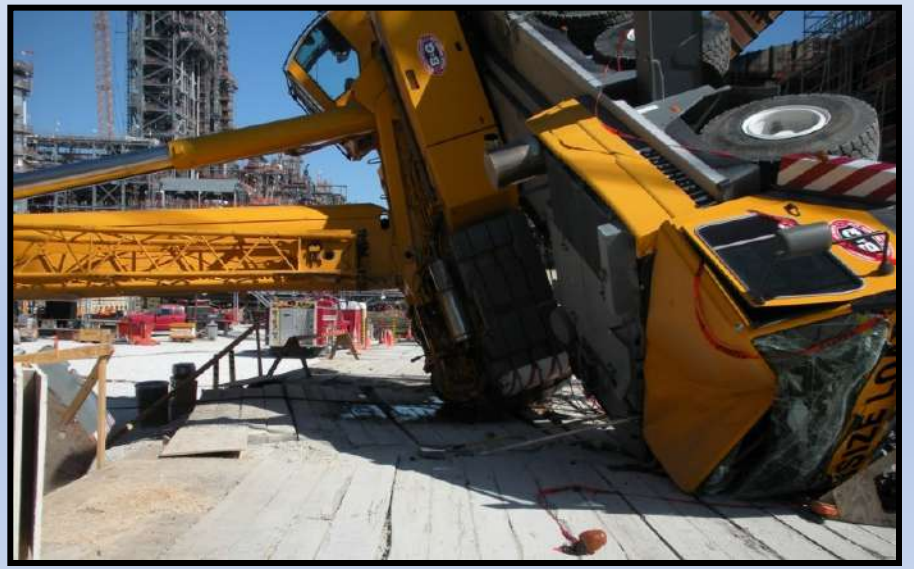
MECHANICAL LIFTING OPERATIONS, DISMANTLING OR ASSEMBLY AND ERECTION OF PREFABRICATED STRUCTURES

OH&S

HSE Worldwide

It includes lifting operations, dismantling or assembly, works with cranes, truck cranes, cables, slings and lifting accessories.

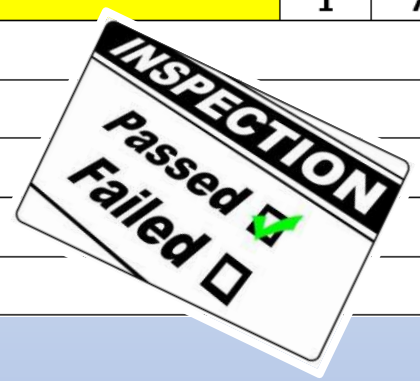
- Cranes must have load and torque limiters to prevent overload and overturning.
- Material must have CE labeling or equivalent suitable for lifting loads.
- All lifting equipment needs to have valid inspection certificates issued by a notified body.
- Equipment must be labeled with safe working load.



Safe Working Load (**SWL**)

- All elements must be **inspected periodically** discarding those in bad condition, especially when cranes or trucks cranes access the worksite. Non-locking snap hook cannot be used.
- **Broken wires must be cut** from cables and steel slings.
- It must be placed **barriers and** adequate **signs forbidding entry** in the lifting area. In any case, the personnel will be kept away from the field of action of suspended loads.

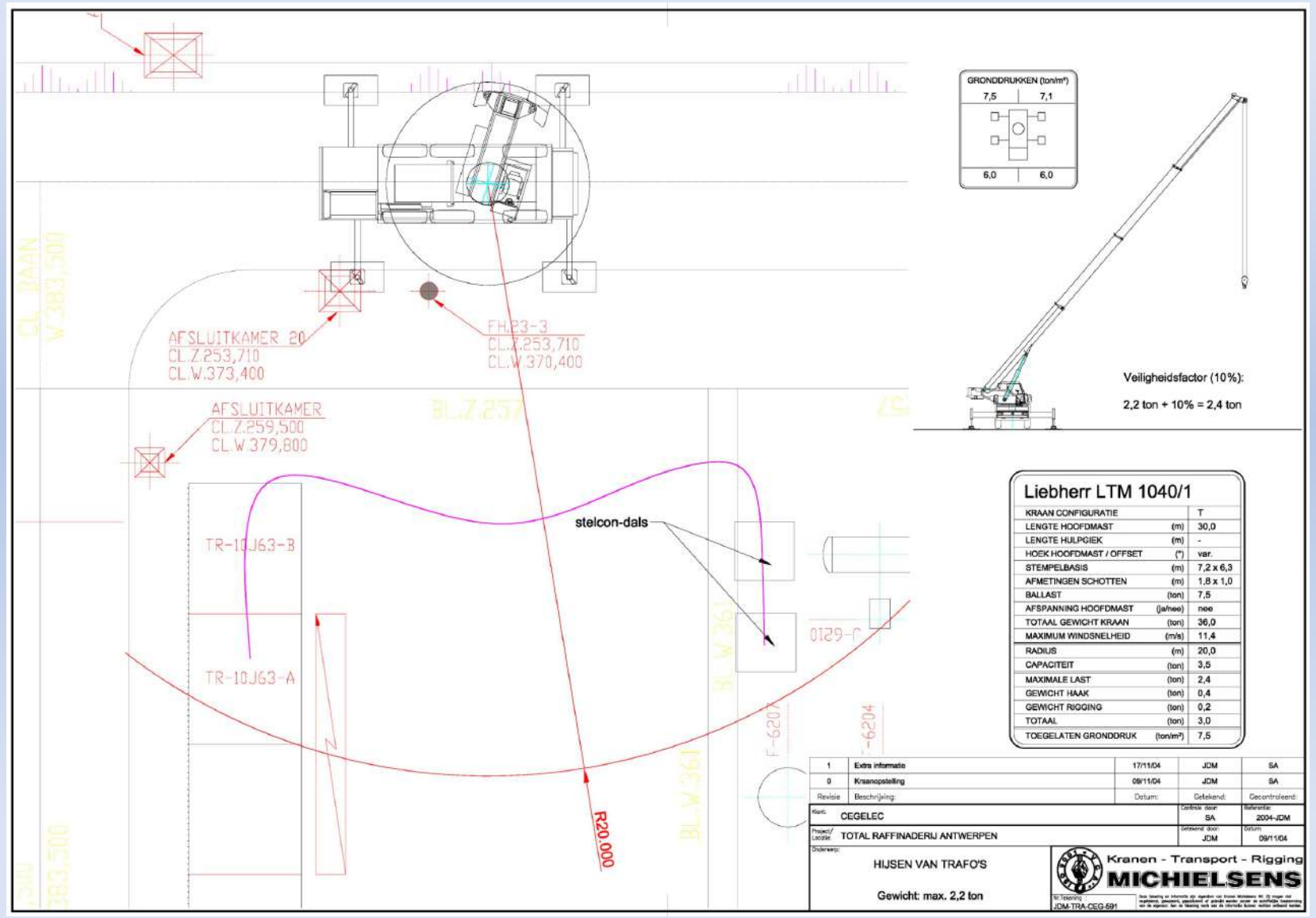
PROJECT	WORK EQUIPMENT INSPECTION	MONTH 1 7
	Company	
	Equipment	
	Serial number	
	Inspection date	
	Checked by	



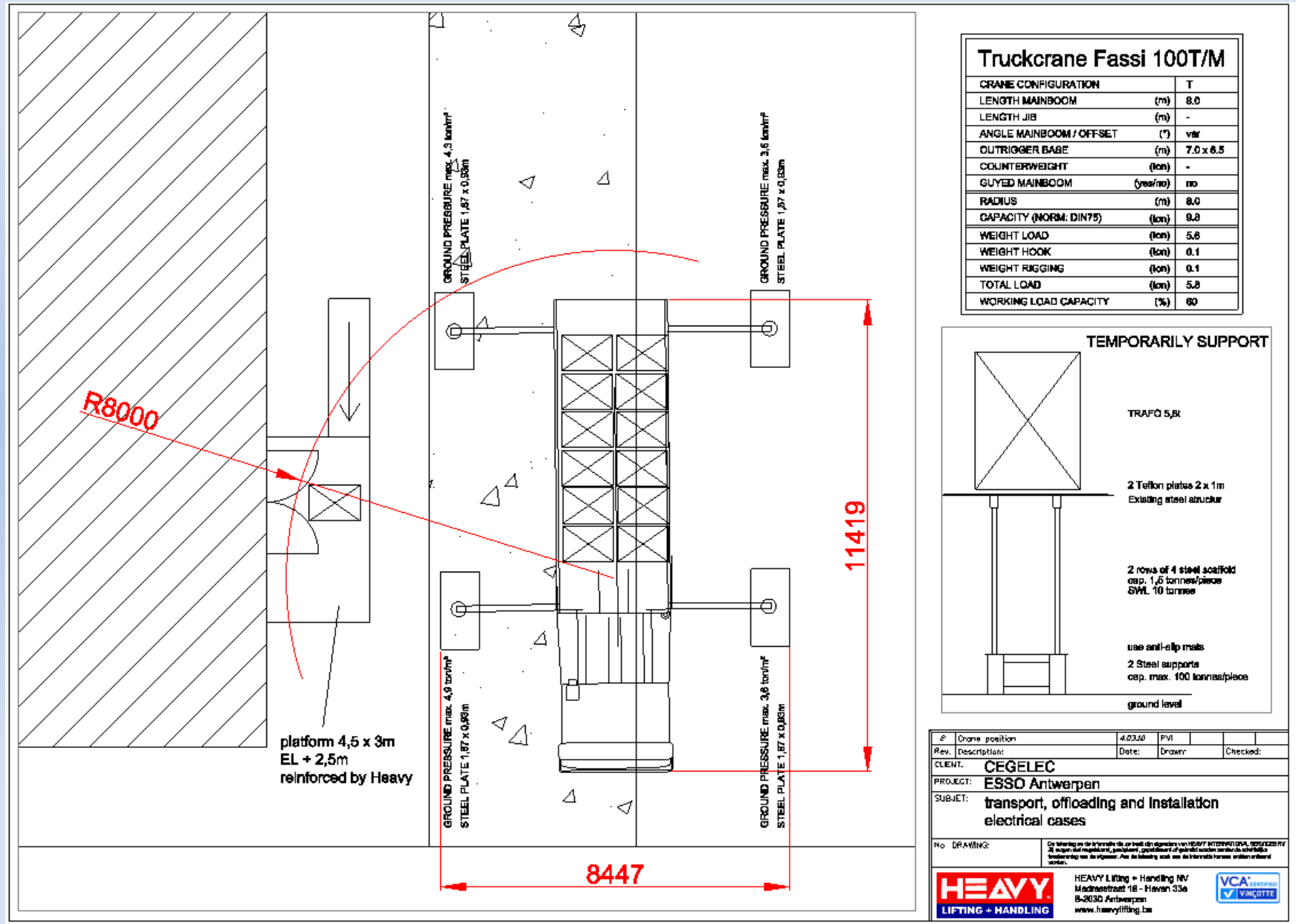
Prior to set up a crane following points need to be taken into account:

- Know the **max. ground bearing capacity**.
- Check the plan of **underground utilities**.
- Fence off the lifting area by means of **barriers**.
- **Only the workers involved** in the lifting operation can be inside the barriers.
- **Outriggers** have to be **fully extended**.
- Execute a **trial lift** for critical operations.
- Use **radios** when **eye contact** can't be remained during the lifting operation.

1. The planning of individual routine lifting operations may be the responsibility of those who carry them out (eg a slinger or crane operator); **but…**



2. For much more complex lifting operations, a written plan should be developed by a person with significant and specific competencies - adequate training, knowledge, skills and expertise - suitable for the level of the task.



Truckcrane Fassi 100T/M

CRANE CONFIGURATION		T
LENGTH MAINBOOM	(m)	8.0
LENGTH JIB	(m)	-
ANGLE MAINBOOM / OFFSET	(°)	var
OUTRIGGER BASE	(m)	7.0 x 6.5
COUNTERWEIGHT	(ton)	-
GUYED MAINBOOM	(yes/no)	no
RADIUS	(m)	8.0
CAPACITY (NORM: DIN75)	(ton)	9.8
WEIGHT LOAD	(ton)	5.6
WEIGHT HOOK	(ton)	0.1
WEIGHT RIGGING	(ton)	0.1
TOTAL LOAD	(ton)	5.8
WORKING LOAD CAPACITY	(%)	60

Rev.	Description:	Date:	Drawn:	Checked:
0	Crane position	4.03.10	PVI	

CLIENT: CEGELEC

PROJECT: ESSO Antwerpen

SUBJET: transport, offloading and installation electrical cases

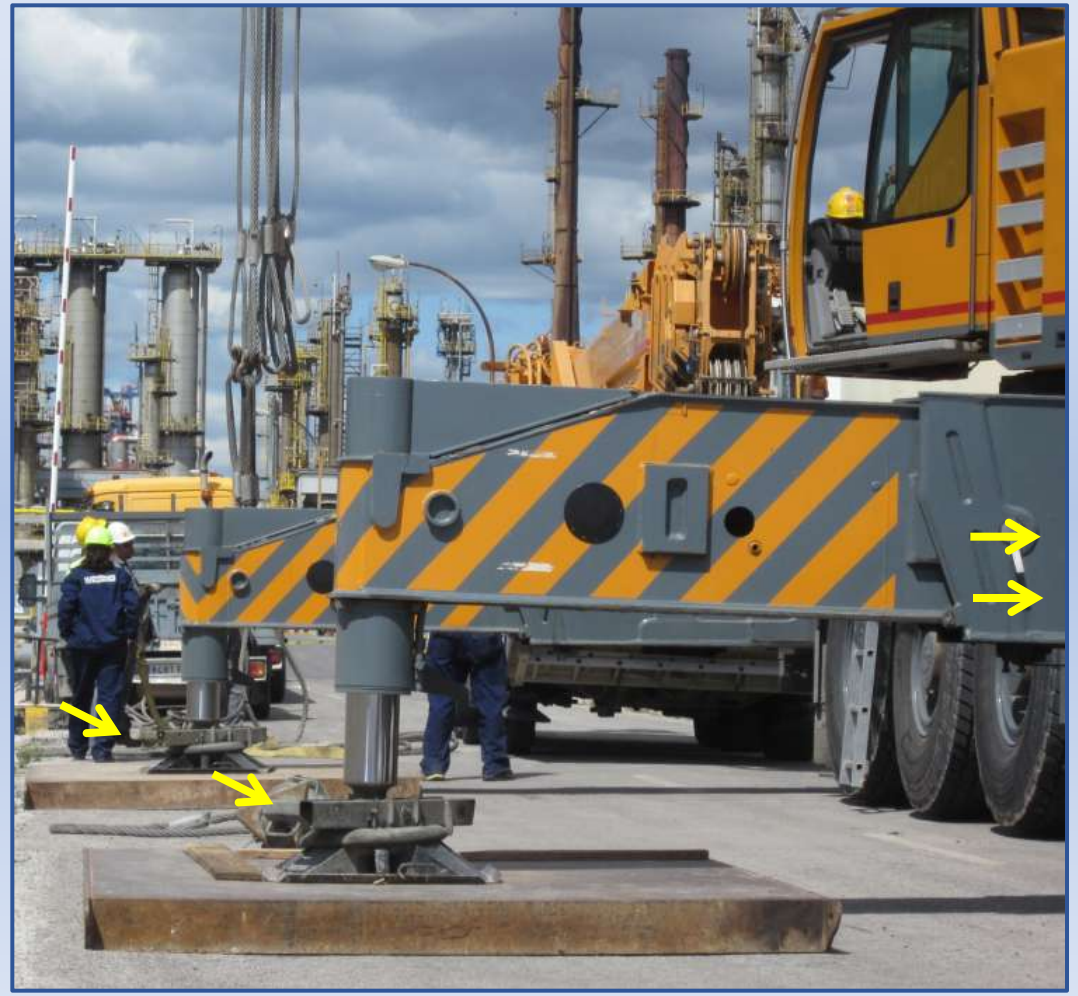
No DRAWING:

HEAVY LIFTING + HANDLING

HEAVY Lifting + Handling NV
Madridstraat 18 - Haven 33a
B-2030 Antwerpen
www.heavylifting.be

VCA CERTIFIED VINÇOTTE

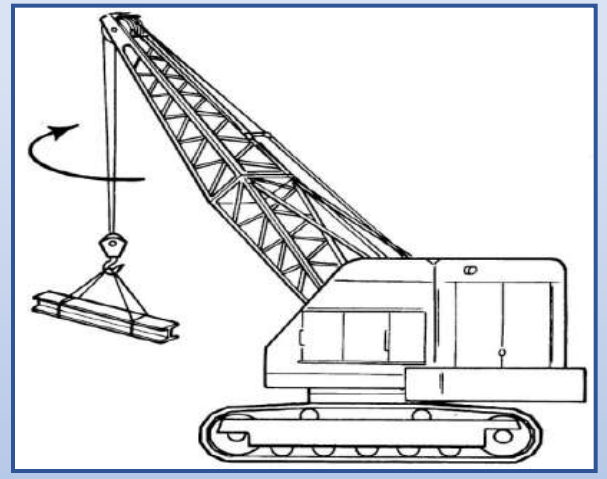
- **Weather** conditions must be considered.
- Cranes and trucks cranes must be settled on a steady base, leveled and supported on manufactured load distribution elements. The dimensions of the plates used to support stabilizers will be in accordance with the manufacturer's instructions. Their use is mandatory even on apparently steady land.
- Elements being lifted will not have loose parts.

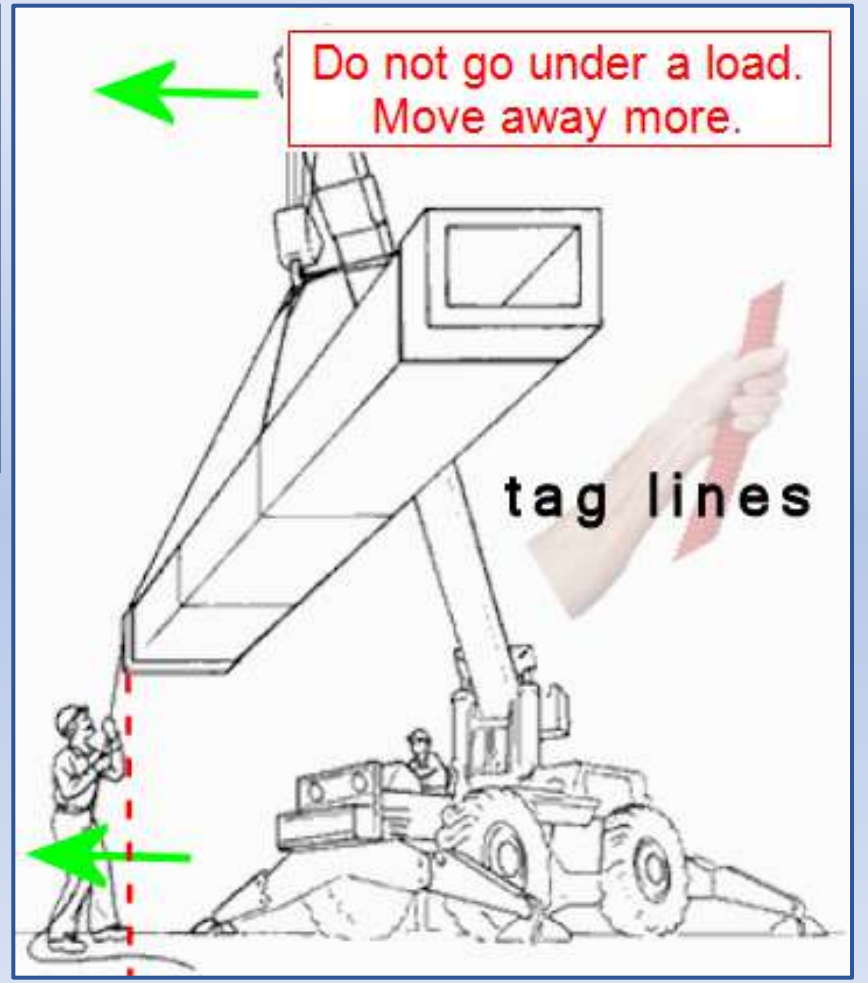


- Factors you should consider when **selecting lifting equipment** so that it is suitable for the proposed task include:
  - The load to be lifted.
  - Its weight, shape, centre of gravity, availability of lifting points.
  - Where the load is presently positioned and where it will be positioned after the lifting operation.
  - The environment in which the lifting equipment will be used.
- All persons involved (slinger, crane operator…) must be experienced.
- The lifting equipment operator, responsible person and, where applicable, any assistants to the responsible person need to use the same reliable means of effective communication. This could be by using hand signals, radios or telephones, etc.

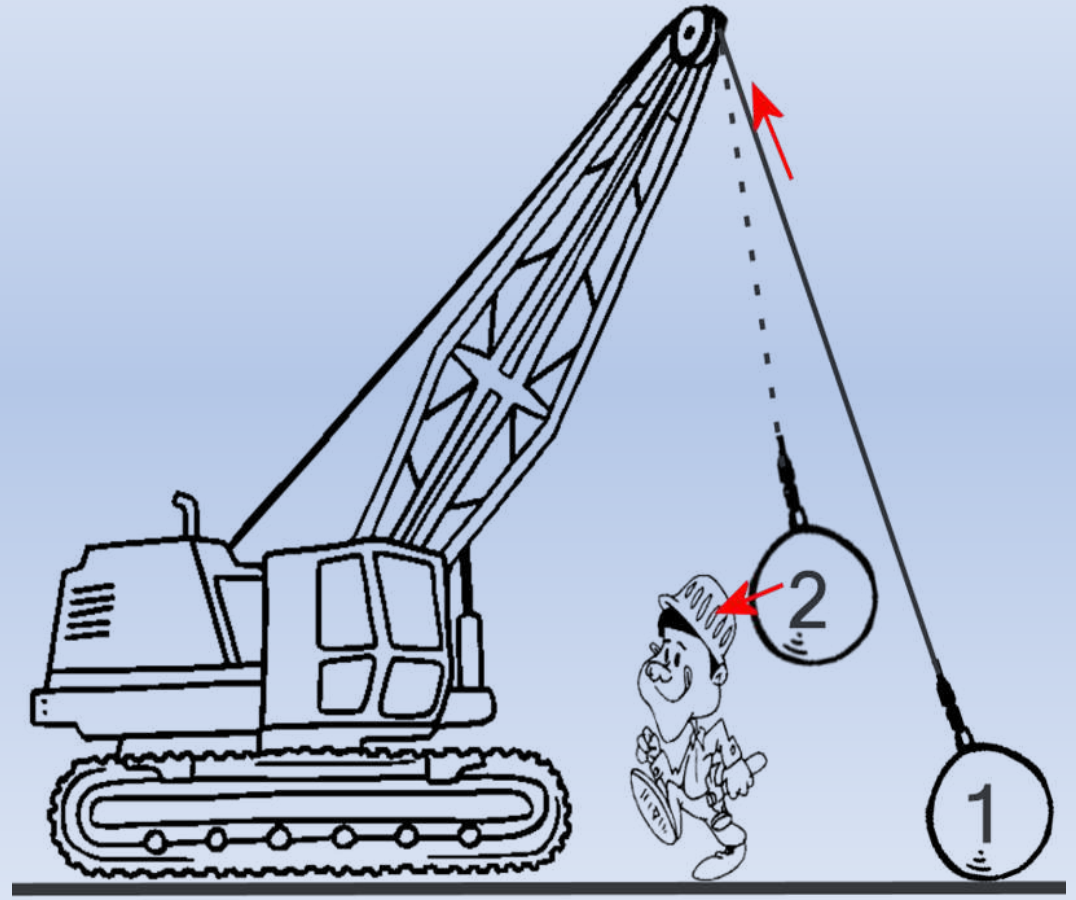
If necessary one or more **tag lines** (long enough) will be used when handling loads.

Crane tag lines: When operating a crane, guy wires, known as tag lines, may be connected to unwieldy payloads, allowing ground crew to **control rotation and swaying while maintaining a safe distance**.

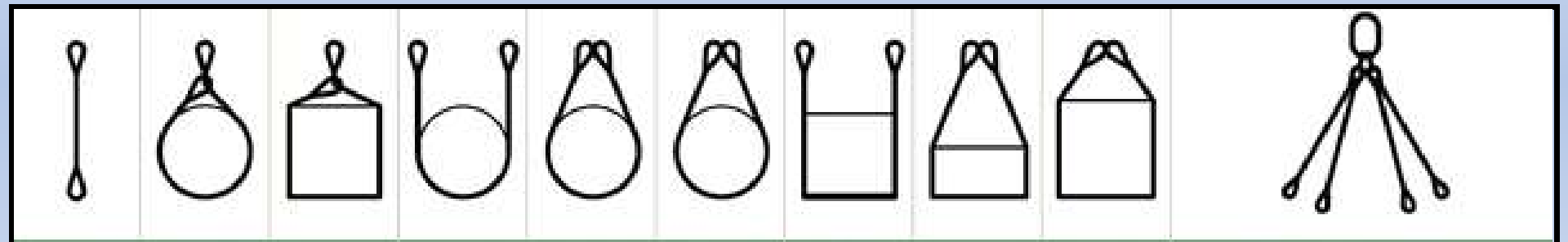




- Loads must be lifted vertically, not obliquely, otherwise the load would move uncontrollably.
- Loads must not be lifted brusquely.
- Nobody must stand between suspended loads and another structure because the risk of being trapped is high.
- Personnel must keep away from the field of action of machines.
- To prevent being trapped when unloading o placing transported material, hands must not be placed in spaces between objects. The same measures must be kept in case of toes.



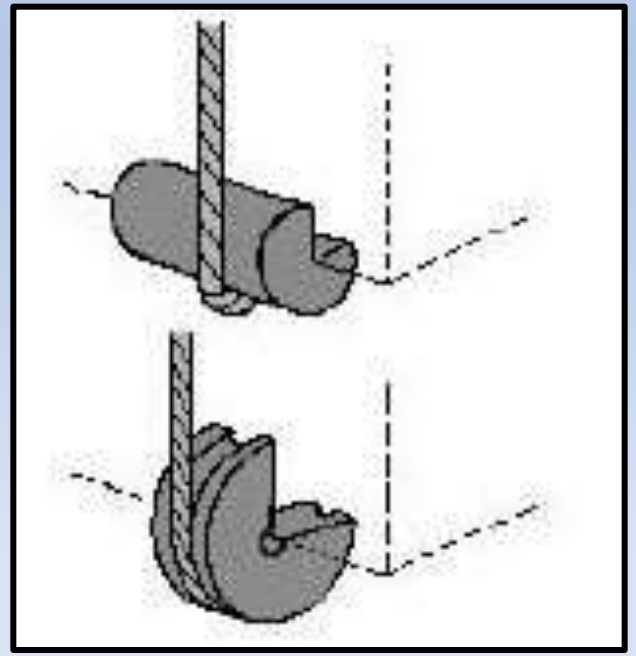
- Personnel must keep sufficiently away from stressed lifting accessories, slings… in case of brake (e.g. when pulling from a machine).
- Slings, lifting accessories, lifting points, etc. shall be used according to the loads being supported. If necessary a spreader beam will be used.

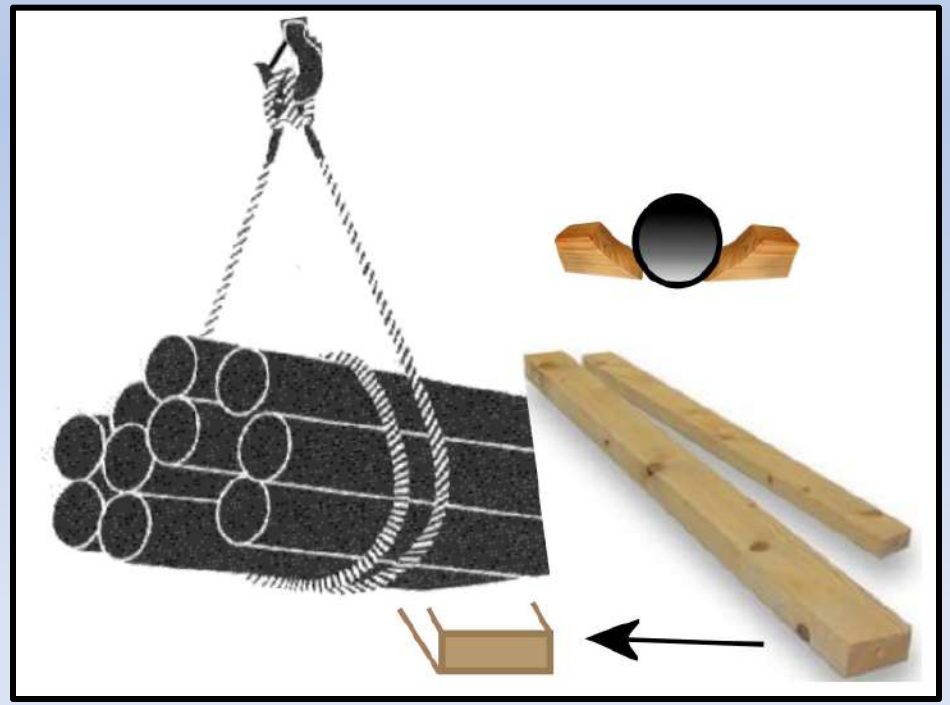


REEVE LOAD			Round Basket Load			Oblong Basket Load			2,3 or 4 Leg Sling		
Straight	Round	Oblong	0°	60°	90°	0°	60°	90°	0°– 60°	90°	120°
1,00	0,75	0,50	2,00	1,70	1,40	1,00	0,85	0,70	1,70	1,40	1,00

- A **load handler o slinger** has the responsibility for attaching/ detaching and securing the loads to the lifting equipment. The load handler should have the necessary competence to select suitable lifting accessories. You need to ensure that they receive adequate information, instruction and practical experience on the principles of selection, use, care and maintenance of lifting accessories including any limitations on use.

- Use of **protectors in cutting elements**, as well as **planks to unload and not crush the slings** when necessary.



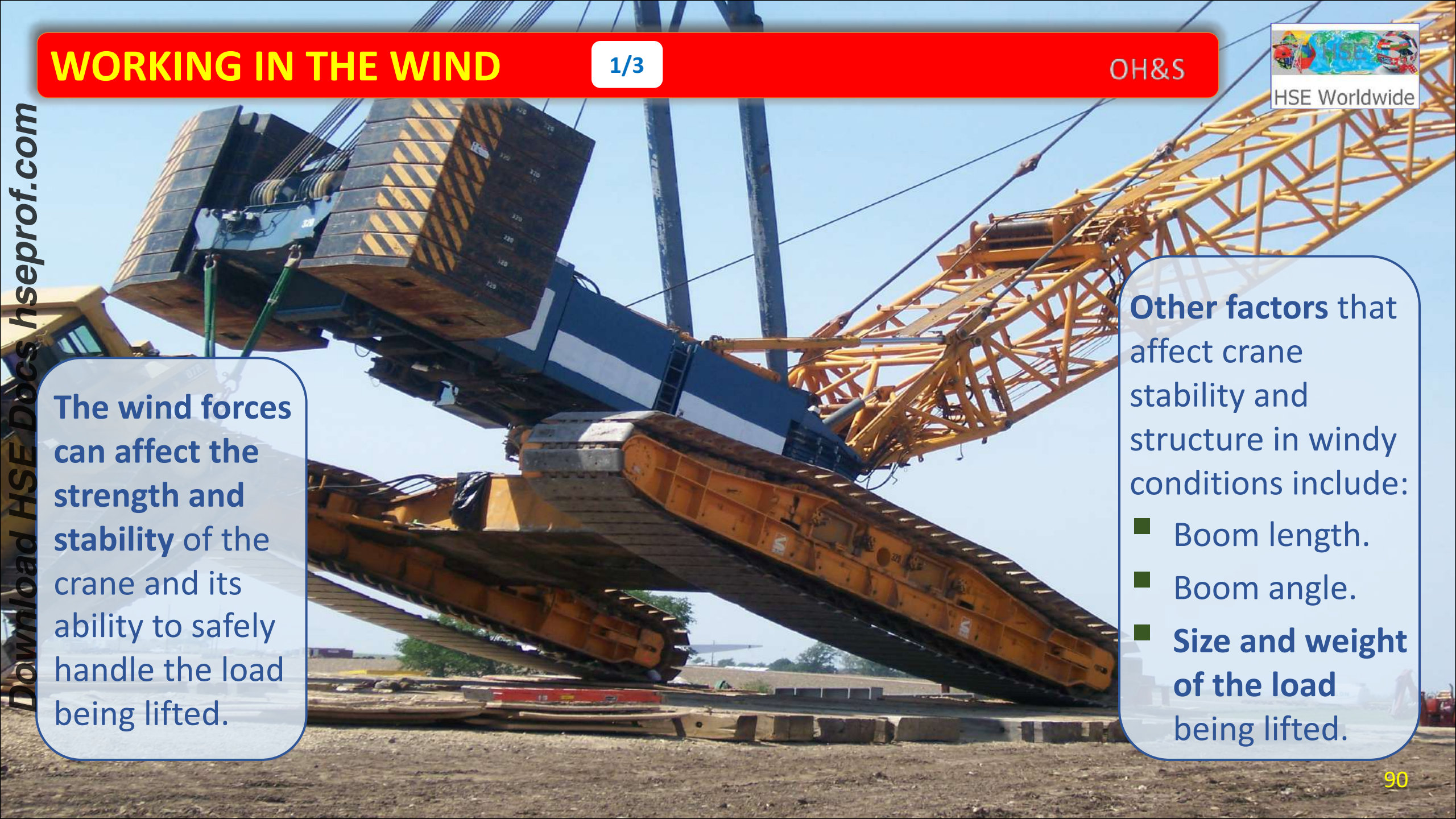


WORKING IN THE WIND

1/3

OH&S

HSE Worldwide



The wind forces can affect the strength and stability of the crane and its ability to safely handle the load being lifted.

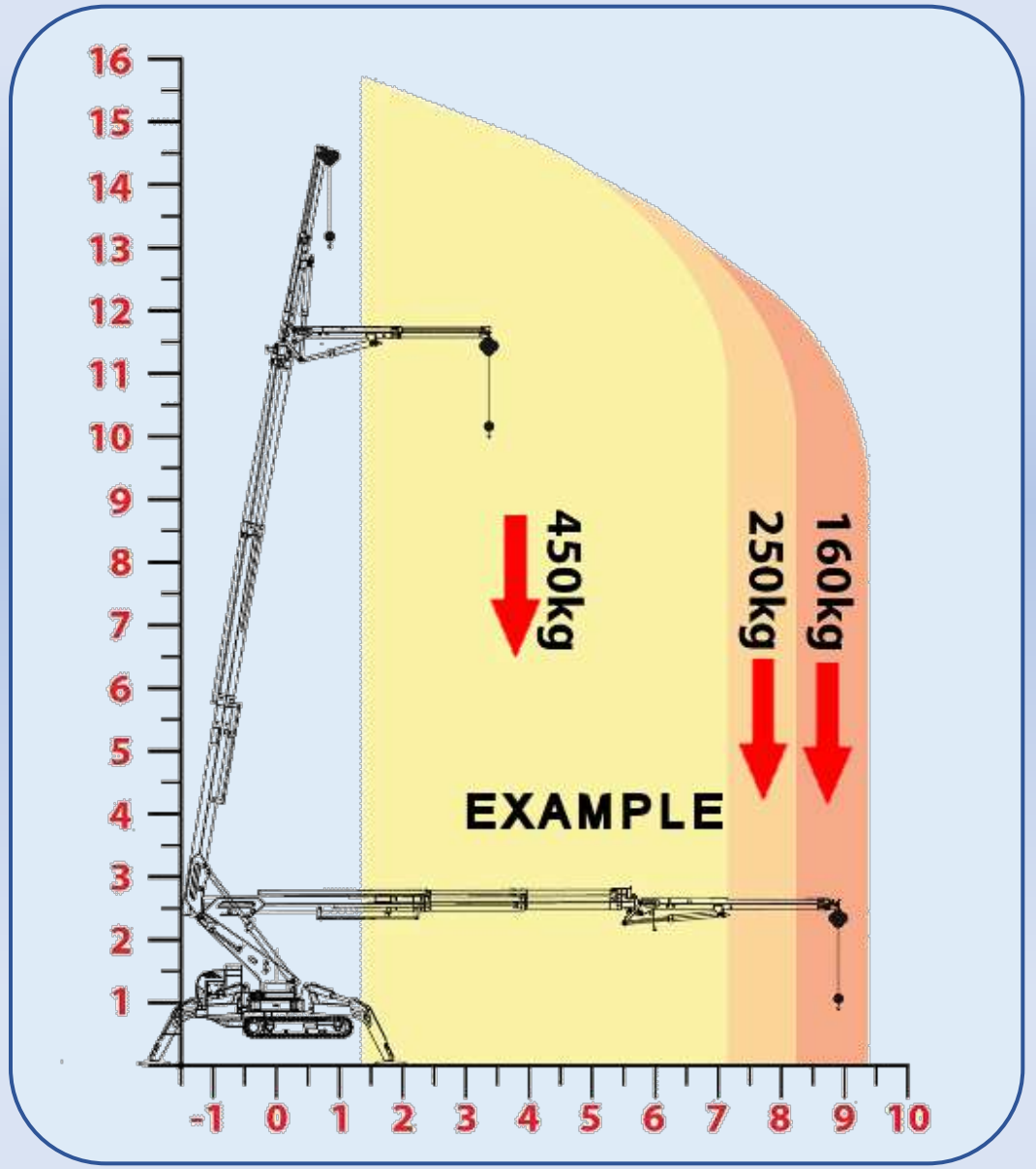
Other factors that affect crane stability and structure in windy conditions include:

- Boom length.
- Boom angle.
- **Size and weight of the load** being lifted.

WORKING IN THE WIND 2/3

HSE Worldwide

- Most crane manufacturers recommend that **when wind speeds exceed 32 km/h, the crane's capacity must be reduced** according to the specifications in the crane's load capacity charts.
- Lifting operations should **not** be conducted **when wind speeds** reach or exceed **48 km/h**.



WORKING IN THE WIND 3/3

HSE Worldwide

Wind must not exceed the speed recommended by the manufacturer or, where manufacturer does not specify this information, the speed determined by a qualified person. The following table can be consulted for guidance.

WIND Beaufort Scale		Velocity Km/h	VISIBLE INDICATIONS Effects of wind as observed
0	Calm CALMA	0 to 1	No wind; Smoke rises vertically. Calma, el humo asciende verticalmente.
1	Light Air VENTOLINA	2 to 5	Wind direction seen by smoke, but not in wind vanes. El humo indica la dirección del viento.
2	Light Breeze BRISA MUY DÉBIL	6 to 11	Wind felt on face; leaves rustle; wind moves vane slightly. Se caen las hojas de los árboles, empiezan a moverse los molinos de los campos.
3	Gentle Breeze FLOJO (BRISA LIGERA)	12 to 19	Leaves and twigs in motion, flags extend. Se agitan las hojas, ondulan las banderas.
4	Moderate Breeze BRISA MODERADA	20 to 28	Raises dust and loose paper, moves small branches. Se levanta polvo y papeles, se agitan las copas de los árboles.
Reduce Crane Load Ratings and Operating Parameters at 32 km/h (sustained or gusts)			
5	Fresh Breeze BRISA FRESCA	29 to 38	Small trees in leaf begin to sway; on ponds, crested wavelets form. Pequeños movimientos de los árboles, superficie de los lagos ondulada.
6	Strong Breeze BRISA FUERTE	39 to 49	Large branches in motion; overhead wires whistle. Se mueven las ramas de los árboles, dificultad para mantener abierto el paraguas.
Cease All Operations at 48 km/h (sustained or gusts), lower and retract boom			
7	Moderate Gale VIENTO FUERTE	50 to 61	Whole trees in motion; walking against wind is inconvenient. Se mueven los árboles grandes, dificultad para caminar contra el viento.

HOISTING PERSONNEL BY CRANE **Man riding**

WORKING AT HEIGHTS

OH&S

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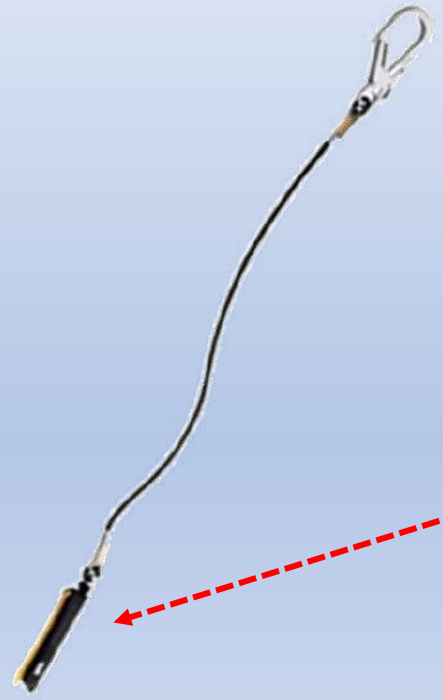
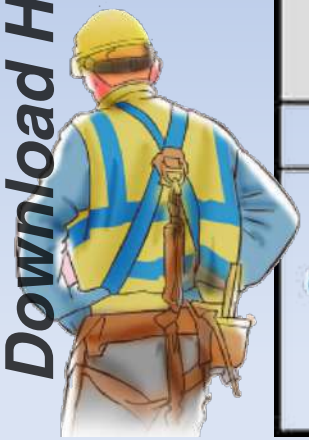
- Fall prevention and protection measures should be implemented whenever a worker is exposed to the hazard of **falling more than 1.8 meters**.
- The **hierarchy** of preference for controls for working at height will be:
  1. **Collective** protection systems.
  2. **Personal** Protective Equipment → **Harness**.

  During works at a height, the surrounding area **must be marked out**.
- People left suspended in harness type systems even for very short periods (15 min) can suffer serious injury or fatality if not rescued in a short period after the fall (**suspension trauma**).
- It is necessary to have a **rescue plan** to respond to workers after an arrested fall.

			
Fall arrest harness EN 361	Energy absorber with integrated single lanyard EN 355 – EN 362	Energy absorber EN 355	Energy absorber with integrated double lanyard EN 355 – EN 362

WORKING AT HEIGHTS 3/5

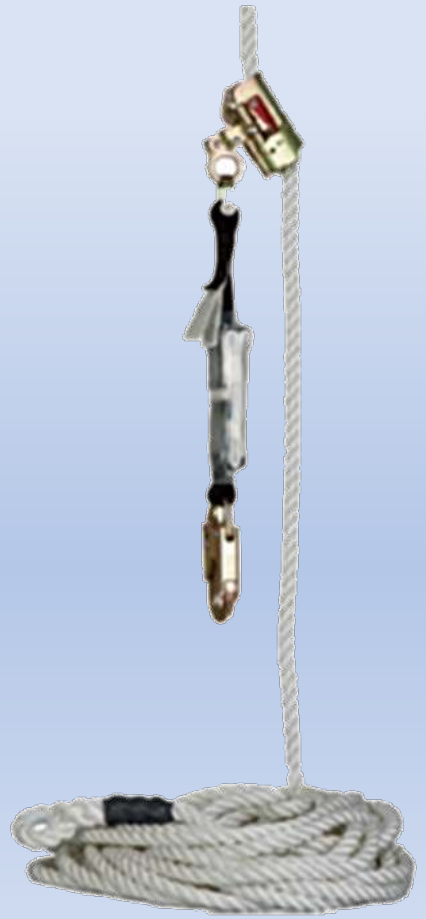
HSE Worldwide



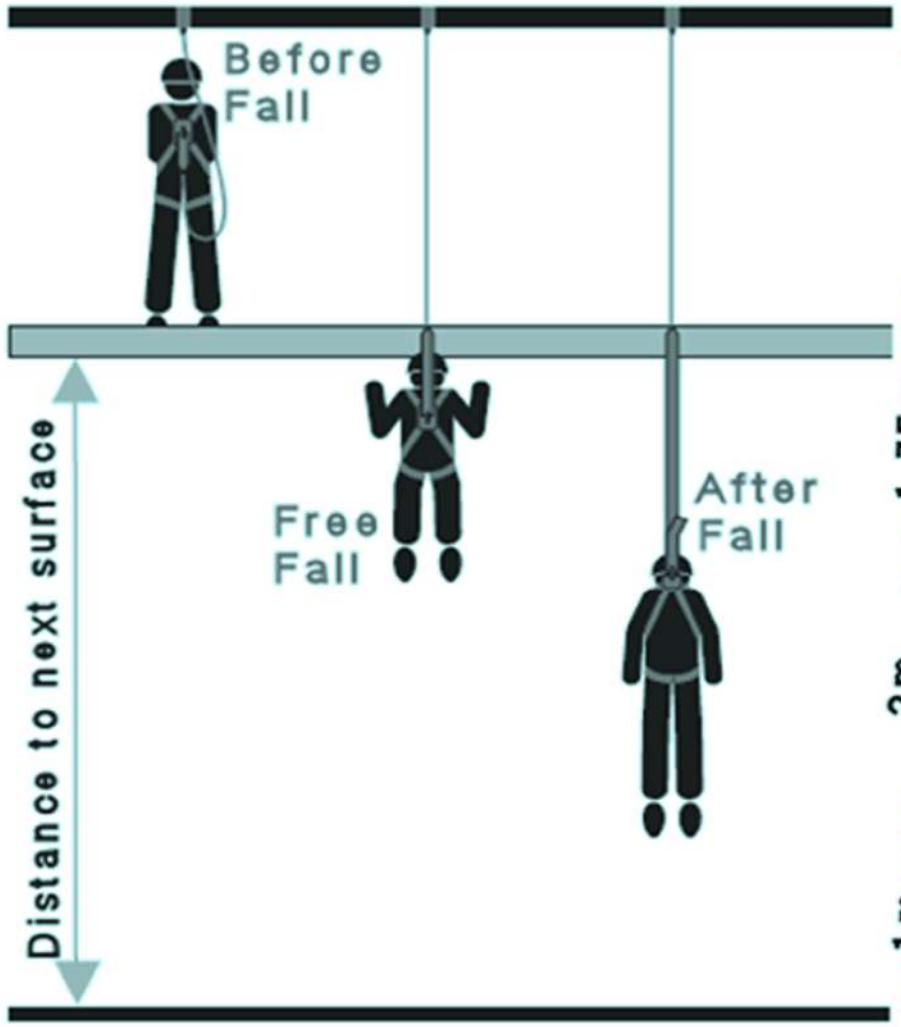
			
			
Rear attachment	**Front attachment**	**Side/Hip attachment**	**Shoulder attachment**
Used for fall arrest and can also be used as a rescue attachment.	Used for fall arrest mostly for descent, ladder climbing and rescue.	Used for work positioning activities that allows the worker to perform hands free work.	Used for raising a user out of, or lowering a worker into, a working environment.

WORKING AT HEIGHTS 4/5

HSE Worldwide

			 
Vertical Lifeline Kit EN 353-2	Self-Retracting Lanyard EN 360	Retractable type fall arrester EN 360	Temporary lifeline. Horizontal fall-arrest system EN 795 class B

How to calculate Total Fall Distance



Example
2m Length of lanyard

1.75m Extension of energy absorber

2m Height of person to attachment

1m Safety factor

Total Fall Distance required = 6.75 m

HSE

LOCK OUT / TAG OUT LOTO 1/2 OH&S

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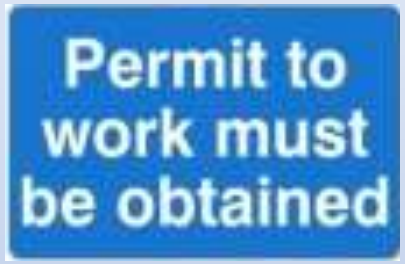
It is required to apply a LOTO procedure before performing any work on energized equipment, hazardous workplace due to the possible entry of chemicals, etc.

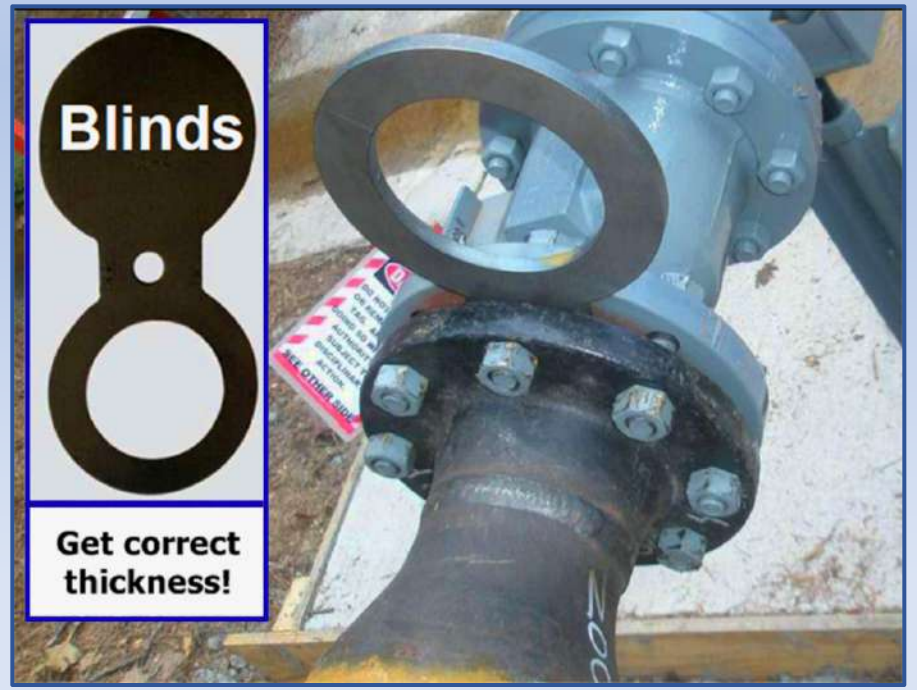


The procedure shall take into account:

- Method of cut-off and discharge of stored energy are agreed and executed by (a) competent person(s).
- Discharges of stored energy (electrical, mechanical, pneumatic, hydraulic, process and others).
- System of locks and tags used as isolation points.
- Tests conducted to ensure the isolation is effective.
- Monitoring of isolation effectiveness.

LOTO 2/2

HSE Worldwide



COMMISSIONING

Once the construction contractor has completed the installation of an item of equipment or system, the Commissioning Manager is notified that the equipment is available for pre-commissioning.

Entry into a Pre-Commissioning or Commissioning Module requires formal permission from the Commissioning Manager or designated Superintendent. These equipments, systems or modules should be tagged.

Live lines (containing products) should also be marked with stickers on which "LIVE LINE" is written.

Permit to work must be obtained

All items of equipment in a commissioning area should be treated as live unless specifically isolated and locked out.

The system and procedures constitutes the most methodical means of ensuring that safe work practices are followed and that the work environmental is safe.

Permits should be approved by the Commissioning Area Supervisor and Commissioning Manager or designated Superintendent.

All work in the commissioning area must be carried out on an authorised permit. Also, it is essential to issue of a “Permit to Work” in relation to all other work procedures being undertaken in the immediate work area, as well as those remote areas likely to be affected.

All areas where hazardous pre-commissioning and or start-up work is being performed shall be properly barricaded and access into the area controlled.

Contractor and subcontractor shall ensure all employees involved in pre-commissioning and start-up work are trained in their task and associated hazards and dangers of their work.

To issue a PTW is required to take into account all the stated guidelines, e.g. the applicable standard for fire and explosion prevention during cleaning and purging of flammable gas piping systems, Lock Out Tag Out systems, precautions to be taken before starting the work, tests and checks, equipment to be used or to be made available on a standby basis, requirements, if any, for further periodic tests and checks, etc.

ACTIVITIES	HAZARDS
▪ Hydro testing of tanks, lines and vessels.	▪ The equipment may fail which can cause injuries. ▪ Environmental contamination.
▪ Chemical cleaning of lines and equipment.	▪ The chemicals may leak due to equipment failure or could be spilled due to failure of fittings and causes burns to the skin on contact or injure the eyes, or contaminate the environment. If the chemically dosed water is drunk, it may result in illness or death.
▪ Pneumatic testing of lines and equipment. ▪ Air blowing of lines.	▪ Equipment or fittings may fail and cause injuries. ▪ Water can cause "water hammers" if not properly drained after hydro testing and result in lines jumping off racks or burst open and cause injuries. Flying particles at open ends may result in eye injuries. High noise levels are often.

ACTIVITIES	HAZARDS
▪ Steam blowing of line.	▪ Steam will heat up the lines and equipment, which can cause burns. ▪ Steam blowing is also associated with high levels of noise which may harm the ears.
▪ "Breaking" of pipes/flanges to replace studs/bolts/ gaskets/"swing" blinds/ insert or remove spades etc.	▪ If the line is under pressure with a product or substance it will escape and cause burns, eye injuries, or other types of serious injuries, fires, gas leaks/clouds etc.
▪ Rotating equipment and other electrical testing.	▪ There is always a danger of electrical shock and/or unguarded moving parts that may cause injuries. ▪ Apart from this there is also the possibility that the equipment may fail.

ACTIVITIES	HAZARDS
▪ Hydraulic testing of instrument system.	▪ Failure of equipment or fittings/tubes which could lead to eye injuries and environmental contamination.
▪ Live lines: After the lines have been cleaned and pressure tested they are commissioned. This is when they are charged /loaded /filled with the products they were designed to carry during the facility's operation.	A. Some gases are poisonous and others can kill because they displace the air which people need to breathe to stay alive. B. Some chemicals are poisonous and others can literally eat or burn away skin or muscles. C. Some gases are explosive when mixed with air and many of the liquids are flammable. D. High pressures. E. High temperatures.

When the pressure and temperature of a dangerous chemical or gas is increased, then the product's hazardous properties are further magnified by the pressure or temperature increase. Some products, which may normally be only flammable, may be so hot in the process that they will also ignite automatically when exposed to the air.

Other aspects which, if not given adequate attention, may contribute to existing hazards/dangers and requiring continuous consideration are as follows:

- Many persons doing different jobs in the same small area simultaneously.
- Persons who have conflicting interests working on the same equipment /activity.

- Too much pressure applied to finish work quickly resulting in "short cuts" being taken.
- Ignoring/by-passing safety aspects because "they cause delays"/retard progress.
- Using incorrect sub-standard tools/equipment or faulty tools/equipment.
- People not being trained and familiarized with dangers associated with hazardous products/substances/gases.
- Ignoring permit conditions or working without an authorized work permit.
- No banners and warning signs or restricted area access control.
- No barricades erected to create a restricted access area.

EXAMPLES OF SAFETY SIGNS

WARNING
TEST IN PROGRESS

RESTRICTED AREA - AUTHORISED PERSONNEL ONLY

HIGH PRESSURE

ELECTRICAL HAZARD

KEEP HANDS CLEAR OF MOVING MACHINERY

AUTOMATIC START / REMOTE CONTROL

EXAMPLES OF SAFETY SIGNS 2/3

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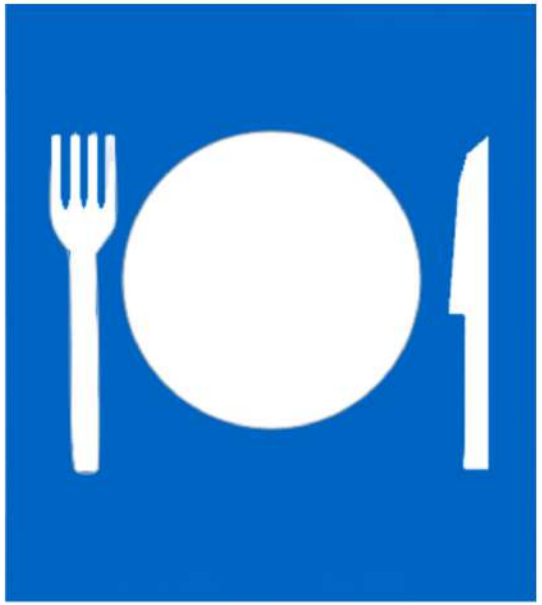
EXAMPLES OF SAFETY SIGNS 3/3

HSE Worldwide

WELFARE ON SITE

WELFARE ON SITE

TOILETS



CANTEEN

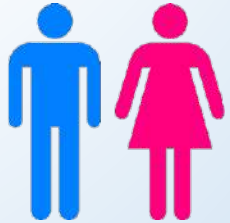
FIRST AID

Find out where these facilities are located

Only smoking in designated outdoor areas is permitted.

Toilets and washrooms.

Workers must have access to sufficient toilets and washbasins in the vicinity of their workplace.



Canteen.

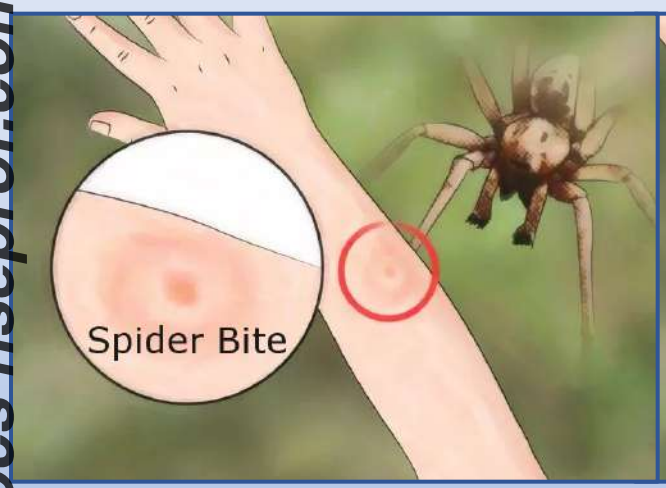
Meals may only be eaten in the designated canteen.

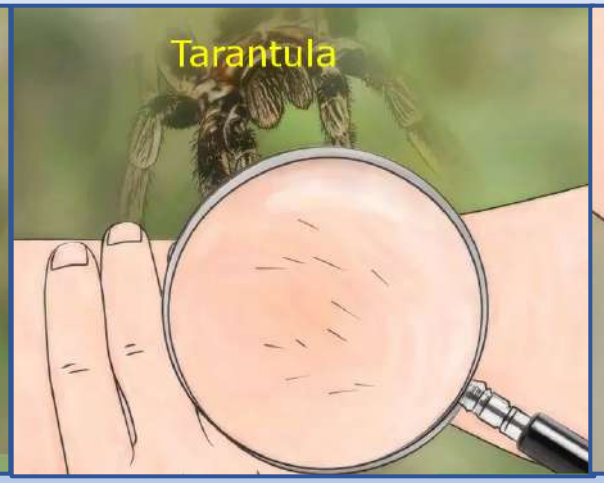
Drinking water.

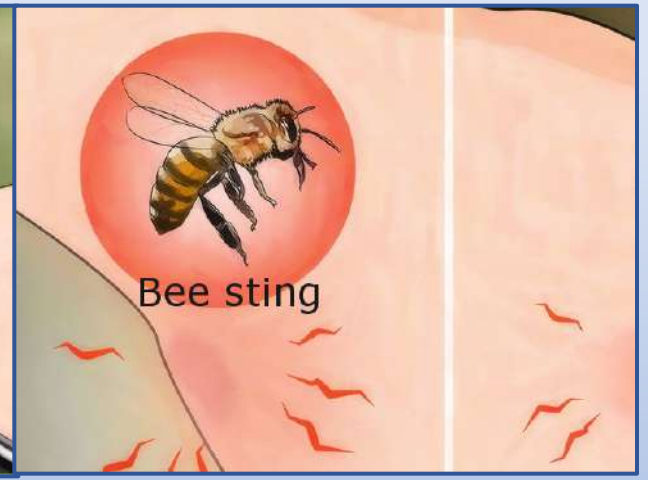
Both on the construction site and in the various rooms and in the vicinity of the work area, workers must have access to sufficient drinking water, and where appropriate some other suitable non-alcoholic drink.

The facilities will be cleaned daily.

ANIMALS AND POISONOUS INSECTS





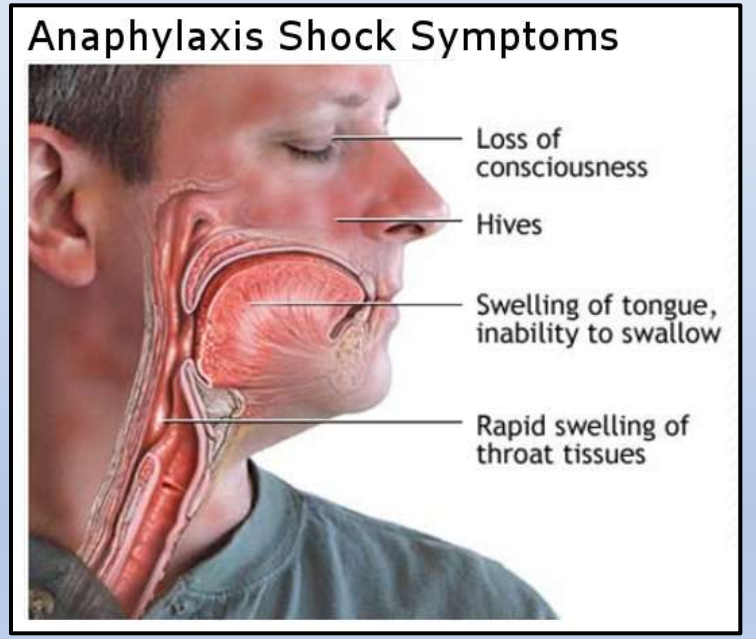


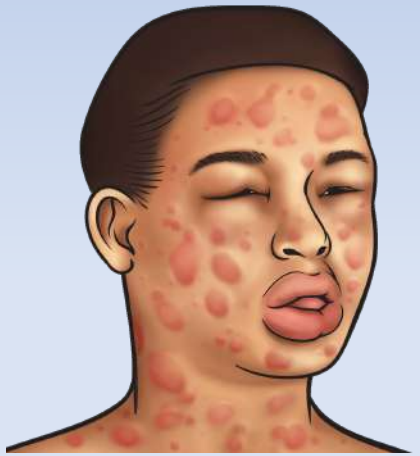
To help identify the type of animal bite, capture it or take a photo with your phone and take it to a local clinic (someone might be able to identify it) or research it online.

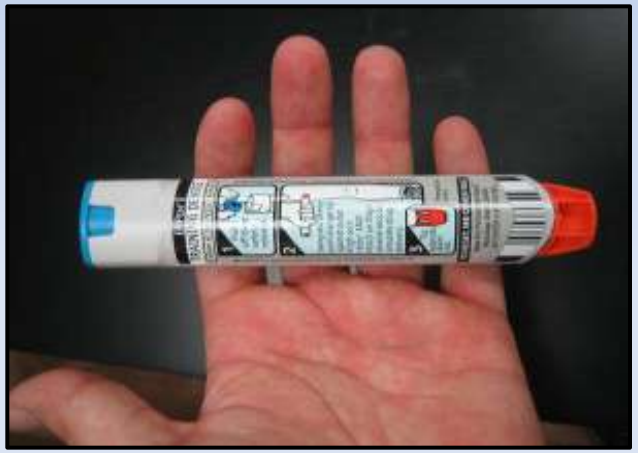
HSE Worldwide

Anaphylaxis

- Venom from stinging or biting insects such as ants, bees, wasps or kissing bugs may cause anaphylaxis in susceptible people.
- It is a serious allergic reaction that is rapid in onset and may cause death. It typically causes more than one of the following: an itchy rash, throat or tongue swelling, shortness of breath, vomiting, lightheadedness, and low blood pressure. These symptoms typically come on over minutes to hours.
- The primary treatment of anaphylaxis is epinephrine injection into a muscle, intravenous fluids, and positioning the person flat.







Carrying an epinephrine autoinjector and identification regarding the condition is recommended in people with a history of anaphylaxis.

Snakebite Prevention

- Snakes are most likely to bite when they feel threatened, are startled, are provoked, or when they have been cornered.
- When dealing with direct encounters it is best to remain silent and motionless. If the snake has not yet fled it is important to step away slowly and cautiously.
- Snakes may also be unusually active during especially warm nights when ambient temperatures exceed 21 °C. It is advised not to reach blindly into hollow logs, flip over large rocks, and enter old cabins or other potential snake hiding-places.
- It is also important to avoid snakes that appear to be dead, as some species will actually roll over on their backs and stick out their tongue to fool potential threats. A snake's detached head can immediately act by reflex and potentially bite. The induced bite can be just as severe as that of a live snake.

Snakebite first aid recommendations

Most first aid guidelines agree on the following:

- Protect the person and others from further bites. Keep the person calm.
- Identify the species without risking further bites or delaying proper medical treatment.
- Call for help to arrange for transport to the nearest hospital emergency room, where antivenom for poisonous animals common to the area will often be available.
- Make sure to keep the bitten limb in a functional position and below the person's heart level so as to minimize blood returning to the heart and other organs of the body.
- Do not give the person anything to eat or drink. Do not administer stimulants or pain medications, unless specifically directed to do so by a physician.
- Remove any items or clothing which may constrict the bitten limb if it swells (rings, bracelets, watches, footwear, etc.)
- Keep the person as still as possible. Do not incise the bitten site.

Severe tissue necrosis following Bothrops asper envenomation that required amputation above the knee. The person was an 11-year-old boy, bitten two weeks earlier in Ecuador, but treated only with antibiotics.

HSE Worldwide

Spider bite

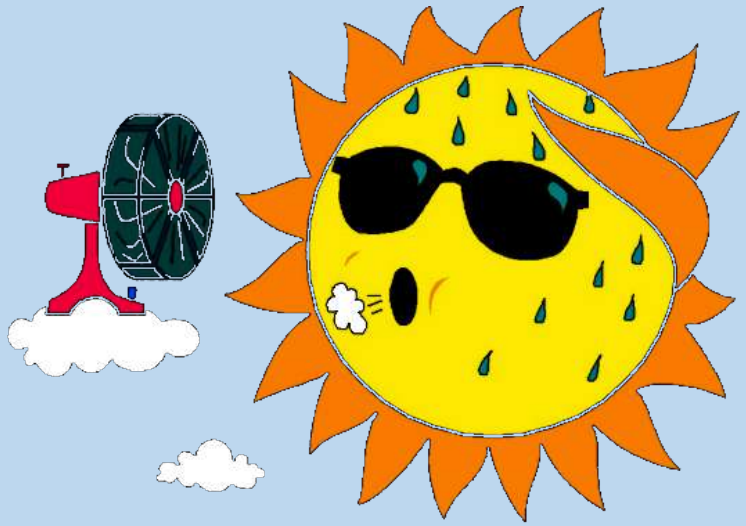
- Measures to prevent spider bite:
  - ✓ Wear a long-sleeved shirt, hat, gloves, and boots when handling boxes, firewood, lumber, rocks, etc.
  - ✓ Inspect and shake out clothing and shoes before getting dressed.
  - ✓ Use insect repellants, such as DEET or Picaridin, on clothing and footwear.
- Some spider bites are harmless, and require no specific treatment. Other ones may develop into a medical emergency.
- Treatment of bites may depend on the type of spider; thus, capture of the spider—either alive, or in a well-preserved condition, is useful.
- Use of antivenom for severe spider bites may be indicated.

Scorpion sting

- Scorpion stings are a cutaneous condition caused by the stinging of scorpions, usually resulting in pain, paresthesia, and variable swelling.
- Most scorpion stings vary from small swelling to medically significant lesions in severity, with only a few able to cause severe allergic, neurotic or necrotic reactions.
- Some species of scorpions can inflict stings which result in death of normal healthy humans.
- Antivenom exists for some species' stings.

HOT ENVIRONMENTS 1/5

- Heat illness is a spectrum of disorders due to environmental heat exposure. It includes minor conditions such as heat cramps, heat syncope, and heat exhaustion as well as the more severe condition known as **heat stroke**.
- It is caused by the failure of the body's internal mechanism to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat.
- Signs include mental confusion, delirium, loss of consciousness, convulsions or coma, a body temperature of 40.5 ºc or higher and hot dry skin which may be red and flushed. **Victims of heat stroke may die unless treated promptly and correctly**.



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Example of controls measures in times of the year where workers can be exposed to heat stress:

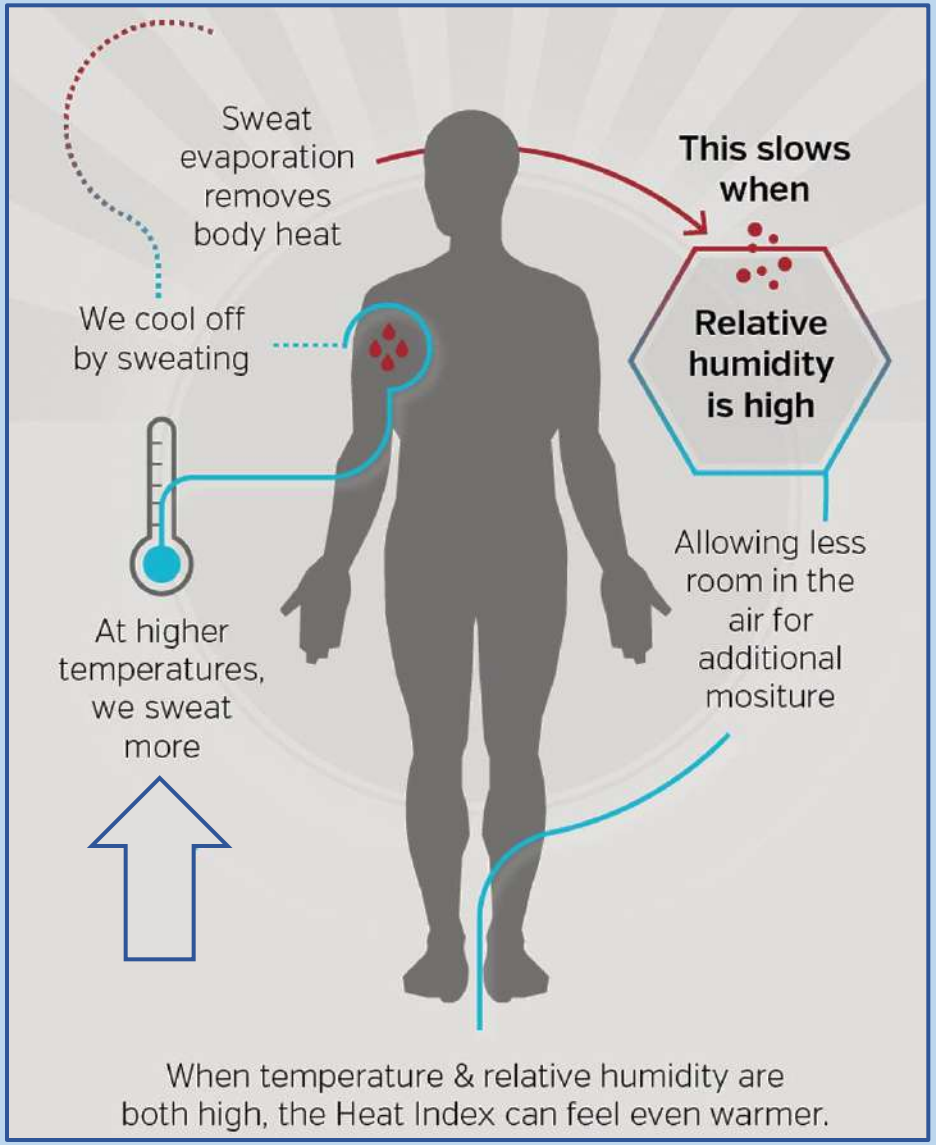
- Heat stress shelters must be distributed nearby the work areas.
  Enough size, seating, good ventilation, large fans or air conditioning, heat stress posters, emergency contacts, drinking water, disposable water cups, electrolyte drinks, sun protection, trash bins, etc.
- Modifying work practices, schedule and urging workers to drink often. Strenuous activities should be avoided during daylight hours in hot weather.
- Implement administrative measures such as work/rest regimens.
  A flagging / signposting system shall be implemented to inform of the work/rest regime to be applied.
- Wear lightweight, light colored, loose-fitting clothes.

HOT ENVIRONMENTS 3/5

HSE Worldwide

HEAT INDEX TABLE

TEMPERATURE (°C)	RELATIVE HUMIDITY								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
50	44	52	>54	>54	>54	>54	>54	>54	>54
49	43	51	>54	>54	>54	>54	>54	>54	>54
48	43	50	53	>54	>54	>54	>54	>54	>54
47	42	48	52	>54	>54	>54	>54	>54	>54
46	41	47	50	>54	>54	>54	>54	>54	>54
44	40	45	49	>54	>54	>54	>54	>54	>54
43	39	44	48	>54	>54	>54	>54	>54	>54
42	38	43	46	>54	>54	>54	>54	>54	>54
41	38	41	45	52	>54	>54	>54	>54	>54
40	37	40	43	49	>54	>54	>54	>54	>54
39	36	38	42	47	52	>54	>54	>54	>54
38	35	37	41	43	49	>54	>54	>54	>54
37	34	36	38	41	43	52	>54	>54	>54
36	33	35	37	41	42	49	53	>54	>54
34	32	34	35	38	41	44	50	53	>54
33	31	32	33	36	38	41	46	50	53
32	29	31	32	33	36	38	41	46	50
31	28	30	31	32	34	35	38	41	46
30	27	29	29	31	32	33	36	38	43
29	26	27	28	29	30	32	33	35	37
28	25	26	27	27	29	30	32	33	35
27	24	25	26	26	27	28	29	30	32



HEAT STRESS GENERAL GUIDELINES

Danger Category	Flag colour	Heat Index Temp. °C	Heat Syndrome	Rest Period (Every Hour)	Water Needed
Extreme Danger	Red	**> 54 °**	Heat Stroke Imminent	No company operates without consulting HSE. The work is permitted only when the appropriate engineering control is in place.	1 glass /15 min
Danger	Yellow	**41°-54°**	Heat Cramps, Heat Exhaustion likely. Heat Stroke possible with prolonged exposure and physical activity	**20 min work** **10 min rest**	1 glass /15 min
Extreme Caution	White	**32°-41°**	Heat Cramps or Heat Exhaustion possible with prolonged exposure and physical activity	**45 min work** **15 min rest**	1 glass /10 min
Caution	-No Flag-	**27°-32°**	Fatigue possible with prolonged exposure and physical activity	**No Restrictions**	

Treatment:

- The body temperature must be lowered immediately. The patient should be moved to a cool area.
- The patient's condition should be reassessed and stabilized by trained medical personnel.
- Treatment involves rapid mechanical cooling. E.g.:
  - ⇨ Remove the cloth.
  - ⇨ Bath in cool (but not cold) water or a hyperthermia vest. However, wrapping the patient in wet towels or clothes can actually act as insulation and increase the body temperature. Cold compresses to the torso, head, neck, and groin will help cool the victim. A fan or dehumidifying air conditioning unit may be used to aid in evaporation of the water.
  - ⇨ Hydration is of paramount importance in cooling the patient.

COLD ENVIRONMENTS 1/4

- Exposure to extremely cold temperatures can freeze exposed skin causing irreparable damage (known as **frostbite**) in only a matter of minutes during the worst conditions known to occur in some regions.
- **Cold Stress (Hypothermia)** is a physiological reaction that starts to occur when the body loses heat faster than it can produce heat.
- **Wind chill** cooling rate: Heat loss index that represents the effect of the air temperature and the wind speed on the body.

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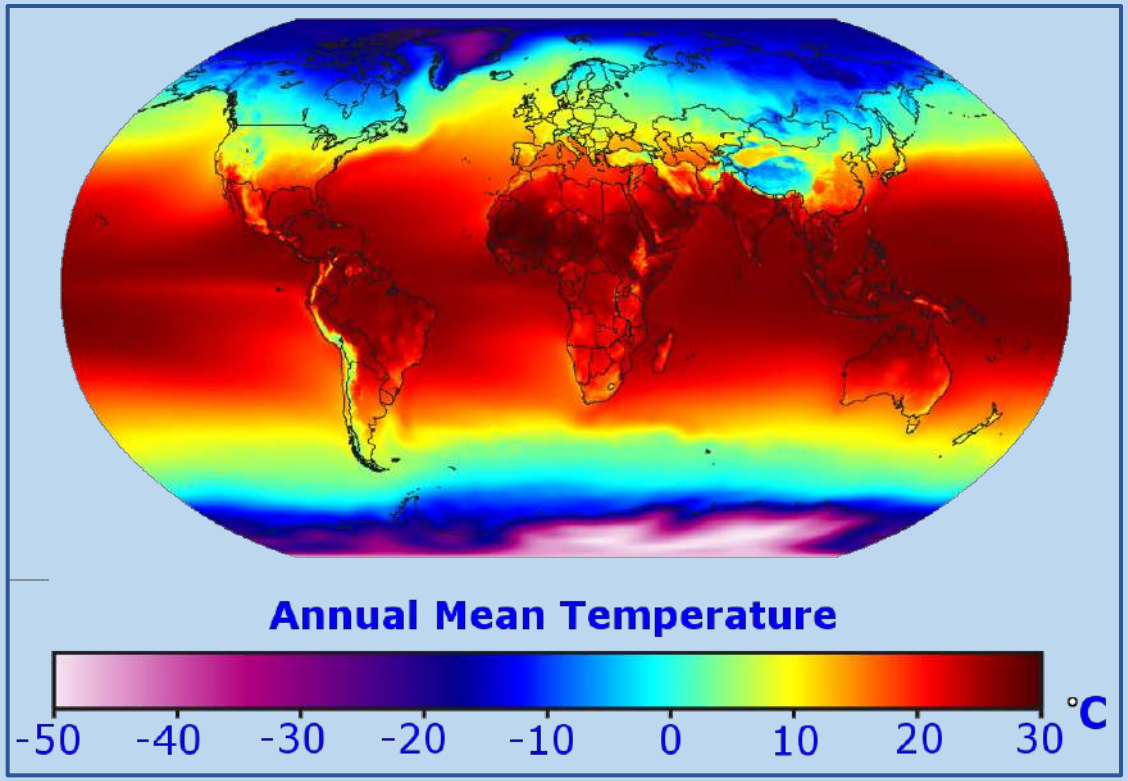

Example of controls measures in times of the year where workers can be exposed to cold stress:

- **Warm-up shelters**: Heated warming shelters should be made available nearby, where the personnel can remain during warm-up breaks. *Enough lighting, seating, adequate heating system and ventilation, cold stress posters, emergency contacts, hot drinks, trash bins, etc.*
- **Warm-up Breaks Schedule**

  In addition, a flagging / signposting system could be implemented to inform of the work/rest regime to be applied.
- Workers should **dress with several layers** so clothing can be removed or added as required.

COLD ENVIRONMENTS 3/4

HSE Worldwide

- Workers who become immersed in water or whose clothing becomes wet must immediately be provided a **change of clothing**.
- Any person who shows symptoms that could be related to cold exposure shall be directed to **first aid services** immediately.
- **Vehicles** should be prepared with suitable provisions in case of an accident or break down that could lead to prolonged exposure to the cold.
- **Workers with circulatory problems** must take special precautions to protect themselves against cold stress.

HSE Worldwide

EXPOSURE LIMITS FOR WORKING IN THE COLD

Schedule for Outside Workers based on a Four-Hour Shift*

Air Temperature (°C) Sunny Sky	No Noticeable Wind		8 km/h Wind		16 km/h Wind		24 km/h Wind		32 km/h Wind	
	Max. Work Period (minutes)	No. of Breaks	Max. Work Period (minutes)	No. of Breaks	Max. Work Period (minutes)	No. of Breaks	Max. Work Period (minutes)	No. of Breaks	Max. Work Period (minutes)	No. of Breaks
-26 to -28	Norm breaks	1	Norm breaks	1	75	2	55	3	40	4
-29 to -31	Norm breaks	1	75	2	55	3	40	4	30	5
-32 to -34	75	2	55	3	40	4	30	5		
-35 to -37	55	3	40	4	30	5				
-38 to -39	40	4	30	5						
-40 to -42	30	5								
-43 and below	Non-emergency work should cease									

- The recommended exposure times are based on the wind chill factor, a scale based on air temperature and wind speed.
- The work-break schedule applies to any four-hour period with moderate or heavy activity. Light activity shall be treated as the immediate lower cell of the table (light work generates less body heat and will get colder sooner).
- The warm-up break periods are of 10 minute duration in a warm location. The schedule assumes that "normal breaks" are taken once every two hours.
- At the end of a 4-hour period, an extended break (e.g. lunch break) in a warm location is recommended.

HEALTH AND SAFETY STANDARD