



# GUIDELINES: HSE-GUL-009-01-AA-EN

## VOLTALIA HSE MINIMUM REQUIREMENTS

### FUNCTIONS INVOLVED BY THE PROCEDURE:

ALL BUSINESS DIVISIONS

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## SUMMARY

These standards define the minimum level of HSE to be complied with in all operations on Construction, Operations, Offices and Maintenance services conducted by or on behalf of Voltage, in absence of more stringent local regulations. If local regulations conflicts with Voltage's HSE Standards, always follow local regulations.

## REVISION HISTORY

VERSION	DATE	AUTHOR	COMMENTS
<b>01</b>	15.08.2021	Eduardo Nigro	First emission

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## 1. AIM AND SCOPE OF APPLICATION

### 1.1. AIM OF THE DOCUMENT

This document aims at defining the minimum standard of Health, Safety and Environmental to be applied in all activities of Votalia, in order to mitigate risks to persons, property and the environment.

As a general principle, all work activities undertaken by or on behalf of Votalia must be covered by task based HSE Risks and Environmental Impacts Analyses, prepared by competent persons and considering all hazards and aspects likely to occur during the execution of the activity. This Directive identifies the main sources of hazards in the activities of Votalia and sets minimum requirements for mitigating their associated risks.

### 1.2. SCOPE OF APPLICATION OF THE STANDARDS

The minimum HSE standards shall be applicable to all stakeholders in all activities performed by or on behalf of Votalia, whenever Votalia, its personnel, sub-contractors, customers, property or activities are exposed to the concerned risk or impact.

As such, its requirements must be applied by:

- Votalia in all of its Projects, Installations, Operations, Warehouse and Maintenance, and;
- Contractors of any tier in all operations they undertake on behalf of Votalia;

This Directive shall form part of any contract with contractors, concerning the products and services they deliver to Votalia and shall be agreed by all parties prior to the signing of any binding contract.

This directive describes the minimum requirements to be applied to all locations. However, where any part of this document conflicts with, or sets a lower standard than local applicable HSE regulation, then the **local regulation shall apply. If this requirement is more stringent than local regulations, but not conflicts with local regulations, Votalia Minimum Requirement must be applied.**

## 2. LIST OF ABBREVIATIONS, TERMS AND DEFINITIONS

### 2.1. ABBREVIATIONS

Abbreviation	Definition
<b>AED</b>	Automatic External Defibrillator
<b>ATEX Zone</b>	<p>Explosive atmospheres contain a flammable mixture of substances in the form of gases, vapors, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.</p> <p>Mixture of substances can include: Oxygen (O<sub>2</sub>), Hydrogen (H<sub>2</sub>), flammable substances (acetone, methane, gasoline vapors, etc.), metallic particle dust (aluminum, titanium, etc.), organic particle dust (powder coating, coal, sawdust, etc)</p> <p>Sources of ignition can include: naked flame, hot temperature, static and non-static electrical sparks or arc, etc.</p> <p>Flammable / explosive (zone 0, 1, 20 and 21 – European &amp; IEC classification, Class I Division 1 and Class II Division 1 – North American classification)</p>
<b>CMR</b>	Substances that are identified as carcinogenic, mutagenic or toxic for reproduction.
<b>CSA</b>	Confirmed Severe Accident, which resulted in hospitalization, lost days of work and eventual permanent bodily harm or disability.
<b>HSE</b>	Health, Safety & Environment
<b>EMF</b>	Electro-magnetic Fields
<b>EN</b>	EN Standards (European Standards)
<b>GFCI</b>	Ground-Fault Circuit Interruptor
<b>GHS</b>	“Globally Harmonized System of labelling of chemicals”. System of classification of hazardous substances issued by the United Nations and regulated by Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures.
<b>HV</b>	High-voltage, i.e. voltage equal or greater than 50000 V AC or DC
<b>HRO</b>	High-Risk Operations - Operational activities presenting high risks due to their nature.
<b>ICNIRP</b>	International Commission on Non-Ionizing Radiation Protection
<b>IR</b>	Infra-red light
<b>LEL</b>	Lower Explosive Limit of the substance (i.e. minimum concentration of the substance in the air, at normal atmospheric conditions, where the substance under the form of gas, vapour, mist or dust can catch fire).
<b>LOTO</b>	Lockout / Tagout - Placement of a locking device and a tag on an energy-isolating device, in accordance with an established procedure, ensuring that the energy-isolating device and the equipment being controlled cannot be operated until the locking device is removed.

<b>LTI</b>	Lost Time Injury - Any work-related injury or illness as a result of which a person is prevented from carrying out work for a period of at least one full day (24h), excluding the day of the injury
<b>LV</b>	Low-voltage, i.e. voltage less than 1000 V AC or DC
<b>MEWP</b>	Mobile Elevated Working Platform
<b>MSDS</b>	Material Safety Datasheet
<b>MV</b>	Medium-voltage, i.e. voltage equal or greater than 1000 V AC or DC and less than 50000 V AC or DC
<b>OEL</b>	Occupational Exposure Limits
<b>OSHA</b>	Occupational Safety & Health Administration from the United States of America
<b>OVHL</b>	Over-Head Line
<b>PAC</b>	Preliminary Acceptance Certificate
<b>PCB</b>	Polychlorinated Biphenyls
<b>PPE</b>	Personal Protective Equipment
<b>PSA</b>	Potentially Severe Accident - An HSE incident or near miss which, under different circumstances, could have reasonably resulted in a major or severe event.
<b>PTW</b>	Permit to Work
<b>RAMS</b>	Risk Assessment / Method Statement
<b>RCD</b>	Residual Current Device
<b>SHSEM</b>	Site HSE Manager
<b>SIM</b>	Site Manager
<b>UEL</b>	Upper Explosive Limit of the substance (i.e. maximum concentration of the substance in the air, at normal atmospheric conditions, where the substance under the form of gas, vapour, mist or dust can catch fire).
<b>UV</b>	Ultra-violet light
<b>W@H</b>	Work at height - Work in any place, including a place at or below ground level and roofs, where a person could fall a distance liable to cause personal injury. Access and egress to a place of work can also be work at height. It does not include stairways or slips or trips on the same level.
<b>WEL</b>	Workplace Exposure Limits

## 2.2. DEFINITIONS

In the remainder of the document, terms that receive a capital letter are defined in the following table:



Term	Definition
<b>Banksman</b>	A competent person, helping drivers of vehicles to maneuver safely, and warning other vehicles and pedestrians of the maneuver.
<b>Competency</b>	A combination of sufficient experience, skills, trainings or qualifications required to safely perform a specific task
<b>Confined Space</b>	<p>Confined space - A space or structure, above or below ground, that is an enclosed or partially enclosed space, large enough that employees can full bodily or partly (head, torso) enter and perform work, with the following characteristics:</p> <ul style="list-style-type: none"> <li>- limited openings for entry and exit; and</li> <li>- restricted natural ventilation with an atmosphere that may be hazardous; and</li> <li>- a design not made for continuous occupancy.</li> </ul>
<b>Construction vehicles</b>	Any wheel or track-mounted plant used for the execution of the construction or commissioning activities. This includes but not limited to vehicles such as bulldozers, front loaders, backhoes/excavators, dumpers, compactors, cranes (except tower cranes), mobile elevating work platforms, forklifts or telehandlers and any other mobile plant even if not self-propelled (e.g. Generators, compressors, lighting towers...)
<b>Contractor</b>	<p>A contractor is a non-Voltalia company who, under a contract, all levels of subcontract or purchase order, is engaged by Voltalia to provide services on Voltalia´s premises or, under Voltalia management, on a customer or third-party sites</p> <p>In this document the term ‘contractor’ will be used for company directly contracted by Voltalia and ‘subcontractor’ any company contracted further by a Voltalia contractor (including all subcontracting levels)</p>
<b>COSHH</b>	Control of Substances Hazardous to Health – is a set of regulations put in place to protect workers from ill health when working with specific substances and materials
<b>Deviation</b>	<p>Departure from a rule that is known, applicable and understood.</p> <p>Non-compliance with an applicable HSE requirement.</p>
<b>Dry-bulb temperature</b>	The dry-bulb temperature (DBT) is the temperature of air measured by a thermometer freely exposed to the air but shielded from radiation and moisture. DBT is the temperature that is usually thought of as air temperature, and it is the true thermodynamic temperature. A dry bulb temperature does not indicate the amount of moisture in the air.
<b>HSE Incident</b>	Any unplanned or undesired “occurrence” that causes (or has the potential to – near-miss) death, injury/illness, property damage, impact on the environment or impact on the Voltalia´s image/reputation.
<b>HSE requirement</b>	Requirement relating to HSE or the management of HSE set out in the legislation, codes of practices, site HSE Plan, client specifications and any other applicable HSE document

<b>Electrical Works</b>	Any work on a live low-voltage system, any work in the Vicinity Zone of a live medium- or high-voltage system, and any other work involving the risk of electrical shock or electrical burns.
<b>Excavation</b>	Any non-permanent man-made cut, cavity, trench or depression in the soil surface that is formed by soil removal and at least 50 cm deep. This excludes any permanent designed depressions such as concrete lined pit, unlined lagoons or unlined stormwater drains.
<b>Fall-arrest lanyard</b>	A double-lanyard attached to a full-body harness on one end and on 2 dedicated anchor points on the other end, and that catches its user in case of a fall, effectively preventing the user to crash on a below level. It may be fitted with a shock-absorbing device.
<b>Fall-restraint lanyard</b>	A lanyard attached to a full-body harness on one end and on a dedicated anchor point on the other end, which is of a short length and prevents its user from falling.
<b>Good-Catch</b>	Also defined as a HSE Non-conformity. Is the recognition of a condition or situation that had the potential to cause an incident but did not cause one due to corrective action and/or timely intervention.
<b>Hard-barrier</b>	<p>A barrier made of means that cannot be moved or torn apart by a single person, e.g.:</p> <ul style="list-style-type: none"> <li>- Guardrails as defined in 10.30;</li> <li>- Sheet piles extending to a sufficient height to prevent access;</li> <li>- Temporary fences with concrete footing;</li> <li>- Concrete blockades (“Jersey barriers”);</li> <li>- Crowd control barriers;</li> <li>- Water barriers (adequately filled with water or sand).</li> </ul> <p>Note: warning tape and chains are not considered as adequate Hard-barriers and shall never be used as a protection mean.</p>
<b>Hazardous atmosphere</b>	<p>Confined Spaces, deep excavations and other areas with poor natural ventilation, where it has been identified that the atmosphere is or may be:</p> <ul style="list-style-type: none"> <li>- Deficient in oxygen (less than 19.5% in volume), or;</li> <li>- Enriched in oxygen (more than 23.5% in volume), or;</li> <li>- Contaminated by flammable gases, vapors, fumes or mists at levels equal to or greater than 10% of the Lower Explosive Limit of the concerned substance, or;</li> <li>- Contaminated by corrosive, harmful or toxic gases, vapors, fumes or mists at levels equal to or greater than their occupational exposure limit, accepted threshold limit value or dose (whichever is the lowest), or;</li> <li>- Flammable / explosive (zone 0, 1, 20 and 21 – European &amp; IEC classification, Class I Division 1 and Class II Division 1 – North American classification), or;</li> <li>- A combination thereof.</li> </ul>
<b>Heat Index</b>	Combination of the Dry-bulb temperature and humidity levels, that helps to identify the levels of exposure to heat.

<p><b>High-Risk Activities</b></p>	<p>Operational activity involving the following types of works:</p> <ul style="list-style-type: none"> <li>- Works on systems handed over to Commissioning</li> <li>- Works for which Lock-Out / Tag-Out (LOTO) must be performed</li> <li>- Works on live equipment or in their vicinity zone</li> <li>- Works in the live working zone of electrical equipment</li> <li>- Excavation works</li> <li>- Works at height</li> <li>- Working on or near floor openings</li> <li>- Working on roofing</li> <li>- Erection, modification and dismantling of scaffolds</li> <li>- Works in potentially hazardous atmospheres (including but not limited to oxygen-enriched, oxygen-deprived, flammable or explosive, toxic atmospheres)</li> <li>- Works in Confined Space</li> <li>- Lifting operations</li> <li>- Hot works</li> <li>- Works requiring the handling or use of hazardous substances</li> <li>- Pressure testing with pressurized fluids or gases</li> <li>- Works near, above or under water</li> <li>- Works involving a risk of interference with moving vehicles</li> <li>- Lone working</li> <li>- Works with exposure to radiations (ionizing or non-ionizing)</li> <li>- Installing, servicing and operating machines</li> <li>- Activities involving the transport, handling or use of explosive charges</li> <li>- Civil works</li> <li>- Over Head-Line works</li> <li>- Working in extreme temperatures</li> </ul>
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<b>Hot works</b>	<p>Hot work is any work that involves burning, welding, using fire- or spark-producing tools, or that produces a source of ignition.</p> <p>This includes but is not limited to: welding, gas cutting, grinding, tar boiling.</p> <p>Note: the production of a source of ignition depends on the ignition temperature of the flammable material exposed to it.</p> <p><u>Example 1</u>: the electrical motor of a non-sparking portable power tool such as a drilling machine is Generally not an ignition source in a normal atmosphere, but may become one in an explosive atmosphere.</p> <p><u>Example 2</u>: heating elements for pre- and post-weld heat treatment are intrinsically not ignition sources, however the heat they radiate or the heat conducted by metal can become an ignition source for wooden pipe supports, or other flammable material.</p>
<b>Individual fall-prevention</b>	<p>System relying upon a person wearing a full-body harness, attached with a Fall-restraint lanyard to an anchor point. The short size of the lanyard and its low elasticity effectively prevent the user to fall.</p>
<b>Individual fall-protection</b>	<p>System relying upon a person wearing a full-body harness, attached with two Fall-arrest lanyards to anchor points. The size of the lanyard and the fact that it is often equipped with a shock absorber will catch the user during the fall, therefore reducing its severity.</p>
<b>m, s, kg, N, etc.</b>	<p>All units used in this document are the base or derived units of the International Standard of Units, with the exception of the decibel (dB).</p>
<b>Machine</b>	<p>General term used to define any equipment with machinery components, excluding portable powered tools.</p>
<b>Machinery</b>	<p>An assembly fitted with or intended to be fitted with a drive system other than directly applied human or animal effort, consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application (it includes but is not limited to: pumps, motors, shafts, ...).</p>
<b>Operational site</b>	<p>All sites excepting office buildings.</p>
<b>Portable power tool</b>	<p>Work equipment or tool that is not stationary and that can be operated by one person, and that is actuated by a power source other than manual labor.</p>
<b>Primary safeguarding</b>	<p>Primary safeguards are:</p> <ul style="list-style-type: none"> <li>- Guards that provide a physical barrier in order to prevent access to dangerous parts of machines;</li> <li>- Devices that detect the intrusion into dangerous zones or contact of persons with dangerous parts of machine and stop the machine from operating (e.g. light curtain, interlock).</li> </ul>
<b>Project-Site</b>	<p>A location where Voltalia undertakes the installation, and/or construction, and/or commissioning, and/or technical advisory thereof for a final customer.</p>

<b>Quarantine (of equipment)</b>	The operation that consists at removing a defective or otherwise unsafe item of equipment from the workplace, so it cannot be used inadvertently.
<b>Remote Areas</b>	Is a location that is at a considerable time and distance from help. It can also present some challenging conditions. Getting to and from this area and the work activities need to be done there will have a significant impact on the planning and the resources needed to complete tasks safely.
<b>Secondary safeguarding</b>	<p>Secondary safeguards are:</p> <ul style="list-style-type: none"> <li>- Emergency shut-down systems, automatically operated (i.e. set-off upon detection of an incident) or manually operated (that require a voluntary operation to be set-off) and that effectively stop the machine from operating;</li> <li>- Devices which do not automatically stop the machine from operating, but which reduce the likelihood of persons entering dangerous areas or making contact with dangerous parts (e.g. warning signals, perimeter fencing).</li> </ul>
<b>(electrical) Shunting / short-circuit / bypass</b>	Creating a short connection between 2 parts of a circuit, 2 pieces of equipment, etc. in order to ensure the 2 parts have the same electrical potential and that there can be no electrical discharge between them. In the context of HSE, this technique is used to prevent electrical sparks or arcs between 2 pieces of equipment, should they become charged differently.
<b>“So far as is reasonably practicable” and other equivalent terms</b>	All means must be employed to comply with the concerned requirement. If this is not possible, it shall be justified in writing.
<b>Voltage levels</b>	<p>In absence of Country regulations that define voltage levels:</p> <ul style="list-style-type: none"> <li>• Extra Low Voltage : &lt;50 V AC or &lt; 100V DC</li> <li>• Low Voltage : &lt;1000 V AC or &lt; 1500V DC</li> <li>• High Voltage : &gt;1000 V AC or &gt; 1500V DC</li> </ul>
<b>Work at Height</b>	<p>Work in any place, including at or below ground level, where without suitable control measures, a person or object could fall a distance liable to cause injury to themselves or persons underneath, or damage to property underneath.</p> <p>This specifically excludes stairways and works on a level ground.</p>

### 3. RESPONSIBILITIES

**Business Line Leaders** are directly responsible for the activities undertaken on site must ensure that this Directive and its requirements are communicated to all stakeholders, and that it is complied with at all times.

**Project Engineers** are responsible to design products / systems that comply with the requirements set by this Directive.

**HSE Team** – setting the health, safety and environment standards, policies and procedures according with the local legislation and the company policies and minimum requirements, involving all the stakeholders. Implement and supervise a master plan based on the risk analysis of all the activities and workforce.

**Contractors are responsible** to comply with the requirements set by this Directive whenever undertaking activities for or on behalf of Voltaia.

**Deviations** to any requirement set forth by this Directive shall be justified in writing, and formally approved by BL Leader and HSE Director. Approval may be escalated, and not delegated.

### 4. CONSEQUENCES OF NON-COMPLIANCE

A breach of environmental, health and safety **legislation** is usually considered a criminal offence in all the countries.

Failure to meet legal standards might lead to:

- Formal enforcement action: an enforcement agency might force an employer either to make an improvement within the workplace within a given time period, or to stop carrying out high risk activities altogether until improvements are made. Failure to comply with formal enforcement action is usually considered to be an offence in itself.
- Prosecution of the organisation in the criminal courts: successful prosecution might result in punishment in the form of a fine.
- Prosecution of individuals, such as directors, managers and workers: successful prosecution might result in punishment in the form of a fine and/or imprisonment.

As well as the criminal law consequences there is also the matter of compensation for workers and others injured by a workplace accident. Depending on the region/country concerned, this might involve the worker:

- Taking legal action against their employer through the civil legal system, and having to prove that their employer had been negligent and was therefore to blame for their injury.
- Claiming compensation from national or regional compensation schemes, with no requirement to prove negligence or blame through the use of the legal system.

Failure to meet the **Voltaia HSE minimum requirements**, even if they are not legal standards might lead to:

- Record of the fact along with the definition of immediate correction/corrective actions;
- Removal from the site or facility;
- Warning message, verbal or written, communicated to the Human Resources / Procurement Dep.;
- Investigation procedure initiated, in case of involvement in an confirmed or potential severe incident;
- Performance evaluation reflecting the negative impact on the HSE related objectives;
- Application of fines or deduction of monetary compensations according to a pre-existent agreement;

- Disciplinary measures or even termination of the contract in case of recurrent or severe breaches. Volitalia can use the Zero Tolerance Policy, 3SYO (3 Strikes you are out) and/or process according to local regulation.

## 5. COMMUNICATION AND COOPERATION

A Communication plan must be put in place whenever a project with more than two employers is prepared, providing guidelines for the interaction between all the intervenient and the support for the traceability of the official communications. Minutes of the Meetings system must be implemented.

Safety meetings planification must be part of the normal activity plan, following the internal procedures, involving all the employees and companies of each project or site and generating the correspondent evidences – Minutes of Meetings and Action Plans.

Cooperation – Any person or Contractor who believes that the work they will carry out may put themselves or others involved in the project at risk have a duty to contact the Site Management to discuss their works and put into force the measures that are necessary to reduce the risk as far as is reasonably practical.

Consultation of the workers or their representatives – will be prepared a regular consultation system with workers in good time on matters connected with the project which may affect health, safety and welfare. It will provide any information reasonably requested in relation to the planning and management of the project only.

It is actively encouraged during induction training, through site walk around the installation and others H&S meetings, that the Health and Safety is not a hidden subject. Any issue or suggestion relating to health, safety and welfare can be discussed with the site management openly and in confidentiality.

Communication of Good-catches and Incidents – all the HSE related Good-Catches and Incidents must be communicated promptly on the provided platform or available forms.

The Health and Safety or Environmental Accidents must be communicated immediately, following the Communication Plan of the project.

## 6. LEGAL DOCUMENTS AND COMPETENCES VALIDATION

Implement and maintain a list of the up to date local legislation applied to the activities to be performed.

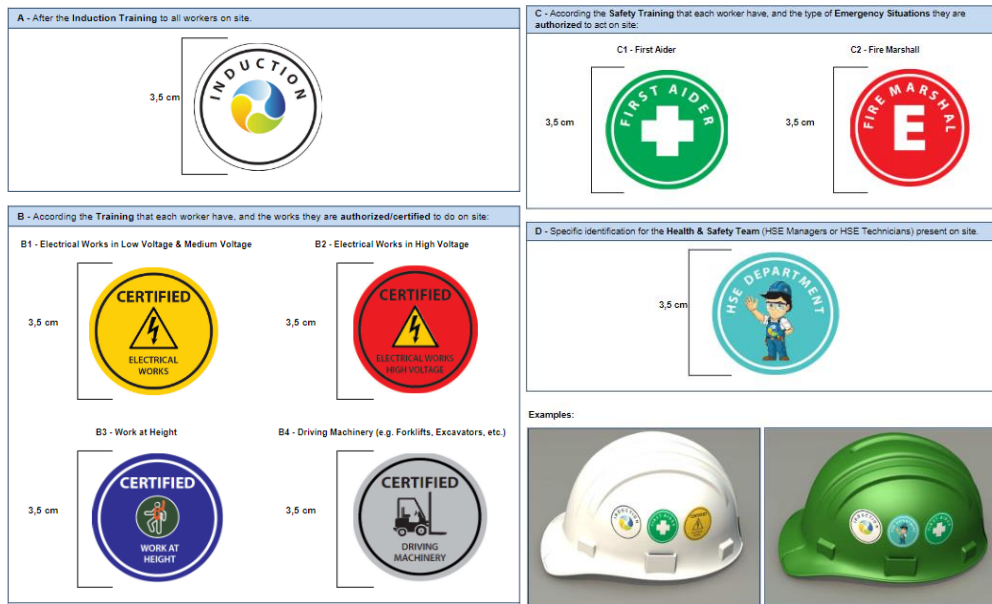
Inform all the involved parties, obtaining the evidences of their acknowledgement;

Implementation of measures that allow the traceability of the documents and the validation of the competences of the workforce.

Before any worker admittance on the worksite, its competences must be validated and a mandatory attendance of an Induction training.

Implement a method to easily verify on site the specific competences of the workforce, as for instance the stickers on the helmet.





- FIGURE 1: IDENTIFICATION STICKERS FOR INDUCTION AND TRAINING.

## 7. GENERAL REQUIREMENTS FOR SITE, LOCATIONS AND OPERATIONS

### 7.1. ACCESS TO AND FROM THE WORKPLACE

- 7.1.1 Voltalia will implement necessary site access control process and means according to the requirements identified in the contract and those requirements will be described in the HSE Master plan from each location.
- 7.1.2 Personnel access: Any person accessing the site shall be duly authorized to do so, either through the induction process for site employees or sponsoring for visitors and deliveries.
- 7.1.3 Construction vehicles : In order for construction vehicles to gain site access, contractors shall submit to Voltalia operational manager in charge a completed site vehicle access request form at least 24h prior to the expected date of entry. The form shall be accompanied by all current certificates and inspection records. Upon access acceptance, the construction vehicle shall be parked when arriving at site in a dedicated area for further joint inspection by the HSE or nominee and a competent contractor representative. If during the inspection defects are noted a further inspection will be required following rectification of the defects. In such circumstance's vehicle entry will only be provided once defects are rectified to the satisfaction of the HSE.
- 7.1.4 Remote areas :Working or traveling in remote areas should be properly planned and should always be ensured:
  - appropriate communication channels.
  - appropriate contingency measures in case of rescue need or emergency
  - survival equipment adapted to the specific situations.

### 7.2. VISITORS

- 7.2.1 At no times are visitors permitted to engage in any Site Work Activities.
- 7.2.2 All visitors shall successfully complete Voltalia visitor HSE induction before entry to the Site. This allow visitor to go to anywhere in the site which is not isolated or barricaded due safety risks. Visitor and all workers must always respect safety measures and boundaries



- 7.2.3 Visitors shall be accompanied at all times while on the Site by a responsible person who shall ensure that they wear and use the mandatory PPE and comply with all HSE and security rules at all times.
- 7.2.4 Internal Visitors – Votalia Staff visitors can access specific work areas or the entire site, according with their internal accreditation and competences. Nevertheless, they need to comply with all the site HSE instructions, have proven competences or seniority on the field fo activity and attend previously at the least to one HSE Induction training. The recognized internal Senior or Specialist other than HSE Managers, as Construction Managers, O&M Managers or other Managers, who are involved in site activities or active visits, should use the following identification badge or stiker:



FIGURE 2: IDENTIFICATION STICKER FOR RECOGNIZED INTERNAL SENIOR OR SPECIALIST.

### 7.3. PERSONAL PROTECTIVE EQUIPMENT (PPE) – STANDARD PPE ON ALL SITES

The following PPE is mandatory at all times for all personnel and visitors, and shall be provided by each employer to their employees, free of charge.

- 7.3.1 **Safety helmet** – in accordance with EN 397:2012 or equivalent must be worn at all Project sites (except in completed office and control rooms and PV sites under operations). For work at height the helmet shall be fitted with a chin-strap.
- 7.3.2 **Safety footwear** - S3 code in accordance with ISO 20345:2011 or equivalent must be worn.
- 7.3.3 **Protective work clothing** – Legs, arms and body shall be covered by protective clothing adapted to the type of work and the work environment:
- Long trousers and long sleeves that protect against the risk of abrasion, cuts, contact burns and sun burns shall be used on Project sites (high-visibility vests with long sleeves may be used, as long as they are made of a solid material providing sufficient protection), and;
  - The fabric used for work clothing shall be unblended cotton, so far as is reasonably practicable.
- 7.3.4 **Eye protection** – all personnel on Project Sites and operations (except in office and control rooms) shall wear eye protection, and as a minimum:
- Safety spectacles offering an eye and side protection against impact in accordance with EN 166:2001 or equivalent must be worn at all times;
  - Corrective glasses must comply with the requirements of safety spectacles (EN 166:2001 equivalent) and must offer side protection against impact, or must be otherwise protected with over-spectacles that comply with the requirements of safety spectacles.
- 7.3.5 **High visibility jacket or vest** – of class 2 according to ISO 20471:2013, or equivalent:
- Must be worn by all pedestrians on Project sites (except in completed office and control rooms), and;
  - Must be worn by all personnel working on the field.
  - This vest is not allowed to be used during Electrical Works due the fact it is not fire resistant. In case of Electrical Works, see item (10.7)

- 7.3.6 **Safety gloves** - safety gloves adapted to the task being performed must be worn to protect hands against injury. Working without gloves is only permitted where no risk to the hands exists or where the work cannot be safely performed while wearing gloves.

#### 7.4. PERSONAL PROTECTIVE EQUIPMENT – SPECIALIZED AND ADDITIONAL PPE

- 7.4.1 Additional PPE may be required based on the analysis of HSE risks and impacts (Risk Assessment).

#### 7.5. SITE INFRASTRUCTURE

- 7.5.1 Permanent and temporary electrical installations (including distribution boards) must be inspected by competent person before put into service for the first time, and every year thereafter. Also for any intervention or modification a competent person must be appointed.
- 7.5.2 Permanent and temporary electrical installations (including distribution boards) must be grounded, in accordance with applicable legislation and building codes.
- 7.5.3 Permanent and temporary electrical installations (including distribution boards) must be protected by Ground Fault Circuit Interrupters (GFCI, also referred to as Residual Current Devices – RCD) that must be installed on distribution boards, Generators and transformers whenever the output voltage is equal or greater than 240 volts. GFCIs shall be rated for a sensitivity of 30 mA (for protection against electrical shock), with a maximum break-time of 0.3 seconds for this value of residual current.
- 7.5.4 Distribution boards, electrical cabinets and panels shall have means of electrical isolation located on the outside of the equipment, so far as is reasonably practicable. They must be protected by fuses or circuit breakers and a GFCI, must be earthed and must have lockable doors that remain locked at all times and may only be unlocked by authorized persons. Non-authorized persons shall only have access to plugs or switches placed outside of the cabinet/board.
- 7.5.5 When there is a significant probability of lightning strikes on site, the site must be equipped with a lightning / thunder detector, which shall trigger an alarm requiring all site personnel to take shelter whenever there are lightning strikes 5 km or less away.

#### 7.6. LIGHTING OF THE WORKPLACE

- 7.6.1 All workplaces (i.e. excluding access ways and vehicle routes) must be sufficiently light, in such a way that lighting levels are equal to or greater than 50 lux at any point of the workplace. If natural lights does not meet this condition, artificial lights must be in place.
- 7.6.2 Areas where persons may be present and where there is no or low natural light (i.e. where the lighting levels may be lower than 50 lux) must be provided by an appropriate and operational emergency lighting that indicates safe evacuation ways.

#### 7.7. WELFARE – DRINKING WATER

- 7.7.1 The employer shall be responsible for providing fresh drinking water for its personnel in the immediate vicinity of the working areas to avoid any risk of dehydration, as far as reasonably practicable.
- 7.7.2 The minimum quantity of fresh drinking water supplied by the employer to its personnel shall be 1.5 liters per person per day.

- 7.7.3 The employer shall ensure that the water supply at its sanitary facilities such as toilets, showers, hand basins, dishwashing amenities, etc., is maintained to the General standard of potable water.
- 7.7.4 The employer shall inform its personnel that any water on the Site not specifically identified as drinkable shall be considered as not drinkable.
- 7.7.5 Sources of non-potable water must be clearly identified as such.
- 7.7.6 Employer should provide ways to drink water but no single use plastic such as plastic cups.

**7.8. WELFARE – SANITARY CONVENIENCE**

- 7.8.1 Clean and tidy facilities. To help achieve this, walls and floors should preferably be tiled (or covered in suitable waterproof material) to make them easier to clean.
- 7.8.2 Placed with easily accessible locations.
- 7.8.3 With adequate ventilation and lighting.
- 7.8.4 Separate male and female toilets, but if this is not possible, as a minimum, rooms with lockable doors are required.
- 7.8.5 A supply of toilet paper and, for female employees, a means of disposing of sanitary dressings.
- 7.8.6 With cold and hot running water, whenever possible.
- 7.8.7 Enough soap or other washing agents.
- 7.8.8 A basin large enough to wash hands and forearms if necessary.
- 7.8.9 Paper towels or a hot air dryer.
- 7.8.10 Showers where necessary in case in case there are particularly dirty work.

Minimum number of toilets and washbasins for <b>mixed use (or women only)</b>		
Number of people at work	Number of toilets	Number of washbasins
1-5	1	1
6-22	2	2
26-50	3	3
51-75	4	4
76-100	5	5

*Example - Tables from: "HSE regulations - 1992 – UK"*

*(to be adapted according the legislation of each country)*

Minimum number of toilets and washbasins <b>used by men only</b>		
Number of people at work	Number of toilets	Number of washbasins
1-15	1	1
16-30	2	1
31-45	2	2
46-60	3	2
61-75	3	3
76-90	4	3
90-100	4	4

- 7.8.11 If the employees are working at temporary worksites, flushing toilets and running water must be provided. Portable cabins converted into toilet facilities are available from hire companies. If the

staff work in remote workplaces without suitable plumbing and a water supply, chemical toilets and washing facilities, such as water containers, must be provided.

7.8.12 Use of public toilets and washing facilities should be a last resort and not used just because they are the cheaper option. This would not be acceptable where the provision of better facilities would be reasonably practicable.

## **7.9. WELFARE – REST FACILITIES AND MEAL BREAKS AREAS**

7.9.1 Adequately heated/cooled rest facilities with the appropriate number of seats and tables are required, if it is reasonably practicable, along with a method for heating drinks and warming food. Where necessary, they should include suitable facilities for woman at work who are pregnant or a nursing mother to rest lying down.

7.9.2 For meal breaks there should be a suitable seating area for workers to use during breaks. It needs to be clean and located where food will not get contaminated.

7.9.3 There should be washing facilities nearby, and a means of heating food or water for hot drinks. Good hygiene standards must be maintained.

7.9.4 If meal not provided by the company, facilities must have refrigerator to preserve the food and sink to clean the dishes.

## **7.10. WELFARE – OTHER SERVICES**

### **7.10.1 Meeting rooms:**

Minimum requirements:

- HSE Policy and other adequate corporate information should be displayed and correctly maintained.
- The desks and workspace in general should be kept organized, clean and tidy.
- There should be adequate ambient lighting, heating installed and climatization system.
- All trailing cables should be kept tidy and managed, avoiding that electrical cables passing on the pathways and overloaded electric outlets.
- Fire Exits will be kept clear.
- No materials (or deliveries) will be stored, or rubbish allowed to accumulate.
- Provided adequate information and access to fire-fighting equipment and first-aid kits.

### **7.10.2 Changing Rooms and Lockers:**

If employees are required to change into specialist clothing (overalls, a uniform, thermal clothing etc), separate male and female changing facilities are required with seating and secure areas for storing personal clothing and protective clothing. In addition, facilities for drying wet clothing are required.

Minimum requirements:

- Enough changing rooms for the number of people expected to use them.
- Separate use of changing facilities should be available to men and women.
- Be readily accessible.

- Contain, or lead directly to, clothing storage and washing facilities.
- Provide seating.
- Provide a means for hanging clothes. A hook or peg may be sufficient.
- Ensure the privacy of the user.
- Enough Lighting, heating and/ or climatization

Try to prevent employees' own clothing coming into contact with work-soiled clothing or getting dirty or wet. Provide separate storage for clean and contaminated clothing which:

- Allows wet clothing to be hung up to dry out during the course of the day
- Is well ventilated.

### 7.10.3 **Washing facilities:**

Minimum requirements:

- Clean and tidy washing facilities with sufficient ventilation and lighting are required next to both toilets and changing areas.
- Cold and hot running water.
- Soap or other cleaning agents.
- Towels or another method for drying hands.
- Showers may be required depending on the nature of the works.
- Ideally, separate male and female facilities should be provided but if this is not possible, as a minimum, rooms with lockable doors are required.
- Lighting, heating and/or Climatization

## 7.11. **SMOKING**

- 7.11.1 Smoking is only authorized in designated areas, located outdoors and not within 6 meters of an entrance, window, or air intakes of a building.
- 7.11.2 Designated smoking areas must be fitted with a fire extinguisher of the appropriate type, and with ashtrays and waste bins of sufficient capacity and cleaned regularly.
- 7.11.3 Designated smoking areas must be sheltered against wind and rain.
- 7.11.4 "No smoking" signs, in line with the local regulation and written in English and the relevant languages so that they can be understood by the workforce must be clearly posted at all entrances of buildings and in the welfare areas.

## 7.12. **HOUSEKEEPING**

- 7.12.1 Each organization is responsible for the housekeeping in its work areas, which includes work zones, lay-down and storage areas, site facilities and office areas.
- 7.12.2 Safe, clean, dry, unencumbered access to and from the work areas shall be ensured at all times.
- 7.12.3 All areas (including offices and rest areas) shall be safe, clean, dry, tidy and well organized and provide protection for the environment.
- 7.12.4 Whenever wet processes are used as part of normal working operations or during cleaning operations, appropriate drainage must be in place with associated platforms, mats or other dry

places for persons to stand, so far as is reasonably practicable. When this is not reasonably practicable, signs must be implemented at all access points to the wet area, which should clearly highlight the hazard of wet and slippery surface in appropriate languages so to be understood by all concerned personnel.

- 7.12.5 Access to emergency equipment and emergency exits must never be blocked or otherwise disturbed, restricted or delayed.
- 7.12.6 Sufficient numbers of suitable bins and/or containers shall be provided for the separation, recycling, treatment and disposal of waste.
- 7.12.7 Waste, rubbish, packing material and surplus building material shall not be allowed to accumulate and shall be systematically removed from the work area and disposed of appropriately. It is forbidden to burn waste. Only authorized and specialized companies can provide this service.
- 7.12.8 Material laydown and storage areas shall be well organized, clearly and permanently identified and shall not create supplementary hazards to persons.
- 7.12.9 All hazardous materials shall be stored, handled, used and disposed of in accordance with the site specific HSE Master Plan/ Site HSE Plan;
- 7.12.10 At the completion of works and before demobilization, all work areas shall be left clean and free of any waste, rubbish or surplus building materials.
- 7.12.11 Particular care must be given to workplaces at height, where exists a risk of falling objects. These areas must be kept free of any loose material resting on the floor that could fall down and injure persons or damage property.
- 7.12.12 Outdoor walkways, workplaces and vehicle routes must be kept clear of the accumulation of snow and ice that could cause any hazard to pedestrians or vehicles, so far as is reasonably practicable.
- 7.12.13 Electrical cables/cords, compressed gas and hydraulic hoses shall not be laid over roads or walkways. If not reasonably practicable, they shall be protected against damage by a sustainable mean above or below ground or safely suspended at height.

### **7.13. INTERFERENCE WITH MOVING VEHICLES AND PEDESTRIANS**

- 7.13.1 The circulation of vehicles and pedestrians must be segregated by establishing restricted areas, one way routes where possible, pedestrian crossing zones and designated parking areas.
- 7.13.2 The appropriate measures must be implemented in order to prevent collision between pedestrians and vehicles at pedestrian crossings. This may include, but shall not be limited to:
  - Mirrors;
  - Lighting;
  - Speed bumps before the crossing point.
- 7.13.3 Vehicle and pedestrian ways shall be physically separated with Hard-barriers, so far as is reasonably practicable, and be indicated with signs.
- 7.13.4 When it is not reasonably practical to implement a physical segregation, pedestrians must maintain safety distance of at least 2 meters from moving/operating vehicles at all times.
- 7.13.5 Traffic rules must be made visible through signage and traffic stops, consistent with those used on public roads of the concerned country.

- 7.13.6 All pedestrians on Project sites must wear high-visibility garments.
- 7.13.7 Pedestrians (including banksmen) must wear high-visibility garments in all areas where trucks and other vehicles (forklifts, cranes, etc.) manoeuvre. These areas must be clearly signalled / marked (floor painting, Hard-barriers, signs, etc.).
- 7.13.8 Competent banksmen must be used for operations involving reversing or manoeuvring where space or view is restricted.
- 7.13.9 Drivers must only operate vehicles they are competent to drive and have a valid license.
- 7.13.10 Drivers must follow the established traffic routes and comply with all site rules.
- 7.13.11 The maximum driving speed on Site is 20 Km (12 miles/h) unless justified otherwise.
- 7.13.12 Carrying of passengers on vehicles not designed for this purpose, or exceeding the rated capacity is forbidden.
- 7.13.13 Drivers and passengers must not get on or off moving vehicles.
- 7.13.14 When driving a forklift, forks must be lowered, the mast tilted back.
- 7.13.15 Smoking, eating, drinking, using a mobile phone or using earbuds or headphones when driving a vehicle is strictly prohibited.
- 7.13.16 When hitching or unhitching a trailer, safety procedures must be defined and fulfilled to ensure there is a clear form of communication between operators and hitchers.
- 7.13.17 When the vehicle is not in use, it must be ensured that:
  - The engine is stopped and prevented from unauthorized use (e.g.: starter key removed), brake applied (and with wheels chocked for heavy vehicles);
  - All raised parts are lowered to the ground or put in a safe position (cranes);
  - It does not obstruct emergency exits, other routes, fire equipment or electricity panels.
  - Parking in reverse, always heading the exit.
- 7.13.18 It is strictly forbidden to use 2 or 3-wheeled motorized vehicles on any Votalia´ site or on behalf of Votalia.

#### 7.14. CIVIL WORKS (INCLUDING REINFORCEMENT, FALSEWORK, FORMWORK)

- 7.14.1 Protruding reinforcement bars must be protected against impalement with appropriate caps (see **Error! Reference source not found.**) or any equivalent secured mean, whenever such a risk exists.





FIGURE 3: PROTRUDING REINFORCEMENT STEEL WITH PROTECTIVE ENDCAPS.

- 7.14.2 Personnel shall not walk on reinforcement bars or structures made thereof. If access is to be provided to persons onto the reinforcement bar structure, then boards or other appropriate rigid material must be used in order to spread the load of the persons on a wide area of the structure, and to prevent persons to fall and be trapped or injured between bars.
- 7.14.3 When lifting bundles of reinforcement steel, the bundles must be tied together securely to prevent slipping. In addition, the appropriate rigging method must be used so to allow for a sufficient angle between the sling legs.
- 7.14.4 Falsework and formwork shall only be used within their designed load bearing capacity.
- 7.14.5 All measures must be taken to prevent persons to walk in fresh concrete, so far as is reasonably practicable. This may include the erection of safe working platforms. If this is not reasonably practicable, suitable PPE shall be used in order to protect individuals to be exposed to fresh concrete.
- 7.14.6 Indiscriminate dumping of fresh concrete shall be strictly forbidden and be properly disposed.
- 7.14.7 The installation of washing facilities for concrete trucks shall be considered and designed in a way that the waste water is treated before release
- 7.14.8 When hoses are attached to concrete buckets being lifted or concrete pumps, it must be ensured that they are completely empty of concrete before being lifted, as concrete may pack-up in the hose and suddenly fall.
- 7.14.9 Temporary structure used to support formworks & slabs during civil works should be:
- stable with sufficient lateral resistance in all directions (jacks are braced )
  - all jacks are precisely centered under battens
  - all jacks used are vertically aligned
- 7.14.10 Never stand directly below a temporary structure when concrete is being poured
- 7.14.11 Formwork, shoring work, braces and any other support must not be removed until it has been determined through an approved method that the concrete has gained sufficient strength to support its own weight and all superimposed loads.



## 7.15. HOUSING STANDARDS

Following the ILO - International Labour Organisation Standards: “Housing Recommendation n° 115”, the accommodation selection will be performed taking into consideration the following points:

TABLE 2: HOUSING STANDARDS - ILO.

Housing standards	
Accommodation design	<ul style="list-style-type: none"> <li>• separate bed for each worker;</li> <li>• adequate headroom, providing full and free movement, of not less than 203 centimeters;</li> <li>• the minimum inside dimensions of a sleeping space should be at least 198 centimeters by 80 centimeters;</li> <li>• beds should not be arranged in tiers of more than two;</li> <li>• separate accommodation of the sexes;</li> <li>• adequate natural light during the daytime and adequate artificial light;</li> <li>• adequate ventilation to ensure sufficient movement of air in all conditions of weather and climate;</li> <li>• heating where appropriate;</li> <li>• adequate supply of safe potable water;</li> <li>• adequate sanitary facilities (see below);</li> <li>• adequate drainage;</li> <li>• adequate furniture for each worker to secure his or her belongings,</li> <li>• common dining rooms, canteens or mess rooms, located away from the sleeping areas;</li> <li>• appropriately situated and furnished laundry facilities;</li> <li>• Rooms should indicate the permitted number of occupants.</li> </ul>
Sanitation facilities	<ul style="list-style-type: none"> <li>• a minimum of one toilet, one wash basin and one tub or shower for every six persons</li> <li>• hot and cold fresh running water</li> <li>• separate sanitary facilities provided for men and for women</li> <li>• Sanitary facilities should have ventilation to the open air, independently of any other part of the accommodation</li> <li>• Soap and hygienic paper should be adequately stocked.</li> </ul>
Health and Safety	<ul style="list-style-type: none"> <li>• Accommodations should be kept free of rats, mice, insects and vermin</li> <li>• In areas where mosquitoes are prevalent, workers should be provided netting</li> </ul>

### Housing standards

- Fire safety measures should be taken, including installing and maintaining fire equipment (alarms, extinguishers, etc.)
- Radiators and other heating apparatus should be placed so as to avoid risk of fire and shielded where necessary to prevent discomfort to occupants.
- Safety exits should be clearly marked. Adequate means of escape should be provided and properly maintained

## 8. EMERGENCY PREPAREDNESS PLAN AND REQUIREMENTS

### 8.1. FIRE PREVENTION AND PROTECTION

- 8.1.1 All flammable material (paper, wood, gasoline, etc.) must be kept at a minimum distance of 2 meters from sources of heat. Specific rules apply for the storage of hazardous substances and for the execution of hot works .
- 8.1.2 Suitable firefighting equipment adapted to the specific fire risk must be available at work areas, and must be maintained in accordance with the applicable regulations.
- 8.1.3 Personnel must receive appropriate information about fire risks and must be adequately trained in the response to fire emergencies (as a minimum: raising the alarm and theoretical use of extinguishers).
- 8.1.4 “Hands-on” training for the use of first-response fire-fighting equipment must be delivered to at least 25% of the workforce of each company working on the site, including 100% of all storekeepers and persons undertaking or supervising hot works.
- 8.1.5 Only an absolute minimum of flammable material shall be kept at the workplace.
- 8.1.6 Flammable material or products shall be replaced with non-flammable material or products, so far as is reasonably practicable.
- 8.1.7 Any flammable material must be removed as soon as practicable after it is no longer required.

### 8.2. EMERGENCY DUE TO A WORK ACCIDENT

- 8.2.1 A specific Communication plan for each Office or Site must be prepared, implemented, distributed and updated, to be used promptly in case of accident;
- 8.2.2 Emergency numbers must be always available and visible, displayed in the places of frequent passage for most people;
- 8.2.3 Assistance flowchart, describing graphically what to do in case of accident;
- 8.2.4 Protection of the perimeter of any accident is mandatory;
- 8.2.5 Reporting and investigation of an accident should be started as soon as possible, after the emergency procedures, collecting evidences, witnesses contacts and other useful information.

### 8.3. EMERGENCY PREPAREDNESS

- 8.3.1 Signs must be clearly posted above emergency equipment, to indicate their position.
- 8.3.2 Full and unrestricted access to emergency exits, fire-fighting equipment, first-aid equipment, other emergency equipment, emergency alarms and emergency response vehicles must be maintained at all times.
- 8.3.3 Emergency exit doors must open in the direction of the escape route.
- 8.3.4 Emergency exit doors may be fitted with panic-bars so far as is reasonably practicable. If it is practically possible, emergency exit doors must be unlocked all times.
- 8.3.5 Construction sites must have a predetermined main muster point, and an auxiliary muster point, in place and indicated on the project site plan.
- 8.3.6 A Fire Risk Assessment for the Construction site, laydown areas and Welfare facilities must be completed
- 8.3.7 Emergency drills must be carried out to test the efficiency of the emergency arrangements and evacuation procedure at regular intervals.
- 8.3.8 Emergency preparedness plan/ procedure needs to be communicated to authority at least for information but recommended to be approved and agreed emergency drills.
- 8.3.9 Where locations do not have mobile or fixe network, it is necessary to provide Satellite phone or radio communications.

### 8.4. FIRST-AID ARRANGEMENTS

The provision and maintenance of a Site first-aid facility does not relieve the employer from its obligation to provide adequate first-aid provisions in the workplace, as follows:

- 8.4.1 Personnel, procedures and equipment for first-aid must be based on the consideration of all site operations, shift patterns and hazardous processes (e.g. specific treatments to be kept on site for immediate response, such as calcium gluconate and calcium chloride in case of burns with hydrofluoric acid).
- 8.4.2 Each employer shall provide a minimum of one first-aider for up to 20 employees, and then one for every 20, or part thereof, employees thereafter.
- 8.4.3 First-aiders shall hold an accredited first-aid certification equivalent to St. John's Ambulance, Red Cross or other nationally recognized workplace first-aid organization.
- 8.4.4 Each employer shall maintain a list of its first-aiders and medical personnel, including but not limited to their names and certifications.
- 8.4.5 All Site first-aiders and medical personnel shall be provided, by their respective employer, with a special identification form that allows for persons to identify them promptly in case of a medical emergency, e.g. green helmets, label on the helmet/high visibility vest, or as otherwise specified by Voltalia.
- 8.4.6 Workplace first-aid kits must contain, as a minimum:
  - 1 guidance leaflet providing brief first-aid guidelines;
  - 1 list of the contents of the workplace first-aid kits, allowing for the verification that the workplace first-aid kit is complete;

- A set of sterile dressings comprising of:
  - o 4 sterile dressings of medium size (conforming bandage, min. 7.5 cm width and min. 2 m stretched length, with an absorbent of not less than 12 cm x 12 cm);
  - o 1 sterile dressing of large size (conforming bandage, min. 10 cm width and min. 2 m stretched length, with an absorbent of not less than 18 cm x 18 cm);
  - o 2 eye pad sterile dressings (conforming bandage min. 5 cm width and min. 1.5 m stretched length or elasticated looped bandage, with an oval pad of no less than 7 cm x 5 cm);
  - o 40 sterile adhesive dressings, water resistant, individually wrapped (min. surface area of 7.5 cm<sup>2</sup>, dressing pad not less than 20% of the surface area);
  - o 2 finger sterile dressings (conforming bandage, min. 3.5 cm width and min. 30 cm stretched length, with a dressing pad of min. 3.5 cm<sup>2</sup>);
- A set of non-sterile dressings comprising of:
  - o 2 triangular bandages (non-woven material or cotton, min. 20 grams per square meter, not less than 90 cm x 90 cm x 127 cm);
  - o 1 conforming bandage (min. 7.5 cm width and 4 m stretched length);
- 1 water-based gel-soaked burn dressing, sterile, that does not dry out within one hour of application (min. 100 cm<sup>2</sup> surface area);
- 20 alcohol free moist cleansing wipes, individually wrapped, sterile (min. 80 cm<sup>2</sup>);
- 6 safety pins (min length of 2.5 cm);
- 1 roll of adhesive tape, individually wrapped (min. 2.5 cm width, 5 m length);
- 6 pairs of medical disposable gloves, large size, conforming with EN 455-1 and EN 455-2 or equivalent;
- 1 resuscitation mask (with a one-way valve), see **Error! Reference source not found.**;
- 1 foil blanket (min. 130 cm x 210 cm);
- 1 pair of shears that is suitable for cutting clothing, including leather;
- 1 pair of tweezers.

8.4.7 Workplace first-aid kits and eye wash supplies shall be available in proximity to all work areas.

8.4.8 An Automatic External Defibrillator must be available at all operational sites, and one additional unit must be available at locations where Electrical Works are performed. They must be located in a way that competent personnel may be able to use them within 5 minutes after a person has started to show symptoms of ventricular tachycardia or fibrillation.

## 8.5. MEDICAL SERVICES

8.5.1 Suitable medical services must be provided for all employees and sub-contractors on each site. So far as is reasonably practicable, the most suitable ambulance and/or medical facilities should be sourced from competent external organizations, at a location that allows for a quick and complete response to the most severe medical emergencies (response time less than 30 minutes). If this is not reasonably practicable, Voltalia or contractor must provide medical facilities.

8.5.2 When medical facilities are provided by Voltalia or contractor, they must be easily accessible and consist of the following:

- 1 lockable treatment room;
- 1 medical bed for treatment;
- 1 stretcher;
- Washing facilities, including a shower;
- Sanitary facilities;
- Adequate collection means for waste that is potentially contaminated with biological pathogens;
- Appropriate Personal Protective Equipment for the first aid and medical personnel to protect themselves from contamination with biological pathogens (e.g. latex gloves, masks, etc.);
- 1 lockable cupboard for storing medical supplies;
- An appropriate supply of medical instruments and medicine, that must include, at least, a defibrillator, gauze, splints, burn kits;
- A desk with lockable facilities (drawers, cupboard) for storing records;

- A computer with a network connection;
  - A phone.
- 8.5.3 When medical facilities are provided by Votalia or contractor, they must be manned by at least a competent medical practitioner (as a minimum, by a competent industrial nurse), during normal working hours.
- 8.5.4 The training of first-aid personnel and medical personnel must include a description of the risks of not being immunized or protected against bloodborne pathogens, measures to prevent contamination with biological pathogens and adequate means to collect waste that may be contaminated with biological pathogens.
- 8.5.5 All employees who are at risk for exposure to bloodborne pathogens shall be offered hepatitis B vaccination (HBV) prior to beginning their assignment and every year thereafter, if they decline the offer.

## 9. ENVIRONMENT

### 9.1 WASTE – IDENTIFICATION

The following requirements are applicable to all parties working for or on behalf of Votalia and must be strictly implemented. It includes waste Generated by sub-contractors.

- 9.1.1 All types of wastes Generated at the site must be identified, in line with local regulations.
- 9.1.2 As a minimum, the following waste types must be segregated on site:
- Bio-hazardous waste, i.e. waste which is contaminated with pathogens borne in human body fluids and parts pests and remnants, etc.;
  - Hazardous waste, i.e. any waste containing or contaminated with hazardous substances. This can include chemical substances residues, containers, contaminated tools (clothes, brushes ...);
  - General waste, i.e. waste that does not pose an immediate hazard or threat to health or to the environment, and includes domestic waste, building, demolition waste, business waste and inert waste;
  - Scrap metal, which must be separated between non-ferrous and ferrous;
  - If appropriate and dedicated collection, transportation and treatment methods exist, segregation can be extended to cardboard, paper, wood, metal, organic, etc.
- 9.1.3 Waste identification shall include, in addition to all applicable legal requirements, requirements for transportation, storage and waste storage areas.

### 9.2 WASTE - STORAGE

- 9.2.1 All waste must be stored on identified areas, located outdoors, at least 10 meters away from building and perimeter fencing.
- 9.2.2 Waste storage facilities must be secured against rummage and arson, fitted with side screens / walls and roofs, and concrete floors. Concrete floors in waste storage areas must be impervious, appropriately bunded to prevent any environmental impact.
- 9.2.3 All sites must avoid single use plastic such as bottles and packages wherever it is possible.
- 9.2.4 No hazardous waste shall be stored on bare ground. All hazardous waste must be stored in an area provided with secondary containment.
- 9.2.5 Potentially contaminated ground or water should be considered and treated as hazardous waste. This may include water or ground in secondary containment.
- 9.2.6 Appropriate spill response kits shall be kept at hazardous waste storage areas (spill kits, bunds).
- 9.2.7 All waste storage areas must clearly identify the type of waste to be stored within the area.
- 9.2.8 All waste storage areas shall be kept clean and tidy.

### 9.3 ELECTRICITY CONSUMPTION

- 9.3.1 The site must be equipped with at least one electrical meter in order to monitor its overall electrical consumption.
- 9.3.2 Where reasonably practicable, movement detectors must be considered for lighting of walkways or non-permanently occupied areas.
- 9.3.3 Office buildings must be verified at the end of the normal working day to ensure lights are turned off wherever possible.
- 9.3.4 Energy efficient lighting and equipment must be used, so far as is reasonably practicable.

### 9.4 WATER CONSUMPTION

- 9.4.1 The source of water must be identified, and its use authorized if it comes from any place other than the public water supply system.
- 9.4.2 The quantity of water must be always quantified for its type of use: human or industrial.

### 9.5 ASBESTOS

- 9.5.1 No purchases shall be made for any equipment or materials containing asbestos of any kind.
- 9.5.2 If the presence of asbestos-containing material is suspected, then the following actions should be taken whilst observing local legislation:
  - 9.5.3 Vacate and cordon-off the area.
  - 9.5.4 Request inspection and tests to be conducted by an organization specifically qualified for such, in order to confirm and quantify the presence of asbestos.
  - 9.5.5 Where it has been determined by a specialist organization that asbestos is present on site, then a plan to prevent exposure of persons to asbestos fibers must be designed by the specialist organization and formally accepted by the Valtalia HSE Leader
  - 9.5.6 Where the decision is taken to leave the asbestos-containing material, appropriate means must be employed to prevent any deterioration of it.
  - 9.5.7 Where the decision is taken to remove the asbestos-containing material only a qualified asbestos contractor must do this.

### 9.6 DANGEROUS GOODS SHIPPING

- 9.6.1 Shipping of dangerous goods must be done in strict compliance with the applicable legislation, including for signaling the vehicles.
- 9.6.2 If there is no legal prescription for the signaling of vehicles transporting hazardous goods, the rules established in the most relevant of the following international regulations shall apply:
  - International UN ADR Treaty (transport by road), or;
  - IMO International Maritime Dangerous Goods Code (transport by sea or navigable water ways), or;
  - IATA Dangerous Goods Regulations (transport by plane), or;
  - IOICR/OTIF Regulations concerning the International Carriage of Dangerous Goods by Rail (transport by rail).
- 9.6.3 Operators of vehicles used to ship dangerous goods must be competent and authorized drivers. In addition, they must be competent for the transport of dangerous goods, and qualified / licensed where required.
- 9.6.4 Copies of the Material Safety Datasheet (MSDS) of the dangerous goods being shipped must be available inside the vehicle.
- 9.6.5 Appropriate emergency arrangements and equipment must be in place in line with the requirements from the MSDS, and as a minimum for road vehicles:

- Instructions in writing for drivers and first-responders (sometimes referred to as “Transport Emergency Cards”) must be displayed on the vehicle, and copies must be available with the shipment’s documentation.
- 1-wheel chock of a size suited to the maximum mass of the vehicle (when loaded) and to the diameter of the wheel;
- 2 self-standing warning signs.
- Eye-rinsing liquid for all classes of material except explosives and gases.
- High-visibility garment, eye protection and gloves for each member of the vehicle crew.
- 1 flashlight for each member of the vehicle crew.
- An emergency escape mask for each member of the vehicle crew whenever substances identified as toxic are transported.
- A shovel, a drain seal and a collecting container for flammable (except those that may be liable to spontaneous combustion), corrosive and harmful for the environment solids and liquids.
- 1 or more fire extinguishers of the appropriate type, to tackle small fires not directly related to the hazardous substances being transported (e.g. brakes, batteries, motor compound).

## 9.7 PLASTIC ERADICATION

- 9.7.1 Voltalia works toward the eradication of Plastic in our Operations and Constructions. For this reason, Voltalia promotes the reduction and elimination of plastic from its supply chain and do not allow the usage of single-use plastics
- 9.7.2 Site and operations must have visual signs about this matter

## 10. HIGH RISK ACTIVITIES REQUIREMENTS

10.01 Before any task related to High Risks activities, a specific PTW (Permit to Work) must be filled, checked and approved by supervision and/ or HSE team.

10.02 In situations where there is a lone worker, risk assessment and measures need to be in place to mitigate the risk , see item (10.43).

10.03 Where activities are being performed in couple, the most experienced worker needs to fill the PTW and the other needs to check, after both must sign in.

10.04 None of the high risk activities are allowed to be performed under extreme circumstance of natural conditions that may impact the task increasing the risk of the activity. Those conditions include the following but not limited to :

- Storms
- Lightning
- High Speed Wind
- Earthquake
- Inundation
- Avalanche

### 10.1. AQUATIC WORKS: WORKING OVER, ON, OR NEAR WATER.

10.1.1 Whenever the site activities and/or personnel are exposed to risks associated with tidal movement, a site survey must be conducted, that must address tidal movement, climate / seasonal changes, riverbed structure and other Geomorphological and hydrological aspects. Work scheduling and the Task-based HSE Risks and Impacts Analyses must be adapted to the results of this survey.



- 10.1.2 All work platforms next to or over water must be protected with guardrails to prevent persons and material falling into the water or work level below
- 10.1.3 Access ramps must be:
- At least 450mm wide;
  - Not sloped more than 1 in 3 (20 degrees);
  - Where slope exceeds 1 in 8 (6 degrees), have grips or anti-slippery coating installed at regular interval to avoid slipping.
- 10.1.4 When used for working (not for transport), rafts and other vessels are considered work platforms. As such, they must be fitted with guardrails, life jackets and appropriate rescue measures must be prepared. The positioning and securing of vessels used as work platforms shall be supervised and undertaken by competent personnel.
- 10.1.5 No work at height activities can take place on floating platforms.
- 10.1.6 Floating platforms must have their maximum safe load and maximum number of occupants clearly displayed and this load must never be exceeded.
- 10.1.7 Working on floating platforms must be subject to a high control PTW.
- 10.1.8 Warning signs must be implemented to warn ships of work activities undertaken on water. These signs must be installed up- and downstream of the work location, at a sufficient distance and in accordance with the local legislation.
- 10.1.9 Consider the need for Safety Nets when structural design, loading access, worker mobility, or other factors make guardrails and fall arrest systems impracticable.
- 10.1.10 Lifejackets and Personal Floating Devices:
- 10.1.10.1 Workers must wear a lifejacket when working over or adjacent to water (i.e. within 3 meters of a water way), including when being on-board a ship or vessel of any sort, but excluding when using a bridge as a passageway.
- 10.1.10.2 As with any personal protective equipment, daily checks and regular inspections and maintenance must be carried out to ensure the equipment is in reliable working order.
- 10.1.10.3 Lifejackets must provide 150 N / 16 kg of buoyancy, suitable for unconscious persons, and as such must comply with the requirements of EN396, ISO 12402-3, or equivalent.
- 10.1.11 Lifebuoys:
- 10.1.11.1 Lifebuoys shall be available at all areas where persons are working over or near water.
- 10.1.11.2 Standard 760 mm diameter lifebuoys should be placed in conspicuous positions near the water edge.
- 10.1.11.3 Lifebuoys should be suspended from a hook or bracket with a line of 30 meters attached. They must be ready to be used by anyone (i.e. not locked).
- 10.1.11.4 Lifebuoys must be signaled clearly and visible from an appropriate distance, for instance by using signs posted at height indicating the lifebuoy's location.
- 10.1.11.5 Access to lifebuoys must be safe, unencumbered and well lit.
- 10.1.12 Rescue methods must be adapted to the foreseeable conditions and to the risks and impacts identified and shall be written and communicated to all workers when working over or near water. Additional considerations for emergency planning must include:
- Trained first aiders competent in approved cardiac pulmonary resuscitation method;
  - Audible alarms;
  - Sufficient lighting;



- Two way radio communications;
- High visibility clothing;
- Regular headcount of personnel;
- Periodic information about weather and tides;
- Training in the use of rescue equipment and techniques;
- Rescue lines and buoys;
- Rescue ships when relevant;
- AEDs and other rescue equipment that may be damaged by water shall be stored within sealed waterproof containers.

10.1.13 Whenever work equipment (fixed or mobile plant) may be damaged by contact with water, or when there is a risk of water being contaminated by hazardous substances being spilled or washed off, watertight barriers (e.g. sandbags) must be installed on the edge of the work platform.

**10.2. AREAS WITH POTENTIALLY EXPLOSIVE ATMOSPHERES (“ATEX ZONES”)**

10.2.1 The number, size and risk level of ATEX Zones must be reduced by design, so far as is reasonably practicable.

10.2.2 Voltalia shall provide advance notice to all site stakeholders that gas, fuel or other potentially explosive substances are to be introduced to a workplace. This will detail:

- The type and character of potentially explosive substances;
- The location of areas with potentially explosive atmosphere/s;
- The delimitations of such areas.

10.2.3 ATEX Zones shall be identified in line with the local legal requirements, indicated with suitable warning signs and their access shall be physically prevented. Signs shall include warnings about the nature of the area, and the main control measures (e.g. “no naked flames”).



FIGURE 1: EXAMPLES OF SIGNS THAT MARK AN ATEX ZONE

10.2.4 A map of all ATEX Zones, their risk level and physical boundaries must be maintained up-to-date at site and communicated regularly to all site stakeholders (including but not limited to: Voltalians, Sub-contractors, Customer, partners).

10.2.5 Works in ATEX Zones of any risk level must be avoided, so far as is reasonably practicable (for instance by planning the works to be performed in the ATEX zone during an outage, or whenever the system has been isolated and made inert). If it cannot be avoided, the following control measures must be implemented:

- Use of gas detectors and/or explosion meters, appropriately calibrated and set;
- Use of non-sparking, intrinsically safe, explosion-proof rated tools and equipment (including communication equipment);
- Prohibition of all sources of ignition such as lighters;
- Electrical shunting and grounding of all metallic stationary equipment,
- Use of thermal motor forbidden in the area (including vehicles);

- Use of anti-static PPE, conductive safety shoes associated with conductive and grounded mats;
  - Prohibition of removal of clothes;
  - Prohibition of use of any synthetic fabric.
- 10.2.6 The access to ATEX Zones must be restricted to specifically authorized personnel, and the implementation of all requirements.
- 10.2.7 Hot works within an ATEX Zone of any risk level, may only be conducted where the flammable / explosive substance has been fully removed and while the installation has been rendered inert, and this can be maintained throughout the works (for instance by implementing a Lockout / Tagout process), so far as is reasonably practicable. If this is not possible, the activity must be controlled by a high control Permit to Work (General Permit to Work when the works are performed within 10 meters of the boundaries of the ATEX Zone).
- 10.2.8 Enclosed or semi-enclosed grinding, wood-working or de-burring machines produce dusts that may Generate an explosive atmosphere. Such machines shall be fitted with dust extraction and collection systems, and these systems and their associated ducts must be fitted with explosion relief panels. These systems must be designed by competent persons and thoroughly inspected at least every 12 months by a competent and recognized 3rd party.
- 10.2.9 Any person working in a live ATEX area shall be equipped with flame-resistant clothes compliant with ISO 11612 or NFPA 2112.
- 10.2.10 All equipment that will be used in ATEX zone must be certified ATEX zones.

### **10.3. CONFINED SPACES – IDENTIFICATION, ACCESS PREVENTION AND WORK PLANNING**

- 10.3.1 So far as is reasonably practicable, the design, purchase, installation and construction of facilities, systems and equipment must consider the elimination of all Confined Spaces that could require entry at any moment of the life phase of the facility, system or equipment.
- 10.3.2 All Confined Spaces must be clearly sign posted at each entry point: “Confined Space, access forbidden to unauthorized personnel” or equivalent, in languages understandable by the entire workforce.
- 10.3.3 Physical means, preferably lockable, must be installed whenever the Confined Space is unattended, in order to prevent any unauthorized entry in Confined Spaces.
- 10.3.4 All Confined Spaces must be logged onto a register, that shall also include their exact location, number and location of the access points, specific hazards and whether they should be considered as permanent Confined Spaces or of their classification depends on the activities conducted. The register must be maintained up to date and readily available to all site personnel.

### **10.4. CONFINED SPACES – ENTRY REQUIREMENTS**

- 10.4.1 Entry into Confined Spaces may only be considered when all other alternative options (e.g. modify the Confined Space so that it no longer meets the definition of a Confined Space, perform the work from outside, remotely or not at all) have been considered and deemed as not reasonably practicable.
- 10.4.2 A competent operational supervisor shall be formally appointed to supervise each work activity where access to Confined Spaces is required.
- 10.4.3 A high control PTW (Permit to Work) must be established before entry and/or work within a Confined Space commences.
- 10.4.4 A dedicated attendant must be posted at each entry point

- 10.4.5 Only specifically competent persons may be authorized to enter and/or work in a Confined Space.
- 10.4.6 The attendant must use a Confined Space Entry-Exit Log (or equivalent) in order to identify the persons inside the Confined Space at any given time.
- 10.4.7 Entering and/or working in a Confined Space without an attendant are strictly forbidden.
- 10.4.8 The attendant must receive the adequate training, that must include, but shall not be limited to, their responsibilities associated with controlling access to and egress from the Confined Space, maintaining communication with those inside the Confined Space, and the appropriate behavior in case of emergency situations.
- 10.4.9 The attendant shall never enter the Confined Space, unless in emergency situations, if and only when he/she has been specifically trained and equipped to do so.
- 10.4.10 Adequate means of communication must be used, that shall enable easy and clear communication:
  - Between those inside the space.
  - Between those inside the space and those outside (attendants) to summon help in case of emergency.
- 10.4.11 Prior to any entry into the Confined Space, it must be physically isolated from any source of energy or material that could Generate a risk to entrants, with the application of an appropriate Lockout / Tagout procedure (see 10.12). Sources of risk include but are not limited to: ingress of hazardous substances, ingress of substances that could crush, constrict or engulf a person, heating / cooling sources, movement of machines.
- 10.4.12 The atmosphere in the Confined Space must be made safe, so far as reasonably practicable, in accordance with the requirements of the task-based HSE Risks and Impacts Analysis and of section 10.2, and it must be adequately monitored.
- 10.4.13 Where there is a risk of fire, appropriate fire extinguishers must be kept in the Confined Space and at the entry point.
- 10.4.14 Adequate lighting, that includes emergency lighting, must be provided.
- 10.4.15 Care must be taken that the lighting means are intrinsically safe, when used in flammable or explosive atmospheres (10.2)
- 10.4.16 Wherever it is expected that there may be large areas of contact between the conductive enclosure of the Confined Space and the entrants (e.g. inside metal tanks), suitable precautions to prevent electric shock must be taken, such as using pneumatic tools instead of electrical tools, task lighting of the lowest possible voltage (not greater than 24 V so far as is reasonably practicable) connected to residual current devices and/or ground-fault circuit interrupters.
- 10.4.17 Only the tools and equipment necessary for the task may be taken into a Confined Space.
- 10.4.18 The work area in a Confined Space must remain clean and tidy.
- 10.4.19 A safe, quick, unobstructed and ready means of access/egress/emergency shall be maintained throughout the works.
- 10.4.20 Entering and/or working in a Confined Space without all required controls in place are strictly forbidden. If any deviation to the agreed controls is observed or arises during the work, all works must stop, the Confined Space must be evacuated, and the Permit to Work suspended until further notice.
- 10.4.21 Prior to closing a Confined Space:
  - An inspection of the Confined Space is carried out to confirm that there are no persons inside;

- The person in charge of the works (Permit Holder) must ensure that all personnel, tools and equipment are removed from the Confined Space;
- All members of the Confined Space working party must be accounted for;
- The Permit Issuer for the works in the Confined Space must ensure that, when personnel are withdrawn, they are instructed not to re-enter the Confined Space;
- All physical means to prevent unauthorized entry must be put back in place.

## 10.5. CONFINED SPACES – EMERGENCY SITUATIONS

- 10.5.1 A task-specific rescue plan, based on a risk assessment, must be prepared for all works in Confined Spaces.
- 10.5.2 Retrieval systems or methods allowing to rescue entrants without actually entering the Confined Space must be used so far as is reasonably practicable, and so far as the retrieval equipment does not increase the overall risk of entry.
- 10.5.3 Whenever they are used, retrieval systems must meet the following requirements:
- Each entrant shall use a full body harness, with a retrieval line attached on one end at the centre of the entrant's back, and at the other end to a lifeline near shoulder level or at another point which the supervisor determines is appropriate for the successful removal of the entrant, and;
  - The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the Confined Space in such a manner that rescue can begin as soon as the attendant becomes aware that rescue is necessary, and;
  - A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 1.5 meters deep.
- 10.5.4 The required rescue equipment must be available at the Confined Space entry point prior to starting the works.
- 10.5.5 The existence, adequacy, availability and response times of emergency services, must be confirmed before starting the works. Where there is a risk of asphyxiation, the target response time for emergency response shall be less than 4 minutes.
- 10.5.6 Emergency arrangements must be periodically tested either by real-scenario simulations (where practical) or other means such as audits, inspections or desktop reviews. For large Confined Spaces or those Confined Spaces where works are planned to be executed during a significant duration (i.e. more than 1 shift), it is recommended that their emergency arrangements are tested before the first entry or as early as possible after the works have started.

## 10.6. DEMOLITION, RETROFIT, REFURBISHMENT AND WORKS ON “BROWNFIELDS”

- 10.6.1 Demolition works shall only be performed by competent organizations, specifically qualified to perform this scope of work.
- 10.6.2 For demolition works, the relevant HSE Risks and Impacts Analyses must consider, but not be limited to, the following hazards and aspects:
- Falling materials/objects;
  - Uncontrolled structure or ground collapse;
  - Live services or stored energy (electricity, gas, water, etc.);
  - Stored or unreleased energy/tension within a structure;
  - Cranes and demolition machinery;
  - Noise and vibration;
  - Public road traffic;
  - Generation of dust;
  - Exposure to hazardous materials, e.g. lead, dust, asbestos, respirable crystalline silica, PCB, formaldehyde;
  - Use of explosives

- 10.6.3 Before any demolition work, a competent person must perform a survey to determine the condition of the structure(s) and location of the existing utility networks. The competent person shall establish a demolition plan to determine the means of protection, isolation, removal and/or rerouting of utilities and the safe disassembly or demolition sequence, and any foreseeable emergency scenario and associated response procedure.
- 10.6.4 The demolition work shall be performed in accordance with the demolition plan.
- 10.6.5 The use of explosives for demolition activities shall be considered as a last resort, to be done only when there is no safer alternative.
- 10.6.6 For retrofit and refurbishment works and General works on industrial brownfields, the following hazards and aspects must be considered in any relevant HSE Risks and Impacts Analyses:
  - Hazardous materials, e.g. lead, dust, asbestos, respirable crystalline silica, PCB, formaldehyde.
  - Unexploded explosive ordnances.
  - Pre-existing contaminated soil or groundwater.
- 10.6.7 Wherever it is suspected that material or equipment contain or are contaminated with asbestos, lead, PCBs, formaldehyde or any other hazardous substance, a competent person, qualified as per the local regulation, shall verify this assumption.
- 10.6.8 Whenever reasonably practicable, quantitative analyses must be performed in order to determine the potential exposure levels of persons, and control measures must be implemented to reduce the actual exposure.
- 10.6.9 Removal, storage, transport and treatment of hazardous substances must be done in strict compliance with local regulation.

**10.7. ELECTRICAL SAFETY FOR MEDIUM AND HIGH-VOLTAGE SYSTEMS**

- 10.7.1 **IMPORTANT** : When VOLTALIA is providing, purchasing or designing High/Medium Voltage System, engineering, sourcing and procurement team must design the system with the interlocking devices, avoiding the cubicles and panels to be opened without the correct step to put it "Dead" meaning no energy. Reference for this system is the NFC 13100 in France.
- 10.7.2 Definition of Live Working Zone and Vicinity Zone for medium- and high-voltage systems

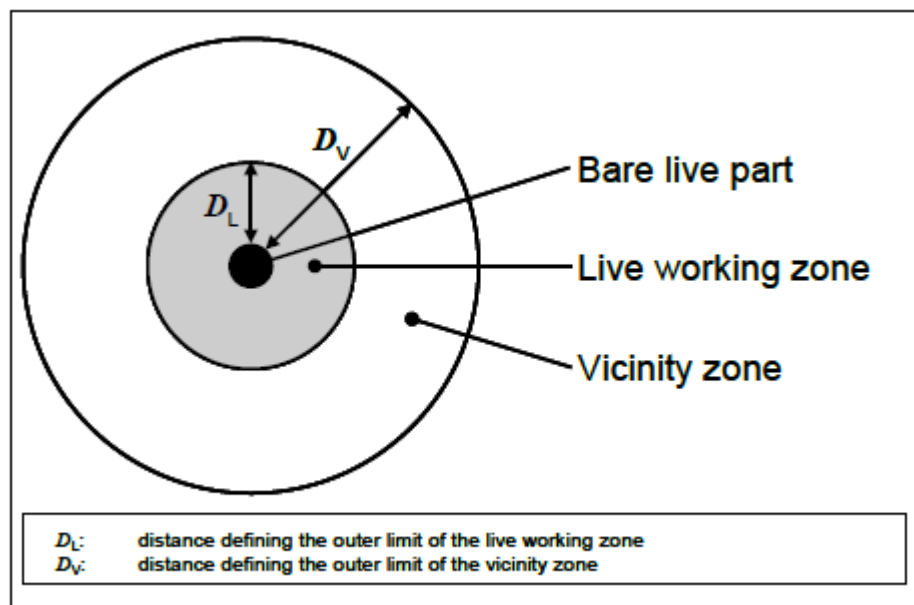


FIGURE 2: DISTANCE DEFINITIONS FOR LIVE MEDIUM- AND HIGH-VOLTAGE SYSTEMS REF. EN 50110-1

On the above diagram:

- The grey shaded area shall be considered as the Live Working Zone, **where no live works are allowed in any circumstances**,
- The Vicinity Zone area is, where any works undertaken within 10 metres (measured at ground level horizontally) from below a live high voltage conductor are considered to be Electrical Works, and must therefore be controlled.
- No individual may enter a live high voltage substation or approach closer than the vicinity distance of 10 metres measured horizontally to a live high voltage conductor unless they have been trained and have sufficient knowledge to avoid danger.

10.7.3 Individuals must not allow any part of their body or objects to approach within the boundary of DL, the specified Minimum Safety Distance(s), detailed in Tables 1 & 2, to exposed HV Conductor(s).

10.7.4 When Isolation has been established and exposed Conductor(s) could still be charged at High Voltage the only objects permitted to approach within the specified Safety Distance(s), within the isolated zone established, are approved:

- Voltage measuring/proving devices
- Earthing Device(s) and their associated application devices
- Discharge Lances

10.7.5 When an isolated zone has been established and danger has been excluded by the application of Earthing /grounding within the isolated zone, encroachment within the specified Safety Distance(s) in Tables 1 and 2, is permitted under an appropriate Safety Document.

Table 1 – AC Safety Distances

Nominal System Voltage		Safety
Up to and including	33kV	0.8m
Exceeding 33kV but not	66kV	1.0m
Exceeding 66kV but not	132kV	1.4m
Exceeding 132kV but not	275kV	2.4m
Exceeding 275kV but not	400kV	3.1m
Exceeding 400kV but not	550kV	4.4m
Exceeding 550kV but not	800kV	6.7m
Exceeding 800kV but not	1100k	8.6m

Table 2 – DC Safety Distances

Nominal System Voltage		Safety Distance 'X'
Up to and including	80kV	1.2m
Exceeding 80kV but not exceeding	150kV	1.8m
Exceeding 150kV but not exceeding	300kV	2.7m
Exceeding 300kV but not exceeding	450kV	3.7m
Exceeding 450kV but not exceeding	600kV	5.1m
Exceeding 600kV but not exceeding	800kV	7.1m



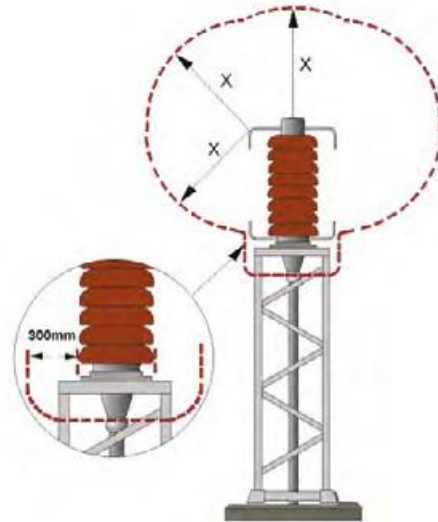


Figure 4.  $D_L$  Safety Distance 'x' (from live high voltage conductors)

10.7.6 A distance of 300mm Shall also be maintained from that part of the insulators supporting exposed unearthed High Voltage Conductors (see diagram above). Work within 300mm is classified as live working and is not allowed.

10.7.7 Where work is being carried out in the vicinity of live conductors using scaffolds or vertical working platforms an application factor must be added to the Safety Distance to ensure no part of a person's body or any object held by the person can infringe the Safety Distance 'X' surrounding the exposed HV Conductor(s) which will remain energized during the work activity. The application factors will be applied as follows:

- The minimum horizontal working clearance distance from any Live part shall be the sum of the relevant Safety Distance and the maximum horizontal reach of a person (taken to be 1.5m)
- The minimum vertical working clearance distance from any Live part Shall be the sum of the relevant Safety Distance and the maximum vertical reach of a person (taken to be 2.4m)

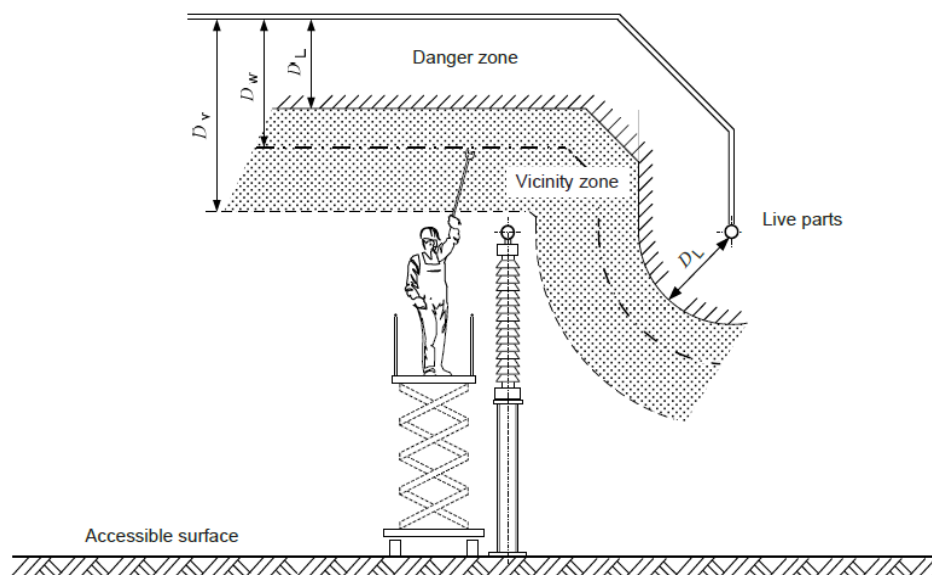


Figure 5. Minimum Working Clearances (Ref IEC 61936)

10.7.8 Tables 3 and 4 below specify the minimum Dw horizontal 'C' and vertical 'B' (see figure 6) Working and Access Clearances for scaffolds and vertical platforms and must also take into account the tools/equipment being used and the nature of the work being undertaken.

**Table 3 – AC Working Clearance distances**

VoltaGe	Safety Distance 'D <sub>L</sub> '	Horizontal Working Clearance safety distance D <sub>w</sub> = D <sub>L</sub> +1.5m	Vertical Working Clearance Safety Distance D <sub>w</sub> = 'DL'+2.4m
Up to 33kV	0.8m	2.3m	3.2m
66kV	1.0m	2.5m	3.4m
132kV	1.4m	2.9m	3.8m
275kV	2.4m	3.9m	4.8m
400kV	3.1m	4.6m	5.5m
550kV	4.4m	5.9m	6.8m
800kV	6.7m	8.2m	9.1m
1100kV	8.6m	10.1m	11m

**Table 4 – DC Working Clearance**

VoltaGe	Safety Distance 'D <sub>L</sub> '	Horizontal Working Clearance safety distance D <sub>w</sub> = D <sub>L</sub> +1.5m	Vertical Working Clearance Safety Distance D <sub>w</sub> = 'DL'+2.4m
Up to 80kV	1.2m	2.7m	3.6m
150kV	1.8m	3.3m	4.2m
300kV	2.7m	4.2m	5.1m
450kV	3.7m	5.2m	6.1m
600kV	5.1m	6.6m	7.5m
800kV	7.1m	8.6m	9.5m

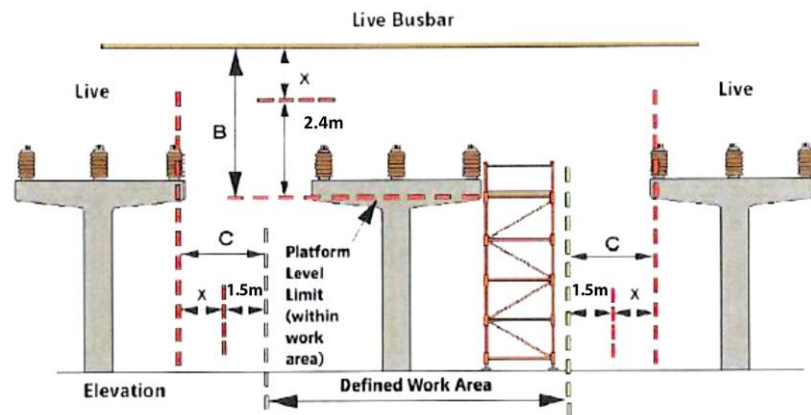


Figure 6. Working Access Clearance example.

10.7.9 Due to the risk of operator error or equipment malfunction when using a Mobile Elevated Work Platform (MEWP) in the vicinity to live conductors additional clearances Shall be applied to ensure neither the MEWP, any part of the operators body or any object held by the operator can infringe the Working Distance Clearances surrounding the exposed HV conductor(s) which will remain energized during the work activity.

- The minimum horizontal clearance (DV) from any Live part shall be the sum of the relevant Safety Distance and the maximum horizontal reach of a person (taken to be 1.5m) plus an additional 1m margin for voltages ≤110kV or a 2m margin for voltages > 110kV (Ref IEC 61936-1)
- The minimum vertical clearance (DV) from any Live part Shall be the sum of the relevant Safety Distance and the maximum vertical reach of a person (taken to be 2.4m) plus a 1m margin for voltages ≤110kV or a 2m margin for voltages > 110kV (Ref IEC 61936-1).

10.7.10 All works on High-voltage systems or in the Live Working Zone must be performed with the equipment isolated with Lockout/Tagout and the application of earthing/grounding. No works on live high-voltage systems or in their Live Working Zone are allowed.



- 10.7.11 Where practicable prior to applying earthing/grounding to isolated equipment, a verification of absence of voltage with suitable test equipment must be performed.
- 10.7.12 When performing works on isolated equipment, earthing/grounding must also be applied at the point of work.
- 10.7.13 The work area must be clearly defined with demarcation and where practicable it must be protected physically to prevent danger to individuals in the area from system hazards in proximity to the work area.
- 10.7.14 Only trained, competent and authorized persons can perform or supervise HV Electrical Works. Without such an authorization, no employee shall undertake HV Electrical Works.
- 10.7.15 Where there is a need to operate or work near energized electrical Equipment an initial risk assessment must be undertaken to identify the hazards associated with Arc Flash. Where the initial assessment indicates a potentially significant risk an Arc Flash study must be undertaken to quantify the incident energy. The result of the arc flash study will identify the Arc Flash Protection Boundary (this is the closest approach allowed before Personal Protective Equipment (PPE) must be worn). Inside the Arc Flash Protection Boundary, a worker must be wearing the appropriate PPE

## **10.8. ELECTRICAL SAFETY FOR LOW VOLTAGE SYSTEMS**

- 10.8.1 When performing LV Electrical Works, the following shall be implemented:
  - Isolation of all sources of supply to the circuit to be worked on with Lockout / Tagout,;
  - Protection against direct contact with adjacent live parts: Screening insulation, non-conductive and antistatic or suitably grounded enclosures / fencing / barriers, distance, use of non-conductive tools;
  - Protection against indirect contact (contact with conductive materials that are themselves accidentally in contact with live parts): earthing of conductive materials, installation of residual current devices and ground-fault circuit interrupters, use of very low voltage, double insulation, rubber mats;
  - Personal Protective Equipment.
- 10.8.2 As a minimum, the following specific PPE shall be considered:
  - Non-conductive clothes, gloves, glasses and shoes shall be worn when working on or near live parts. Gloves must be selected based on the work being done and level of risk;
- 10.8.3 It is strictly forbidden to use multimeters or Voltage sticks for performing a verification of absence of voltage.
- 10.8.4 Verification of absence of voltage must be undertaken with a two-pole voltage indicator which must be tested immediately before and after use with a voltage proving device.
- 10.8.5 Testing and commissioning, including functional testing, may be carried out with Low Voltage Equipment Live provided that approved insulated tools and instruments are used and work is carried out by authorized staff to an approved procedure
- 10.8.6 Live work may be carried out on Extra Low Voltage electrically powered Equipment, but where reasonably practicable the equipment shall be made Dead.
- 10.8.7 Conductive articles of jewelry shall not be worn when performing Electrical Works.
- 10.8.8 All electrical rooms, energized panels and electrical cabinets must be locked whenever they are unattended and tagged with the signs and warnings indicating the presence of danger.
- 10.8.9 If not reasonably practicable, a restricted area (physical delimitation supported by warning signs) shall be implemented around opened live equipment.

- 10.8.10 Barriers used for preventing access to live systems and made of conductive material must be earthed.
- 10.8.11 Where reasonably practicable an Automatic External Defibrillator must be available at locations where Electrical Works are being undertaken.
- 10.8.12 Where there is a needs to operate or work on/or near to energized electrical Equipment an initial risk assessment must be undertaken to identify the hazards associated with Arc Flash. Where the initial assessment indicates a potentially significant risk an Arc Flash study must be undertaken to quantify the incident energy. The result of the arc flash study will identify the Arc Flash Protection Boundary (this is the closest approach allowed before Personal Protective Equipment (PPE) must be worn). Inside the Arc Flash Protection Boundary, a worker must be wearing the appropriate PPE

#### 10.9. ELECTRICAL SAFETY – INDUCED VOLTAGE IN HV SUB-STATION

- 10.9.1 Particular care shall be taken when working on an isolated circuit in an electrical Substation which is in proximity to other live circuits, due to the risk of induced voltages on equipment even when not directly energized from the electrical system. A site-specific risk assessment must be undertaken to identify all potential Induced Voltage hazards. An Induced Voltage Earthing/grounding Schedule must be used to specify the Induced Voltage Earthing/grounding requirements for each stage of the work
- 10.9.2 In an Electrical Substation or test area, vehicles and mobile Equipment may also accumulate electrical charge from Live adjacent circuits. To avoid potential risk of electric shock, explosion and fire, Earths/grounds Shall be applied to all vehicles and mobile equipment.

#### 10.10. ELECTRICAL SAFETY – TRAPPED/CAPACITIVE CHARGE IN HV EQUIPMENT

- 10.10.1 Prior to undertaking invasive works the Authorized Person must ensure that trapped/capacitive charge is fully dissipated.
- 10.10.2 All HV Equipment, associated contacts and Conductors to be worked on must be Earthed to ensure adequate dissipation of trapped/capacitive charge on every part of the HV Equipment

#### 10.11. ELECTRICAL SAFETY – ELECTRICAL EQUIPMENT

- 10.11.1 Electrical equipment, including cords, plugs and sockets, must be visually inspected before use.
- 10.11.2 Sockets, power strips and extension cords used on Operational Sites (except in office and control rooms) shall be of industrial standards whenever such standards exist in the country of operation, and sized and rated in line with their foreseen use (see **Error! Reference source not found.**).



FIGURE 3: INDUSTRIAL STANDARD FOR CORDS, PLUGS AND SOCKETS

- 10.11.3 Electrical cords must always be fully extended (not wrapped around cable reels).
- 10.11.4 Live parts of electrical equipment must be protected from accidental contact.
- 10.11.5 All live electrical installations must be clearly marked as such.
- 10.11.6 Access to high-voltage installations must be physically prevented, at a distance from the live parts equal to or greater than the limit of the Vicinity Zone (see 10.7).
- 10.11.7 Electrical equipment that may Generate important heat (e.g. halogen lamps, electrical radiators) must only be used away from flammable material.
- 10.11.8 All electrical equipment must be grounded, either by connection to the grounded electrical infrastructure or by applying local earths.
- 10.11.9 Ground Fault Circuit Interrupters (GFCI, also referred to as Residual Current Devices – RCD) shall be installed at the power supply of distribution boards, Generators and transformers whenever the output voltage is equal or greater than 120 volts. GFCIs shall be rated for a sensitivity of 30 mA (for protection against electrical shock), with a maximum break-time of 0.3 seconds for this value of residual current.
- 10.11.10 GFCIs shall be tested to verify that they function normally by pressing the dedicated push-button, at least once per month. In addition, they shall be thoroughly tested by a competent person to verify that they effectively break the circuit within the required break-time when the residual current exceeds the designed rating.
- 10.11.11 Distribution boards, electrical cabinets and panels shall have the means of electrical isolation located on the outside of the cabinet, so far as is reasonably practicable. They must be protected by fuses or circuit breakers and a GFCI, must be earthed and must have lockable doors that remain locked at all times, and that may only be unlocked by authorized persons. Non-authorized persons shall only have access to plugs or switches placed outside of the cabinet/board.
- 10.11.12 GFCIs must be installed at the power supply of arc welding machines.
- 10.11.13 In potentially wet environments, any electrical equipment where water can come into contact with shall be placed above ground and be of an appropriate water protection degree (minimum IPx4 rating according to IEC 60529, or equivalent).
- 10.11.14 Electrical cords must be fitted with cable glands at each end, so that all conductors remain safely attached (see **Error! Reference source not found.**).



FIGURE 4: CABLE GLANDS

- 10.11.15 Electrical cables/cords shall not be laid over roads or walkways. If not reasonably practicable, they shall be protected against damage by a sustainable mean above or below ground or safely suspended at height.
- 10.11.16 Plugs shall not be removed from sockets or electrical equipment moved/handled by pulling the cable. Plugs/connections shall not be touched with wet hands.
- 10.11.17 Damaged electrical equipment must be removed from service and may only be repaired by a competent electrician.
- 10.11.18 Batteries and battery charging installations must be located in ventilated areas and provided with appropriate containment in case of leakage

## 10.12. LOTO (LOCK OUT / TAG OUT) FOR ISOLATION OF SOURCER OF ENERGY

LOTO is defined as a set of practices (Steps) that guarantee the isolation of any source of energy, such as electrical, mechanical, gravitational, pressure etc. Usually associated with electrical works these processes must be applied before any activity with related to energy sources.

### 10.12.1 LOTO - LOCKOUT / TAGOUT – THE EQUIPMENT

**A. General Requirements** - Equipment shall not be altered or modified. Equipment shall not be used if damaged or where determined that it longer meet the manufacturer's intent for hazardous energy control. Equipment shall only be used as it was designed.

**B. Locks** - Locks will be issued by the HSE department to the Qualified Person only. The Qualified Person shall maintain possession of their key. The key shall not be given to a supervisor or coworker for use or storage. Locks shall only be applied or removed by the Qualified Person in which they were assigned. Employees who are no longer authorized to participate in LOTO shall return all locks and keys to HSE department.

The following locks have been approved for use under LOTO:

Personal (Individual) Locks - Uniquely identified and shall only have one common key; Maintained and owned by a Qualified Person.

Group Locks - Uniquely identified and shall only have one common key; Maintained and owned by Business Line / Area / Department.

The above listed locks shall only be used for energy isolation of machinery, equipment, and/or facilities and not to be used for another purpose.

**C. Tags** - Tags shall be of sufficient material that is capable of enduring adverse conditions (weather, wet locations, corrosive materials, etc.) that will not cause the tag to deteriorate or message on tag to become illegible.

- Tags shall contain at a minimum the following legible information:
- Name of person placing tag
- Business Line / Area / Department.
- Phone number of person placing tag (Contractor only)
- Date of installation
- Reason for application
- Tags must be standard “Danger – Do Not Operate” (black, red and white).

Tags installed as a tagout device shall be installed to prevent inadvertent or accidental removal. The securing means shall be of sufficient strength to prevent removal without destroying the securing means (such as a zip or cable tie) or require the use of a tool to remove it.

If lockout is not feasible, tagout tags shall be secured directly on the energy isolating device on or as close as possible to the isolation point.

**D. Energy Isolation Devices** - Isolating devices shall be adequately labeled or marked to indicate their function, unless they are located and arranged so that their purpose is evident.

The devices shall be capable of either being locked or otherwise secured in an effective isolating position.

When replacement or major repair, renovation, or modification of a machine or equipment is performed, and when new machines or equipment are installed, such devices shall be designed to accept a lockout device.

**E. Group Lockbox** - A lockbox is a container that secures the keys from locks placed on energy isolating devices as part of group LOTO, which allows Qualified Person in the group to apply their personal lock directly to the lockbox instead of the individual isolation points.

#### 10.12.2 LOTO - LOCKOUT / TAGOUT – THE SEQUENCE

##### **A. Step One – Preparation for Shutdown:**

1. Employees qualified for LOTO shall identify the type and magnitude of the energy to be controlled, all hazards (including stored energy) and the method or means of controlling the energy.
2. The Qualified person must be familiar with the specific machinery, equipment, or facilities in which LOTO will be conducted.
3. Qualified Persons shall notify all affected person that the equipment will be locked or tagged out.

4. Business Line / Area / Department impacted by LOTO, but not directly working on the equipment or system, may act as the Qualified Person. For example, O&M may serve as the Qualified Person for isolation of a system being worked on by other VOLTALIA's Business Line / Area / Department or contractors.

**B. Step Two – Equipment Shutdown:**

1. The equipment shall be turned off or shut down by following established shutdown procedures.
  - The Energy Control Procedure will be initiated by VOLTALIA Qualified Person only.
  - If an Energy Control Procedure does not already exist, one must be developed by the Qualified Person.
2. An orderly shutdown must be utilized to avoid any additional or increase hazards to employees because of the equipment stoppage.

**C. Step Three – Equipment Isolation:**

1. All energy isolating devices (e.g., manually operated switch, valve) required to control the energy to the equipment shall be physically located and operated in such a manner as to isolate the equipment from the energy source.
2. Electrical systems shall only be operated by qualified and trained persons.
3. Under lockout, energy isolation shall be accomplished by securing lockout devices (e.g., adjustable cable lockout, valve cover) of suitable construction on each energy isolating device that prevents inadvertent re-energization of machinery or equipment.

**D. Step Four – Application of LOTO Devices:**

1. Lockout devices shall be placed by the Qualified Person, either directly at each energy isolating devices, or as part of a managed group lockout procedure.
  - Circuit control devices (include but are not limited to, push buttons, selector switches, wall switches, emergency stop buttons or equipment activating devices) are not energy isolating devices.
  - Equipment controls shall be secured in a "safe" or "off" position.
  - Emergency stop buttons (e-stops) shall not be used during LOTO. Verify that all emergency stop buttons on the system are not engaged.
2. Each employee working on or servicing the equipment shall be responsible for attaching their personal locks without exception. No employee shall perform work under another Qualified Person lock and tag. Employees shall maintain possession of their own key.
3. The Qualified Person administering the LOTO shall apply an out of service lock and tag (as an administrative control to prevent unauthorized and untrained employees from the electrical



hazards associated with system energization) and perform necessary verification (i.e. verifying zero voltage) activities as needed.

4. Qualified Person shall remove all personal locks once they have completed the job or they leave the work task indefinitely. Qualified persons joining the work task must place their locks and tags on the isolation devices prior to any potential exposure to hazardous energy.
5. The Qualified Person administering the LOTO must be the first to lock on and the last to lock off the energy isolating devices or group lockbox.
6. When more than two employees are involved in the LOTO a multi-lock hasp or lockbox may be used. A multi-lock hasp allows placement of more than one lock on each energy isolation device. Each Qualified Person must place their lock on the hasp. The Qualified Person administering the LOTO shall be the last person to remove their lock.
7. If an energy isolating device is not accepting of a lock, a tagout device may be used. The tag shall be attached at the same location that the lockout device would have been attached.
  - Additional precautions will be implemented to provide a level of safety equivalent to that obtained by using a lockout device.
  - Each participating Qualified Person shall either place an individual tag at each isolated source or be named in a group tagging method. Additional safety measures may include such steps as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or removal of a valve handle to reduce the likelihood of inadvertent energization.

#### **E. Step Five – Stored Energy:**

1. Stored or residual energy must be released or dissipated from each system as to isolate the equipment or process from the reaccumulating or release of hazardous energy (eg. Electrical circuits have been grounded to discharge stored electricity).
2. If there is a possibility of re-accumulation of stored energy, verification of isolation must be continued until the work is completed, or until the possibility of such accumulation no longer exists.
3. In the case of stored or residual energy, warnings or instructions may be provided when it is not practical to dissipate the energy. Warning may be omitted if the existence and location of the energy is clear.

#### **F. Step Six – Verification of Isolation:**

1. Prior to servicing or maintenance on machines or equipment that have been locked out or tagged out, Qualified Person(s) shall verify that isolation and de-energization of the machine or equipment has been accomplished. Multiple verifications steps shall be performed. Verification may include, but is not limited to the following:
  - a) Activate all startup devices and/or operating controls;



- b) Use voltage testing equipment/indicators to verify de-energization of electrical circuits;
- c) Have a second Qualified Person familiar with the equipment verify;
- d) Return all operating controls(s) to the neutral or off position after verifying the isolation of the equipment; and
- e) Walk the line to verify all sources are accounted for and controlled.

**G. Step Seven – Servicing and Maintenance Work:**

1. Once hazardous energy has been isolated and verified, the work can be performed.
2. If during verification hazardous energy is still present, Steps 2 through 6 shall be performed.

**H. Step Eight – Release from LOTO Control:**

1. Before lockout or tagout devices are removed and energy is restored to the equipment, procedures shall be followed, and actions taken by the Qualified Person(s) to ensure the following:
  - Nonessential items have been removed and to ensure that machine or equipment components are operationally intact, including guards and covers.
  - All employees have been safely positioned or removed from the work area.
  - Verification that all operating controls are in the neutral or off position.
  - All Qualified Person have personally removed their individual locks and tags from the isolation devices.
  - The Qualified Persona administering the LOTO does not have authority to remove another Qualified Person personal lock left on an energy isolating device or group lockbox.
  - After lockout devices have been removed and before the equipment is started, Affected Employees shall be notified that the devices have been removed and is ready for use.
  - Business Line / Area / Department impacted by LOTO must be notified when the work is complete so that the machine, equipment or facility can be put back into service.
  - When lockout devices must be temporarily removed for troubleshooting, positioning of the machine, etc., the sequence of this section will be followed and lockout tagout reapplied in accordance with the required lockout sequence.
  - Only trained and Qualified Persons shall re-energize the electrical equipment.

**10.13. ELECTRICAL SAFETY - TESTING OF HIGH VOLTAGE EQUIPMENT**

- 10.13.1 When any High Voltage Equipment is to be subjected to test voltage the Person responsible for the testing must ensure that the associated test equipment, leads and connections are of adequate strength/capability and are suitably insulated/guarded to prevent damage and accidental contact.

10.13.2 A risk Assessment must be done before the HV test by the test engineer

10.13.3 A formal plan of commissioning operations must be produced to indicate the sequential order of switching/commissioning activities to energize and de-energize High Voltage Test Equipment/areas on site.

#### **High Voltage Test Equipment**

10.13.4 Where possible, test equipment purchased must conform to IEC/EN 61010 (Safety requirements for electrical equipment for measurement, control, and laboratory use). Purpose in house built test equipment must be designed and constructed to the same standards of safety as purchased test equipment.

10.13.5 Dedicated test instruments or purpose-built testing boards must have clearly identifiable shrouded plugin terminations. Test equipment shall be inspected by the user for visible defects, current calibration/valid current certification on each occasion prior to use.

10.13.6 If any equipment is found to be faulty prior to use it must be labelled defective, removed from service and quarantined.

10.13.7 The test equipment and the apparatus/ equipment to be tested, must be equipped with a safety pressure rupture device or safety valve

#### **Demarcated Temporary HV Test Area**

10.13.8 All Test area exclusion zones must be properly demarcated with temporary barriers with a designated access and exit point.

10.13.9 Danger signage must be placed around the perimeter of the equipment to be tested to prevent un-authorized access.

10.13.10 The size of the demarcated area will be determined by the safety distances and clearances needed from live components including the risk of the gas pressure equipment failure.

10.13.11 On customer site, while the dielectric testing, the live section of the busbar must be isolated from the test section with 2 disconnecting switch (or bus-bar link) open with the connection between the opened contact must be connected to the ground earth.

#### **Energization of test supplies**

10.13.12 Prior to energizing the area/unit the work areas must be checked to confirm all personnel are outside of the test area.

10.13.13 All tests must be conducted in line with the relevant procedures, specifications, risk assessments and equipment operating instructions.

10.13.14 If during any electrical tests an unsafe act or condition occurs either with the product or personnel, the test shall be immediately terminated.

10.13.15 The equipment to be tested must connected the main earth ground circuit

10.13.16 When testing is carried out where there is a risk of wet conditions, all low voltage equipment and terminations must be IP54 rated, if this is not the case the testing must be STOPPED.

10.13.17 On Power transformers, test engineers must consider the possibility of Generating high voltages through test connections on high ratio transformers.

10.13.18 The test dielectric equipment must be connected to a ground earth connection.

10.13.19 Prior to making contact with Transformer/test connections, earthing must be applied to discharge any residual capacitive or inductive electrical charge from the applied test voltage.

10.13.20 The instruments voltage transformers installed on the equipment to be tested, must not be exposed to a voltage frequency above the manufacturer's rating

#### **Entry into the Energized Test Area**

10.13.21 Prior to any activity within an energized area the following controls must be in place:

- Any person entering the energised area must be formally authorised;
- A Permit to Work must be completed and communicated prior to entry;
- Safety Clearances must be maintained
- The Exclusion zone must be physically demarcated;
- An Accompanying Safety Person must be assigned to observe the test engineer
- If modifications are needed, before altering test connections, all energy must be isolated with LOTO applied and ZERO energy verified

#### **Rescue procedure**

10.13.22 An accompanying safety Person who is not directly involved in the work or test activity must have been instructed on how to disconnect the Equipment being worked on from all supplies of electricity, and how to switch off any test Equipment or disconnect it from the supply.

10.13.23 The person must also be trained in electrical rescue protocols and have the necessary rescue equipment sufficiently rated to the voltage of the test activity.

10.13.24 The rescue equipment will include but not limited to:

- Rescue pole
- Rubber mat
- Rubber (insulated) gloves

#### **Completion of Testing**

10.13.25 All Equipment, cables and capacitors must be safely discharged after the application of test voltages.

10.13.26 Prior to returning the tested equipment to service all relevant documentation must be completed and customer informed testing completed.

### **10.14. EXCAVATIONS – BURIED SERVICES**

10.14.1 "As-built" drawings shall be reviewed prior to the start of digging any excavation in order to identify the presence, type and location of buried services.

10.14.2 If it is suspected that underground services are buried in a radius of 10 meters within the planned location of the excavation, or if a doubt exists regarding the accuracy of the as-built drawings, scanning for buried utilities must be performed with appropriate equipment operated by a competent person.

10.14.3 The exact location of buried services shall be noted on the documents pertaining to the excavation (e.g. risk assessment, permit to work, Point of Work Risk Assessment) and marked on the work location in accordance with the local standards (flags, painted, etc.) prior to digging the excavation.

10.14.4 Hand digging must be considered when digging an excavation near a known buried service. Hand digging is mandatory when excavating near any flammable or explosive service.

10.14.5 All exposed cables and pipes shall be adequately protected and supported when an excavation is opened.

**10.15. EXCAVATION WORKS – DIGGING THE EXCAVATION**

10.15.1 Alternative methods to digging excavations must always be considered, such as micro-tunneling or directional drilling, so far as is reasonably practicable.

10.15.2 Soil surveys must be undertaken by competent organizations specifically qualified for such prior to the excavation, in order to identify:

- Potential soil contamination;
- Presence of buried services (live or dead);
- Risk of collapse of excavations;
- Risk of water ingress;
- Unstable ground and risk of sinkholes;

10.15.3 Excavations equal to deeper than 1.2 m shall be protected from collapse/cave-in by adequate means, as designed by a competent civil engineer, based upon soil surveys, and other relevant factors. This may include, but should not be limited to the following means, or a combination thereof:

- Purpose built shuttering or shoring,
- Sloping/battering/benching the excavation walls to a suitable angle,
- Sheet piling,
- Installation of trench-boxes,



FIGURE 5: TRENCH-BOX

10.15.4 When persons need to cross an excavation, a bridging walkway must be designed in accordance with local legal requirements and design codes, and must be erected with guardrails and toe-boards .

10.15.5 Vehicle and plant movement that is not in direct relation with the works in the excavation shall be kept a minimum of 3.0 m from the edge of any excavation.

10.15.6 Personnel must be kept clear of the vehicles / plant working in connection with the excavation works or the works inside the excavation, while they are in operation.

10.15.7 Vehicles / plant working in connection with the excavation works must have a banksman controlling their movement to prevent them from going close to the edge of the excavation, in order to prevent the edge to break away under their weight.

- 10.15.8 When vehicles / plant working in connection with the excavation works or the works inside the excavation remain stationary during part of the works, wheel-chocks must be used to prevent the equipment to move towards the excavation. In addition, Hard-barriers made of concrete may be used to physically prevent any vehicles of falling into the excavation.
- 10.15.9 Excavators, when designed specifically for this purpose, may be authorized to lift equipment in place into an excavation. See 10.40.
- 10.15.10 The excavation shall be designed in such a way to provide a distance of at least 60 cm between any workplace and any formwork, piping, or other equipment within the excavation.
- 10.15.11 Excavations must be dug in a way that there are no instances where the soil or banks hang over an excavated area.

#### **10.16. EXCAVATIONS – GENERAL REQUIREMENTS AFTER DIGGING**

- 10.16.1 Excavations between 0.5 and 1.2 m in depth shall be protected at all times with Hard-barriers except where a safety distance of at least 1.5 m is maintained by visible safety chains or flexible mesh of 1.1m in height.
- 10.16.2 Excavations equal to or deeper than 1.2 m shall be protected at all times with guardrails and toe-boards. Toe boards are not required where the guardrails are positioned at least 1.5 m from the edge of the excavation.
- 10.16.3 Guardrails and toe-boards shall be installed at a sufficient distance from the edge of excavations so that they would remain an efficient fall prevention control in case of reasonably foreseeable landslide or collapse of the excavation.
- 10.16.4 All means must be employed in order to prevent ingress of water into the excavation, and on its sides. In addition, water must be removed regularly so that it does not accumulate in the excavation pit.
- 10.16.5 All materials must be kept at least at a distance of 1.2 meters from the edge of the excavation.
- 10.16.6 Traffic routes shall be planned and diverted if necessary, and the installation of Hard-barriers made of concrete shall be considered in high-traffic areas.
- 10.16.7 Excavations may be considered as Confined Spaces and may contain Hazardous Atmospheres
- 10.16.8 Working on slopes or sides of the excavations above other workers is forbidden.

#### **10.17. EXCAVATIONS – UNSTABLE GROUND AND RISK OF SINKHOLE**

- 10.17.1 When there is a risk of collapse or sinkhole (e.g. excavation dug near to the shore line) and if it is required to have pedestrian access along the edge of the excavation, only a dedicated platform, independent to the excavation structure and provided with guardrails and toe-boards shall be considered. Such platform shall be fixed in such a way that if the ground stability is weakened, the structure remains stable and in position.
- 10.17.2 In case a platform cannot be installed, other means shall be implemented such as a lifeline system allowing an immediate rescue if someone fell into unstable ground.
- 10.17.3 Where the stability of adjoining buildings, walls or other structures is endangered by excavation works, support systems shall be provided such as shoring, bracing or underpinning.

#### **10.18. EXCAVATIONS - ACCESS / EGRESS**

- 10.18.1 All excavations shall be provided with safe access and egress. Ramps, steps and staircases shall be preferred to ladders.

- 10.18.2 In trenches (i.e. relatively narrow and long) equal to or longer than 15 meters, at least 2 independent means of access and egress shall be provided, and an additional access/egress point every 15 meters thereafter.
- 10.18.3 An access point shall be available at no more than 20 meters in any direction.
- 10.18.4 If ladders are used, they shall not be longer than 5 meters (excluding the 1 meter extension above access level), and be accessible within 10 meters of anyone in the excavation, in any direction.
- 10.18.5 Excavations greater than 5 meters in depth must be provided with dedicated staircases with guardrails

## 10.19. EXPLOSIVES

This section specifically excludes the use of explosive-powered tools, which are covered in ATEX chapter

- 10.19.1 Explosives may only be purchased, transported, used and disposed of by competent personnel, authorized by a statutory body, and in permanent and strict compliance with all applicable regulations.
- 10.19.2 Explosives shall not be stored on site, so far as is reasonably practicable. Should explosives be stored on site, the storage must be strictly compliant with all applicable regulations, be fitted with blast walls and pressure relief wall panels as appropriate and be locked at all times when materials are not being delivered or collected.
- 10.19.3 Areas where explosives are used (and exposed to blast) must be free of debris and anything likely to be shattered or blown away by the blast, and barricaded with clear signs reading (in English and all applicable site languages): "DANGER: USE OF EXPLOSIVES – ACCESS FORBIDDEN TO UNAUTHORIZED PERSONNEL".
- 10.19.4 Explosives shall only be transported and/or used during daylight.
- 10.19.5 A siren must be sounded as a minimum 5 minutes before the blast, requesting evacuation of exposed personnel. The area where people may be exposed to the blast must be searched for any remaining personnel, and only upon the area is confirmed to be cleared of any person may the operation continue.
- 10.19.6 A siren must be sounded at the latest 30 seconds before the blast, to announce the imminent explosion.
- 10.19.7 A siren must be sounded at the latest 30 seconds after the blast, to give the all-clear.

## 10.20. HAZARDOUS ATMOSPHERES

- 10.20.1 Works in a hazardous atmosphere must be avoided, so far as is reasonably practicable.
- 10.20.2 If works in a hazardous atmosphere cannot be avoided, they shall be subject to a high control Permit to Work.
- 10.20.3 A ventilation plan must be designed and attached to the PTW.
- 10.20.4 Sources of fresh air must be kept away from contamination sources such as extracted air, welding fumes, exhaust gases, etc.
- 10.20.5 Sources of fresh air must be protected from interference (i.e. open vents must be prevented from being closed or obstructed and air blowers / extractors must be safeguarded against disconnection).
- 10.20.6 Forced ventilation must be fitted with an alarm that will activate in the event of a breakdown of the ventilation system or alternatively the equipment must be doubled up, or a person must be



on standby close to the equipment. In case of failure, the area with a hazardous atmosphere must be immediately evacuated.

- 10.20.7 Consideration must be given to the relative weight of the possible gases in the hazardous atmosphere, in order to design the appropriate ventilation plan: for instance, if the atmosphere contains heavy vapors or Carbon Dioxide, which are heavier than air, the fresh air supply must be forced to ventilate from the bottom.
- 10.20.8 Pure oxygen must never be used to improve the atmosphere, in order to limit the fire / explosion hazards linked with oxygen-enriched atmosphere.
- 10.20.9 Compressed gas cylinders shall not be taken into areas with hazardous atmospheres, other than those necessary for respiratory protection (e.g. escape breathing apparatus, self-contained breathing apparatus), medical resuscitation equipment, handheld aerosol spray containers and fire extinguishers.
- 10.20.10 Gases must be conveyed inside the work area by hoses of continuous length (no connections inside the hazardous atmosphere area).
- 10.20.11 When not in use, the gas supply must be turned off at the nozzle / torch and cylinders and hoses completely removed from the hazardous atmosphere area whenever it is empty of persons (including but not limited to lunch breaks, end of shift, completion of the works).
- 10.20.12 In flammable or explosive atmospheres, all electrical equipment and appliances must be explosion proof or intrinsically safe, tools must be non-spark Generating and all other potential sources of ignition (Including non-intrinsically safe mobile communication devices) strictly prohibited.
- 10.20.13 Where there is a risk of fire, appropriate fire extinguishers must be kept at the entry point of the area, bearing in mind that their use may introduce additional risks (e.g. asphyxiation for CO<sub>2</sub> extinguishers).
- 10.20.14 Thermal engine driven plant / equipment such as pumps shall not be used in a hazardous atmosphere area. If unavoidable, the exhaust from engines shall be vented to a safe place away from the area and downwind of any fresh air supply intakes. Fueling of portable engine-driven equipment shall be conducted outside the area.
- 10.20.15 If hot works or works using hazardous substances (including spray-painting) are conducted in a hazardous atmosphere area, consideration must be given to the fact that the process could seriously reduce the level of oxygen and introduce flammable or toxic substances.
- 10.20.16 It is forbidden inside to store hazardous substances in the hazardous atmosphere area except for quantities immediately required for the activity.
- 10.20.17 A gas monitoring strategy adapted to the identified risk must be in place. Tests must be carried out at the necessary frequency, and always prior to entry into the potentially hazardous atmosphere.
- 10.20.18 The gas monitoring strategy must also identify whether:
- Continuous monitoring (throughout the work) is required, for instance when there is a risk that the atmosphere deteriorates suddenly;
  - Periodical monitoring is required, and if yes, how often;
  - Monitoring at the completion of the work is required.
- 10.20.19 In all cases, the monitoring equipment must provide direct reading and penetrates far enough into the area to provide meaningful results; measurements taken at the entry point only are not acceptable.
- 10.20.20 Gas monitoring must always be performed in the following order:
1. Oxygen,



2. Flammable substances,
3. Toxic and harmful substances.

10.20.21 When monitoring levels of flammable substances, particular care must be given to set the Lower Explosive Limit of the concerned flammable substance, in order to avoid a false negative test (i.e. alarm not going-off by having set a LEL higher than which of the concerned substance).

10.20.22 In addition to the regular mandatory calibration of the gas detection equipment, verification of the sensor accuracy must be checked before each day's use. Exposing the instrument to a known concentration of test gas will show whether the sensors respond accurately and the instrument alarms properly. The acceptable tolerance ranges for such "bump tests" must be verified in the user's manual or with the manufacturer. Bump tests must always be carried out in the following sequence, in order to avoid saturation or contamination of the sensors that may lead to false readings:

1. Oxygen,
2. Flammable substances,
3. Toxic substances.

10.20.23 In case of a gas monitoring alarm, all entrants shall evacuate the workplace until a safe situation is recovered and new gas monitoring test is performed successfully.

10.20.24 The appropriate type of respiratory protective equipment shall be used whenever there is a risk that the atmosphere is or may become hazardous during the course of the works, despite forced ventilation.

10.20.25 Filter- or Cartridge-type respirators do not provide protection against oxygen-deprived atmospheres, and therefore may only be used if the air contains enough oxygen, but is contaminated otherwise.

10.20.26 A task-specific rescue plan, based on a risk assessment, must be prepared for all works in areas with potentially hazardous atmospheres.

10.20.27 The required rescue equipment must be available at the entry point of the area with potentially hazardous atmosphere prior to starting the works.

10.20.28 The existence, adequacy, availability and response times of emergency services, must be confirmed before starting the works.

10.20.29 Emergency arrangements must be periodically tested either by simulations (where practical) or other means such as audits, inspections or desktop reviews.

- In addition, the **Error! Reference source not found.** shall be considered (if a substance has more than 1 pictogram describing it, the acceptable storage conditions must be the most stringent of all those applicable).

10.20.30 Permanent and temporary piping at the site shall have their contents, direction of the fluid, pressure and temperature identified by color-coding and signs, in line with all local regulations.

## 10.21. HAZARDOUS SUBSTANCES – LIST OF CONTROLLED SUBSTANCES

10.21.1 The following table establishes the list of substances restricted for use in Votalia, and the scope of such restrictions.

**TABLE 1: LIST OF PROHIBITED SUBSTANCES**

Substance name
Asbestos
Brominated Flame Retardants
Cadmium, Hexavalent Chromium, Lead, Mercury and their compounds
Chlorinated Hydrocarbons
Chlorinated Paraffins
Formaldehyde
Halogenated Diphenyl Methanes
Lead in Paint
Ozone Depleting Substances (ODS) except CFCs and HCFCs
Chlorofluorocarbons (CFCs)
Hydrochlorofluorocarbons (HCFCs)
Polychlorinated Biphenyls (PCBs) and Polychlorinated Terphenyls (PCTs)
Polychlorinated Naphthalenes
Radioactive Substances
Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

## 10.22. COHSS ASSESSMENT

10.22.1 Ensure the issuing and compilation of work-based assessments for the project.

10.22.2 The Site Management and / or H&S Technician will review and obtain all work-based COSHH assessments and ensure compliance is maintained with regards to use and disposal of COSHH materials.

10.22.3 Where alternative products can be obtained and used then the Site Management shall, where possible, look for alternatives. All COSHH materials shall be disposed of as advised by the relevant data sheets and where possible segregated from general skips to avoid contamination and recycling opportunities.

## 10.23. HOT WORKS

10.23.1 So far as is reasonably practicable, there shall be no hot works performed within 10 meters of explosive or flammable substances and of areas with a potentially explosive atmosphere. All hot works must only be initialized after specific PTW ( Permit to Work).

- 10.23.2 Hot works adjacent to any cavity wall structure where there is no visibility of internal surfaces must be avoided, so far as is reasonably practicable.
- 10.23.3 Hot works on or under roof or gutters shall be avoided so far as is reasonably practicable, due to the risk of accumulation of dust and debris that could catch fire. Cold working options should be employed wherever possible.
- 10.23.4 Whenever the above requirements cannot reasonably be implemented, and in addition to any other control measures (e.g. Permit to Work), a fire watch must be provided and maintained for 1 hour after the work has been completed. This fire watch shall consist in 1 or more persons, competent and trained in detecting and extinguishing fires, surveying the area in order to detect, tackle and report any fire that could start as a result of the hot works.
- 10.23.5 Appropriate steps must be taken to avoid hot working methods when installing, repairing or replacing flat roof coverings, so far as is reasonably practicable. Cold curing adhesives shall always be considered in preference to gas-torch roofing.
- 10.23.6 Only dedicated torch strikers shall be used to ignite gas-torches. It is strictly forbidden to use lighters, matches, or existing hot work to do so.
- 10.23.7 A suitable fire extinguisher shall be available at each location where hot works are undertaken, and within 2 meters of the activity.
- 10.23.8 Falling and flying sparks shall be contained and equipment protected by the use of fire-resistant screens and/or mats.
- 10.23.9 Protective screens shall be installed to prevent welding flash injuries to other persons.
- 10.23.10 Mobile fuel gas supply facilities shall be set up at the workplace or as near to it as practicable and should where possible be in the employee's field of vision, without creating any supplementary risks.
- 10.23.11 Gas cylinders and welding equipment must be accompanied by conformity and certification documents and/or labels.
- 10.23.12 Flammable gas supply facilities must be safeguarded against flashback at the main cylinder valve and the valve at the point of work.
- 10.23.13 All gas cylinders, full or empty, shall be secured in the upright position without risk of falling over.
- 10.23.14 Empty gas cylinders shall be removed from the work area as soon as practicable.
- 10.23.15 Transport of gas cylinders must be done in line with the requirements of section (See Cylinders section).

#### **10.24. WORK AT HEIGHT – GENERAL REQUIREMENTS**

- 10.24.1 All personnel assigned to work at height must be physically and medically fit to do so.
- 10.24.2 Collective fall prevention measures (e.g. safe working platform or scaffolds see Chapter Scaffolding) shall always be preferred, , to individual fall prevention (e.g. fall restraint).
- 10.24.3 All platforms designed to provide safe access to workplaces at height or to provide a safe work area must be designed and constructed in order to bear the reasonably foreseeable loads on this surface, with a reasonable safety factor. An competent engineer needs to approve the design.

- 10.24.4 When collective fall protection measures are not possible to implement then individual protection, (i.e. a safety harness with a Fall-arrest lanyard, attached to appropriate anchorage points and lifelines designed for purpose) is compulsory.
- 10.24.5 Whenever collective or individual fall protection measures are used, an appropriate rescue plan must be in place before the start of work. This rescue plan must provide the necessary equipment for rescue and this must be available.
- 10.24.6 Safe access to all work stations at height must be assured.
- 10.24.7 Only one person can be attached to a vertical lifeline at a time.
- 10.24.8 When Working in Nacelle, Hub and Windmill towers, worker must wear PPEs including the harness all the time and rescue kit must be in place. When tower is being under construction, worker must be attached with double hooks or independent lifeline.

### **10.25. WORK AT HEIGHTS , LADDERS - GENERAL REQUIREMENTS**

Ladders are a means of access between two different elevations only and are not Generally considered to be a work station, and may only be used strictly adhering to the following requirements.

- 10.25.1 Only one person shall climb a ladder at any one time.
- 10.25.2 When climbing or descending a ladder, persons shall maintain at least 3 points of contact at all times. Both hands must be kept free for holding onto the ladder.
- 10.25.3 Ladders shall extend a minimum of one (1) meter beyond the top of the step-off point.
- 10.25.4 Ladders shall be maintained free of oil, grease and other slipping hazards.
- 10.25.5 For access ladders higher than 3 meters, a collective (cage / hoops) or individual (vertical lifeline with fall arrest equipment) protection shall be used.
- 10.25.6 Whenever an access is to be created for a significant number of users, stairways shall be preferred to ladders as far as reasonably practicable.

### **10.26. WORK AT HEIGHTS - LADDERS - PORTABLE LADDERS**

- 10.26.1 Portable ladders shall be of professional purpose-built construction and conform to European Class 1 standard for portable ladders, or acceptable equivalent.
- 10.26.2 Conductive or metal portable ladders shall be prominently marked as conductive and not be used near energized lines or equipment.
- 10.26.3 Portable ladders shall be inspected before each use and in case of deformity, damage or missing parts be removed immediately from use.
- 10.26.4 The use of self-fabricated ladders is strictly prohibited.
- 10.26.5 Step-ladders must be used in the open and secure position.
- 10.26.6 Portable ladders must not be placed in such a position that any material or equipment would interfere with their safe use.
- 10.26.7 Portable ladders must be laid on stable ground and secured to prevent slipping outwards and sideways (or secured by another person).
- 10.26.8 Portable ladders shall be set at an angle of approximately 75°, secured at the top and base, in such a way to prevent shifting, slipping, rotating, being knocked or blown over, without impeding the ascent or descent.
- 10.26.9 Portable ladders shall never be tied to piping, conduits, or ventilation ducting.

- 10.26.10 The maximum length of an extended portable ladder shall not be more than six (6) meters.
- 10.26.11 Portable ladders may only be used as a temporary workstation for non-repetitive tasks of short duration at a maximum height of three (3) meters. This is only approved if no other matter is possible to be used such as scaffolding or MEWPs.
- 10.26.12 Portable ladders must be lowered and stored at the end of each workday.
- 10.26.13 Portable ladders must be inspected every day before its usage. Inspection tag or color code must be attached to the ladder

#### **10.27. WORK AT HEIGHTS LADDERS - FIXED / PERMANENT / VERTICAL LADDERS**

10.27.1 Vertical ladders shall be designed in accordance with ISO 14122-4 and as such:

- Over 10 m high, must have a platform at least every 6 m and be offset of at least 0.7 m at every platform;
- Have a fall protection device when over 3 m;
- Must have a safe live line over 3 m.
- When a cage is used as a fall protection device, this cage shall start between 2.2 and 3 m from the ground level.

#### **10.28. WORK AT HEIGHT - MOBILE ELEVATING WORKING PLATFORMS**

- 10.28.1 The type of MEWP to be used must be selected to be suitable for its intended use, considering the ground conditions (e.g. scissor lift must not be used on rough terrain) and the working needs (e.g. height to reach and number of operators required). This must include any travel within the work area.
- 10.28.2 The manufacturers' operating manual must be available at the workplace and strictly followed. Operators must at no time attempt to operate outside the recommended limits.
- 10.28.3 A visual control of the MEWP must be done by the operator before use
- 10.28.4 The man-basket of MEWPs must be fitted with an anchor point so that its occupants can attach themselves to it. The anchor point must be designed to withstand the dynamic force of the maximum number of persons allowed in the basket falling from it at the same time.
- 10.28.5 MEWPs must be fitted with guardrails and toe-boards in accordance with the requirements below
  - doors open inward
  - a top guardrail at  $h = 1100 \pm 100$  mm,
  - an intermediate guardrail at  $h/2 \pm 50$ mm,
  - a toe board at least 150 mm high. The gap between the toe board and the working surface (where the workers stand) should not exceed 10 mm
- 10.28.6 MEWPs shall be equipped with an automatic overload warning signal and an inclination sensor and indicator while in operation.
- 10.28.7 MEWPs shall be fitted with a set of controls accessible at all times from the ground level.
- 10.28.8 MEWPs shall be fitted with emergency stop controls on all control panels.
- 10.28.9 As part of the rescue plan for MEWPs usage, there must be in the close proximity of MEWP operation a nominated responsible person(s) who has been shown how to use the emergency lowering system from ground level.
- 10.28.10 Personnel inside the MEWP shall wear a full-body harness with a fall-restraint lanyard, appropriately attached to a manufacturer's designated anchor point at all times.

- 10.28.11 All works must be performed from the inside of the MEWP platform. Operators must never leave the machine at height unless there's no other possible safe way of doing the job, in which case this must be considered as a non-routine high-risk activity subject to PTW and a double-lanyard system must be used.
- 10.28.12 Soft ground must be levelled, ballasted, and compacted to ensure it provides the sufficient load bearing capacity to withstand the weight of the MEWP and occupants.
- 10.28.13 Outriggers must be used whenever available on the MEWP, they must be extended fully on both sides of the MEWP and be laid on steel plates of sufficient thickness and surface area in order to spread the load.
- 10.28.14 A suitable exclusion zone must be implemented around the MEWP and be clearly indicated with Hard-barriers and warning signs, with a qualified banksman in place to guide the operator and prevent other personnel from entering its work area, in order to control the risks of collisions with persons and falling objects. The banksman shall possess a valid operator permit and a written authorization from their employer to operate the MEWP so as to be able to safely operate it from the ground level controls if needed.
- 10.28.15 MEWPs shall be operated only on firm surfaces of a maximum inclination as prescribed by the manufacturer.
- 10.28.16 MEWPs shall not be used during thunderstorms and/or when the wind speed exceeds 14 m/s at the work height. If the MEWP is not equipped, the operator must check such speed at the working height by means of a hand held wind meter
- 10.28.17 MEWPs shall not be used as an elevator to transfer personnel or material to other working platforms or levels.
- 10.28.18 Climbing out of the designed man-basket is strictly prohibited.
- 10.28.19 The use of non-integrated working platforms mounted on forklift trucks is strictly forbidden.

## **10.29. WORK AT HEIGHT – FLOOR OPENINGS**

- 10.29.1 Horizontal openings of a surface equal to or less than 1 square meter shall be covered with temporary coverings and visually highlighted (e.g. high-visibility stickers/tape, fluorescent paint), so far as is reasonably practicable.
- 10.29.2 Temporary coverings shall have equal loading capacity as the surrounding area (i.e. 5 kN/m<sup>2</sup> for openings in gratings) to be achieved by an appropriate plate thickness of wood or steel.
- 10.29.3 Temporary coverings shall have sufficient overlap - it must not be possible for the covering to fall into the opening that it is protecting.
- 10.29.4 Coverings shall be securely fixed and prevented from sliding, shifting, inadvertent removal and Generating a trip or fall hazard.
- 10.29.5 Horizontal openings of a surface greater than 1 square meter and open ends of platforms or breaks in handrails etc., shall be fully protected with a rigid guardrail and toe-boards, so far as is reasonably practicable.
- 10.29.6 Gratings and/or base plates must be secured with the designed appropriate connections. When this cannot be guaranteed, it shall be considered that there is a Horizontal Opening that must be controlled in accordance with, so far as is reasonably practicable.
- 10.29.7 If horizontal openings cannot be protected (for instance when work is being performed through the opening such as installation of a pipeline), all persons present in an area where they could fall through the opening must wear a full-body harness attached to a designed anchor point at all times.



### 10.30. WORK AT HEIGHT – GUARDRAILS

- 10.30.1 Guardrails shall be constructed from materials specifically intended for that purpose, i.e. scaffold material or a purpose built fall prevention system. Timber structures may be used for guardrails, for all applications except in scaffolds.
- 10.30.2 It is strictly forbidden to use warning tape or chains as a means to prevent falls.
- 10.30.3 Guardrails must be integrated or fixed in a manner that is secure, rigid and with the capability of resisting an impact or a fall producing a minimum 1 kN of horizontal force, without breaking or giving way.
- 10.30.4 Guardrails must have an upper rail at a height of at least 110 cm, mid-rails so that there is no gap of more than 50 cm in height between rails, and a toe-board placed at the floor level, and offering protection of at least 15 cm in height.
- 10.30.5 Guardrails may be substituted by any other suitable means which provide equivalent protection (e.g. sheet pile extending 110 cm from the ground level).
- 10.30.6 Guardrails shall not themselves create supplementary risks to workers, i.e. tripping hazards, exposed sharp edges or nails, etc.

### 10.31. WORK AT HEIGHT – INDIVIDUAL FALL-PREVENTION AND FALL-PROTECTION

When individual fall arrest or protection means are used, the following conditions must be applied:

- 10.31.1 Personnel required to work at height have a medical certificate confirming their aptitude to work at height.
- 10.31.2 Personnel required to use Individual fall-prevention or -protection must receive theoretical and practical training for the correct and safe use of the equipment. Records of this training shall be maintained at the Site.
- 10.31.3 Individual fall-prevention and -protection equipment must be selected based on a risk assessment and it shall only be used and stored in accordance with the manufacturer's instructions and applicable HSE requirements.
- 10.31.4 All Individual fall-prevention and -protection equipment shall be maintained in serviceable condition in accordance manufacturer's instructions and with the Site-specific HSE Plan, with up to date verification documentation available at the Site.
- 10.31.5 Every person using Individual fall-prevention or -protection shall be attached to an anchor point at all times.
- 10.31.6 Anchor points must have a load capacity as per EN 795-2012 of no less than:
  - Metallic anchor devices 1200 kg (12 kN) per person attached, and must be formally determined as safe for use by a competent person.
  - Non-metallic anchor devices 1800 kg (18 kN) per person attached, and must be formally determined as safe for use by a competent person

The following may be considered as appropriate anchor points:

- A permanent structure or suitable features of a building (e.g. a steel beam around which an anchor sling is wrapped);
- An anchor device that is specifically design-made (e.g. an eyebolt installed on a beam clamp, a tripod, a cast-in eyebolt);
- A temporary structure or element specifically designed for the purpose of preventing or protecting against falls (e.g. lifeline, scaffold, guardrail);
- Other elements, temporary (e.g. portable ladders) or permanent (e.g. stacks, vents, piping, ductwork), may only be used if their minimum structural requirements have been determined to be safe and approved by a competent person.



- 10.31.7 Anchor points shall be positioned overhead, so far as is reasonably practicable.
- 10.31.8 Individual fall-protection systems must be designed and used in such a way that in case of a fall, the person would be caught in their fall before they reach the floor.
- 10.31.9 However, particular care shall be taken when using shock absorbing lanyards for Individual fall-protection: the calculation of the safety distance shall consider the length of the lanyard with shock absorber deployed, the height of the worker, the height where the lanyard is attached, and a safety factor (see **Error! Reference source not found.**).

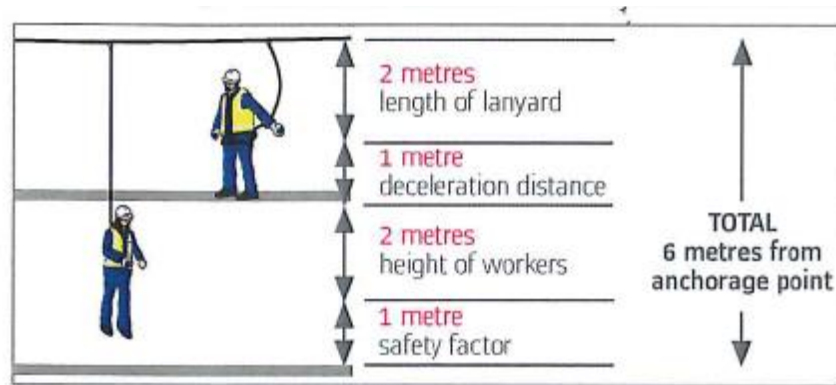


FIGURE 6: EXAMPLE OF CALCULATION OF SAFETY DISTANCE WITH A SHOCK-ABSORBING LANYARD

- 10.31.10 Vertical or horizontal lifelines may be used as anchor points for Individual fall-prevention and -protection systems, provided that they are installed by a competent certified person and verified by an accredited third party expert.
- 10.31.11 Vertical lifelines must be used in conjunction with a Fall-restraint Lanyard attached to a suitable fall-arrest device, itself attached to the lifeline.
- 10.31.12 The installation of temporary lifelines must be such that the lifeline and anchorage device cannot be damaged (e.g. cut, burnt or abraded) during use and in case of a fall. Each lifeline installation must clearly display the maximum number of users at any one time. Temporary lifelines must be formally inspected by a competent person following erection and at least weekly thereafter, and after any incident, event or fall which may affect its strength and integrity. Evidence of weekly inspection must be made available at lifeline access point.
- 10.31.13 Only one person may be attached to a vertical lifeline at a time.
- 10.31.14 Whenever individual fall protection is used, a rescue plan to recover suspended personnel in case of a fall must be prepared, prior to commencing the work. The plan shall ensure that rescue takes place rapidly to minimize the dangers of suspension trauma and loss of consciousness. Even though self-rescue may be possible, workers using a safety harness shall be supervised at all times.

## 10.32. WORK AT HEIGHT – WORKING ON ROOFS

- 10.32.1 General hazards associated with working at height must be controlled as described in the section 'Work at Height – General requirements'
- 10.32.2 Safe access to roofs shall be ensured prior to starting the work. This can include General access fixed or rolling scaffolds, mobile elevated working platforms ladders and roof access hatches. Appropriate control measures must be implemented in accordance with the requirements of each appropriate section of this document.
- 10.32.3 A specific emergency rescue plan must be designed for working on roofs.

- 10.32.4 Appropriate lifting appliances must be used in order to make sure that materials and equipment are not carried at height by persons, and they must be designed and installed in such a way that persons fetching lifted materials at height do not expose themselves to a fall from height.
- 10.32.5 Waste-chutes or appropriate lifting operations must be implemented in order to safely remove waste from the roofs, during and at completion of the works.
- 10.32.6 Laying and handling of insulation, cladding or roofing material shall only be performed when the wind speed is lower than 10 m/s (7 m/s when ultra-light material such as glass fiber is used).
- 10.32.7 Care shall be taken to minimize the risk of electrical arcing, when working on roofs near to exposed high-voltage conductors.
- 10.32.8 Permanent roofs must be designed and installed with fall prevention systems
- 10.32.9 Permanent sloped roofs must be designed and installed with roof ladders or crawling boards in addition to edge protection. Roof ladders or crawling boards must be:
- designed and fabricated to be fit for purpose;
  - strong enough to support workers when spanning across the supports for the roof covering;
  - long enough to span the support (at least three rafters);
  - Secure or placed to prevent accidental movement.
- 10.32.10 All roofs shall be considered as fragile until a competent person has confirmed that they are not.
- 10.32.11 The hierarchy of controls that must be followed for work on fragile roofs is:
- Work from underneath the roof using a suitable work platform;
  - Where this is not possible, consider remote works (e.g. using mast photography or videography) or using a MEWP that allows people to work from within the MEWP basket without standing on the roof itself
  - If access onto the fragile roof cannot be avoided, perimeter edge protection must be installed and staging used to spread the load. Unless all the work and access is on staging or platforms that are fitted with guardrails, safety nets must be installed underneath the roof or individual fall protection used; and
  - where harnesses are used they need adequate anchorage points
- 10.32.12 Roofs must be inspected at the end of the working day to make sure that loose materials, especially sheets, offcuts and fixings, are not left unsecured on the roof.
- 10.32.13 Note: Some roof coverings can give a false sense of safety to those who are working on or passing by them. They may be capable of carrying some distributed load, giving the impression that they can bear a person's weight, but they might not carry a concentrated load, such as the heel of someone walking or someone stumbling and falling. A stumble may cause the roof to fail instantly like a trap door. For example, asbestos cement and other non-reinforced fiber cement sheeting are liable to shatter without warning under a stumble. They also become more brittle with time.

### **10.33. WORK AT HEIGHT - SCAFFOLDS – GENERAL REQUIREMENTS**

- 10.33.1 Scaffold material must be specifically designed for the purpose of scaffolding and shall conform to applicable local regulations and standards.
- 10.33.2 Scaffold structure elements and guardrails must be made of steel material.
- 10.33.3 Defective or damaged scaffold material shall be immediately put out-of-service and removed from the Site.
- 10.33.4 Scaffolds are intended only as a work platform and must not be used for long term storage and/or supporting other structures.

- 10.33.5 Work surface planks/boards shall be regularly cleared of rubbish, waste and surplus building material.
- 10.33.6 For scaffolds which higher than 24 meters, or constructed in a manner that deviates from the scaffold manufacturer's specifications/standard design, a detailed assembly plan and calculation sheet shall be prepared and submitted to Valtalia to justify its stability and function, and a high control Permit to Work must be obtained.
- 10.33.7 For scaffolds of a height lower than or equal to 24 meters, and of a standard construction and function which conforms to the manufacturer's specifications and standard assembly plan, it is not necessary to provide a separate calculation sheet – the manufacturer's specifications and standard assembly plans shall be permanently available on Site. However, where any doubt exists as to the stability and function of the scaffold, the scaffold constructor shall supply a detailed assembly plan and calculation sheet before the scaffold will be approved for use.
- 10.33.8 Climbing guardrails and structure of the scaffold is strictly prohibited.
- 10.33.9 Scaffolds must be tagged (e.g. "Scaff-tag") at each access point. These tags must include the following information:
- Whether the scaffold is safe for use or not;
  - Name of the scaffold erector (or erector company) and inspector;
  - Proof of regular inspection;
  - Maximum working load;
  - Access restrictions (e.g. one specific company, or level of competency);
  - Particular hazards.
- 10.33.10 Incomplete, defective or otherwise unsafe scaffolds must be marked as such at each access point, and access to them must be physically prevented, so far as is reasonably practicable.
- 10.33.11 It is strictly prohibited for anyone but competent scaffolders to alter a scaffold in any way.

#### **10.34. WORK AT HEIGHT - SCAFFOLDS – SAFE DESIGN OF SCAFFOLDS**

- 10.34.1 Scaffolds shall be designed and constructed in compliance with the requirements of 'EN 12811-1 Temporary Works Equipment – Part 1: Scaffolds – performance requirements and General design' or ANSI equivalent.
- 10.34.2 In addition to the above:
- 10.34.3 Materials used for scaffolding works must be certified to a recognized standard such as EN 12811-1 Scaffold Access & working platforms Scaffold structure elements and guardrails must be made of steel aluminum or GRP(Glass Reinforced Plastic or Fibreglass) material. Wood or other organic material (e.g. bamboo) must not be used for scaffolding uprights and bracing..
- 10.34.4 Scaffolds shall be stable and be supported by hard-wood treads or other appropriate means under the scaffold base-plates.
- 10.34.5 Scaffolds shall have guardrails and toe-boards on all open sides and ends of platforms
- 10.34.6 Where a scaffold is placed next to a structure and does not have safety guard rails between the scaffold and the structure, the gap between the structure and the work surface must not exceed 20 cm.
- 10.34.7 When the scaffold is constructed along a wall or any other structure which does not extend beyond the work surface level by at least 90 cm, a guardrail must be installed along or on the opposite side of the wall or structure.
- 10.34.8 External access ladders may only be employed to access the first level of the scaffold from ground level to a maximum height of 2 meters. The step-off point from the ladder to the work surface shall be protected by a self-closing gate or equivalent means.

- 10.34.9 All accesses to levels of the scaffold over 2 meters from the ground level shall be internal.
- 10.34.10 Access ways through the scaffold work surfaces shall be protected with self-closing trap-doors or gates so far as is reasonably practicable. Should this not be reasonably practicable, guardrails and toe-boards complying with the requirements of shall be installed on at least 3 sides of the opening, and one movable guardrail of a height of 1.10m shall be installed on the remaining side of the opening, in order to facilitate access / egress to / from the platform.
- 10.34.11 Where 2 scaffold planks overlap, both shall be supported on the ends where there are no overlaps, and the overlap length must be of at least thirty cm.
- 10.34.12 All scaffold planks must be attached so that they cannot skid away from their position.
- 10.34.13 Scaffolds with heights higher than 4 times the width of their base must be securely tied-off to a fixed structure, or the width of their base must be extended by the use of outriggers.

### **10.35. WORK AT HEIGHT - SCAFFOLDS – ERECTION, MODIFICATION AND DISMANTLING**

- 10.35.1 Scaffolds shall only be assembled, modified and dismantled by competent persons.
- 10.35.2 The scaffold manufacturer's specifications shall be respected at all times for the erection and use of the scaffold material.
- 10.35.3 All scaffold elements used to construct one scaffold shall be from the same manufacturer and of the same material type (e.g. same thickness and type of steel, etc.).
- 10.35.4 All materials used in the construction of scaffolds shall be free from defects and/or damage.
- 10.35.5 During the assembly, modification and dismantling of scaffolds, the work area must be clearly identified by signs and barriers to prevent unauthorized persons from entering the area and/or the scaffold.
- 10.35.6 Signs prohibiting access to the scaffold shall be clearly displayed at all the scaffold access points to avoid unauthorized use of the scaffold during its construction, modification, disassembly and before it has been approved as safe for use.
- 10.35.7 In addition, and so far as is reasonably practicable, access to scaffolds and working platforms during their construction, modification, disassembly and when they are not safe for use, should be prevented by physical means (e.g. Hard-barriers, netting).
- 10.35.8 Access ladders and stairways must be installed as early as is reasonably practicable during the construction process to minimize the need for the scaffolders to climb up the scaffolding components.
- 10.35.9 The planks/decking, guard rails and toe-boards must be put in position as each working level is completed.
- 10.35.10 Wherever required, scaffolds shall be anchored and secured during the assembly process. All components shall be anchored as soon as the structure reaches the points specified in the scaffold construction plan and/or calculation sheet. Scaffolds shall however never be anchored to trays, pipes, railings, or any other temporary or permanent structure not specifically designed to withstand the required horizontal force applied by the scaffold.

### **10.36. WORK AT HEIGHT - SCAFFOLDS – ROLLING SCAFFOLDS**

- 10.36.1 In addition to 'Scaffolds – General requirements for scaffolds' (10.33- 10.34 and 10.35)
- 10.36.2 The surface area of the highest work platform shall not exceed 2 times the surface area of the base, and the scaffold shall be designed in such a way that a reasonably foreseeable load applied to the most extended point of the highest work platform would not lead to the scaffold tipping over.

10.36.3 Wheel brakes must be in the engaged position while the scaffold is in use.

10.36.4 It is strictly forbidden for personnel to remain on the scaffold while it is being repositioned or moved.

**10.37. WORK AT HEIGHT - SCAFFOLDS – SUSPENDED SCAFFOLDS**

Suspended scaffolds must not be confused with cantilevered scaffolds.

For suspended scaffolds, the General requirements for scaffolds’ (10.33) apply and in addition, the following:

10.37.1 All suspended scaffolds (powered or manually hoisted) must be equipped with a breaking device that engages automatically in case of uncontrolled or sudden movement.

10.37.2 Suspended scaffolds must be hoisted or supported with appropriate outrigger beams, hooks or tie-backs. These must be specifically designed and capable to withstand the designed load of the suspended scaffold and of its occupants (persons and material), with a reasonable safety factor.

10.37.3 Outrigger beams must be placed horizontally, securely attached to the horizontal surface or stabilized with counterweights.

10.37.4 When counterweights are used, they must be specifically designed for this use, and secured against accidental displacement.

10.37.5 When the suspended scaffold can be horizontally displaced, stop blocks must be in place on the route of the support system to appropriately limit the range of movement of the scaffold.

10.37.6 An exclusion zone must be implemented underneath suspended scaffolds, to prevent the risk of injury due to falling objects.

10.37.7 Personnel inside the suspended scaffold shall use a full-body harness attached with a fall-arrest lanyard to a designed anchor point inside the suspended scaffold.



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**10.38. WORK AT HEIGHT – PREVENTION AND PROTECTION AGAINST FALLING OBJECTS**

10.38.1 Where any object may fall from height and cause injury, the following shall be considered by order of priority:

1. Eliminate the need to use that object at height.
2. Prevent the risk of the object falling: hand tools must be provided with a short strap/rope used to attach the hand tool to an appropriate anchor (user wrist, or in the case of heavy tools, a fixed point such as a guard rail), strict implementation of toe-boards on working platforms, persons wearing helmets with the chin strap attached.



3. Prevent injuries from a falling object, e.g. barricade the area below to keep personnel out of the potential drop zone, or erect safety nets, screens, panels extending from the edge of the platform or a guardrail system to reduce the likelihood of the falling object hitting a person or property on a lower level.

10.38.2 When objects are used at height all personnel are responsible to ensure that housekeeping and correct storage of materials are observed.

10.38.3 Unless specified otherwise by risk assessment a minimum safety distance of 2m per 10m elevation must be considered for the definition of hazardous areas for falling objects.

### 10.39. LIFTING - ACCESSORIES

10.39.1 The Safe Working Load must be labelled on every lifting accessory.

10.39.2 Lifting accessories must never be overloaded. An exception may only be granted when an authorized competent person is testing the lifting accessory.

10.39.3 Sufficient protection (e.g. rubber pads) shall be installed on edges and corners of the load to prevent damage to lifting accessories.

10.39.4 Any observed damaged lifting accessory shall be immediately removed from the workplace, returned to the quarantine storage where it shall be either destroyed or repaired and re-inspected.

10.39.5 All hooks used for lifting must be fitted with a spring-loaded safety catch.

10.39.6 "C-hooks" use is forbidden.

10.39.7 Hooks shall be removed from service if twisted 10 or more degrees, if their opening is deformed from 15% or more, or if they are damaged in any way.

10.39.8 Slings must be attached correctly to the lifting equipment either by passing the sling directly into the hook (the sling shall lay in the base of the hook) or by the use of a bow-shackle, fitted with the pin of the shackle on the hook and the slings attached to the bow of the shackle.

10.39.9 Multiple slings (two-legged, three-legged, etc.) must be attached together by a ring or a shackle and the load properly distributed so that no leg is overloaded.

10.39.10 The angles between sling legs must be taken into account in calculations, as the Safe Working Load of the sling assembly decreases when the angle between slings increases.

10.39.11 Chain slings shall only be shortened by using the correct shortening clutches.

10.39.12 Chains must not be knotted or joined by nuts and bolts.

10.39.13 Wire ropes shall never be used if:

- 5 or more wires are broken in a strand in a lay length, or;
- or more wires are broken anywhere in a lay length, or;
- it is "bird-caged" or kinked, or;
- it has excessive corrosion, or;
- An electric current flow has passed through the rope.

10.39.14 Single lengths of wire rope shall not be used to create custom-made "endless slings" (where an end of a rope is attached to the other end in order to create a loop) directly on site, so far as is reasonably practicable, and in any case never in order to lift persons (e.g. man-baskets, working platforms, gondola scaffolds).

10.39.15 If "endless slings" are made from wire rope directly on site, the following requirements must be applied:

- Preferably, the two terminations of the wire rope shall be attached together with interlocking turnback eyes, protected with thimbles. See Figure 7.

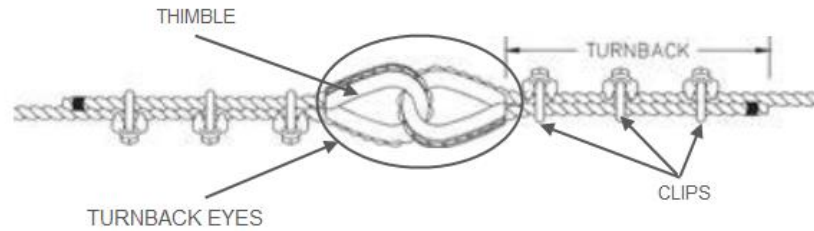


FIGURE 7: WIRE ROPE ENDS ATTACHED WITH TURNBACK EYES, WITH THIMBLES

- Alternatively, the 2 ends of the wire rope can be attached together using twice as many clips as used for a “standard” termination. The 2 ends shall be placed parallel to each other and overlapping by twice the turnback amount as used for a standard termination. The minimum number of clips shall be installed on each “dead” end. See Figure 8.

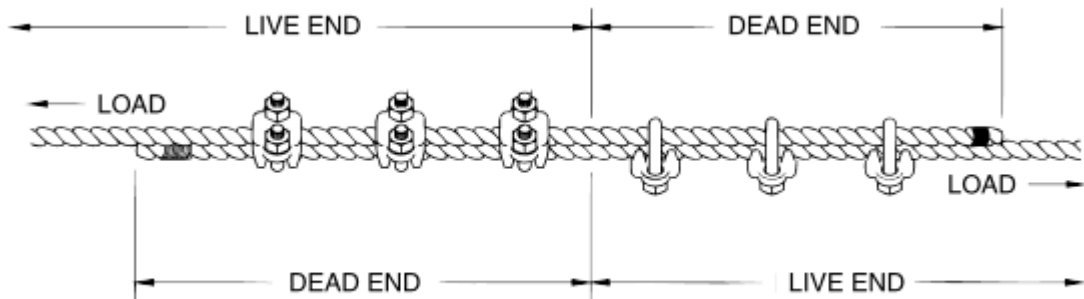


FIGURE 8: WIRE ROPE ENDS ATTACHED WITH A DOUBLE TURNBACK TERMINATION

- The appropriate method must be used to attach securely the ends of the wire rope together (e.g. clamps/clips, ferrules, etc.). When clips are used, the minimum number used must be 2, and they must always be installed with their saddle on the load-bearing (live) side of the wire rope.

10.39.16 Particular care shall be given to the use of Dynamo eyebolts (where the eye is not forged into the collar), as they are not able to withstand any load applied on the side of their eye. Collared eyebolts shall be used whenever the lifting accessories are applied at an angle from the eyebolt's screw, and therefore shall be the preferred type of eyebolt to screw into or through a load. Recommendation: Use of swivel lifting eyebolts (articulated) should be used. Indeed, this kind of lifting eyebolts is able to tip over 180° and to rotate 360°. For that matter, it is recommended to use it when tipping over a load





FIGURE 9: COLLARED EYEBOLT. PICTURE BY ARIFSA REPRESENTACIONES, SCP, CC BY-SA 3.0

10.39.17 It is strictly forbidden to use folded eyebolts as lifting points.

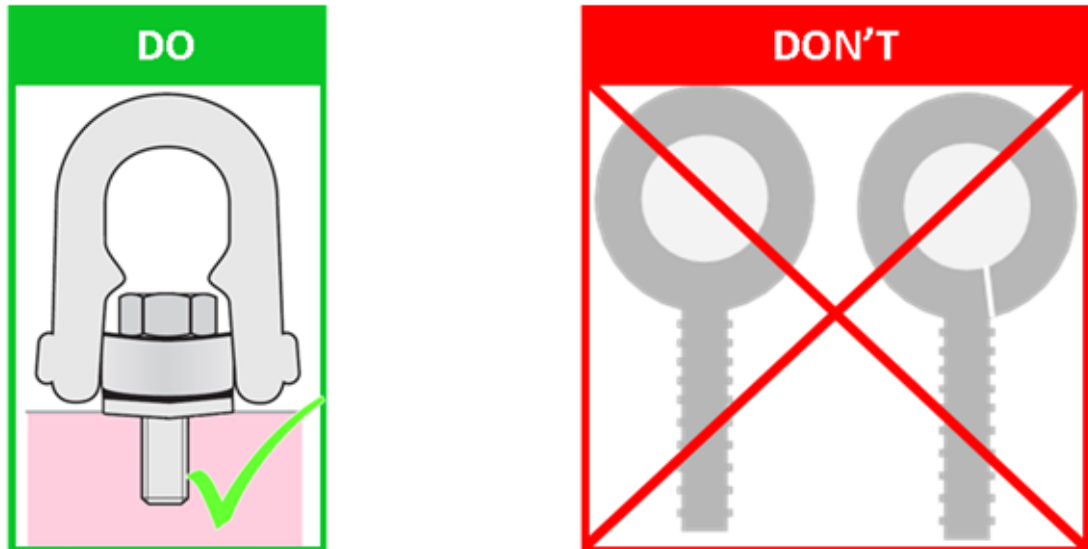


FIGURE 10: FOLDED EYEBOLT DO/DON'T

10.39.18 All lifting equipment and accessories must be uniquely identified, marked with the safe working load, and subject to thorough examination by a competent person at intervals not exceeding:

- Six months for lifting accessories and equipment used to lift persons
- Twelve months for other lifting equipment

10.39.19 All lifting equipment and accessories must have a valid manufacturer's certificate or thorough examination records

10.39.20 Gloves preventing the risk of abrasion and cuts must be used to handle lifting accessories.

10.39.21 Custom made lifting accessories may only be used if they have been designed by a competent person, formally certified by a competent recognized third party as safe for their designed use, upon examination and testing, and provided with all relevant documentation, as required by the Site-Specific HSE Plan. In case such designs, certificates or any other documentation are not available, the lifting accessory must not be used and quarantined.

#### 10.40. LIFTING OPERATIONS – LIFT PLANS

10.40.1 Every lifting operation shall be covered by either a lift plan or risk assessment, prepared, checked and issued by competent authorized persons and providing a sufficient level of details on load(s) characteristics, lifting equipment and accessories being used, lifting and rigging methods and staffing of lifting crew. Routine lifts may be managed by a risk assessment.

10.40.2 Any lift that meets one of the following criteria must be managed with a lift plan/ Rigging Plan:

- Lifts using 2 cranes.
- Lifting loads that are more than 75% of the crane capacity.
- Lifts outdoors that may act as a sail in windy conditions, i.e. weight of >1 tonne per m2.
- Lifting or personnel in man baskets.
- Crane operations close to overhead power lines.

10.40.3 As a minimum, Lifting Plans must include:

- The reference to the task-based HSE Risks and Impacts Analysis;
- The step-by-step lifting sequence and method;
- The list of all persons undertaking any roles in the Lifting Operation, with the description of their roles and responsibilities and their proof of competency;
- The intended communication method between the Crane Operator and Signalmen;
- The identification of the lifting zone and the control measures to prevent access to it;
- Consideration for simultaneous operations and the measures taken to avoid conflicting tasks in the lifting zone;
- The description of the load including but not limited to its type, weight, size, shape, location of center of gravity, type of packaging, special conditions (fragile, hazardous substances, etc.), etc.;
- The method used for slinging, attaching and detaching the load, as well as the location and characteristics of the lifting points on load (safe working load per point, allowed lifting angles, etc.);
- The list and characteristics of the lifting accessories to be used;
- The calculation of the total weight to be lifted (i.e. load + lifting accessories);
- The identification and description of the Lifting Equipment, including its Safe Working Load;
- Location of the Lifting Equipment, load-bearing of the ground and appropriate methods to secure the crane and spread the load;
- The proximity of hazards and obstructions to the movement of the crane (e.g. overhead power lines);
- The identification and description of the landing area, including but not limited to: dimensions and load bearing;
- Any necessary calculations as required.

#### 10.41. LIFTING OPERATIONS – EQUIPMENT

10.41.1 When several lifting equipment may operate in their mutual area of operation, there must be engineering measures implemented in order to prevent any collisions. These may include (but are not limited to): stop blocks on the crane course, electronic / software limitations and proximity warnings, trip devices operated by light curtains. Additional measures may be implemented such as coordination of lifting operations and Permit to Work.

10.41.2 Lifting equipment must be marked with their Safe Working Load for each hook.

10.41.3 Cranes must be equipped with a summary of all safety precautions for use that shall be directly available to the crane operator, so far as is reasonably practicable. This summary shall include but be not limited to:

- A diagram of maximum loads allowable (load chart) depending on the boom angle and/or its extension for mobile cranes, and distance of the trolley on the jib for tower cranes,
- A diagram of the control panel.

10.41.4 Cranes must be fitted with a boom angle indicator, boom extension length indicator and trolley distance on the jib indicator whenever relevant. These indicators must be readable by the crane operator at all times while operating the lifting equipment.

10.41.5 Cranes must be fitted with a wind meter at the top of the crane boom or jib, whichever is the highest.

10.41.6 Lifting equipment must be fitted with brakes on the hoisting mechanism that engage automatically in case the lifting equipment is not powered.

10.41.7 Cranes may require to be fitted with aviation warning lights, in compliance with the local regulation.

10.41.8 Custom made lifting equipment may only be used if it has been designed by a competent person, formally certified by a competent and recognized third party as safe for use upon examination

and testing and provided with all relevant documentation as required by the Site-Specific HSE Plan.

#### 10.42. LIFTING OPERATIONS – PREPARING AND CONDUCTING THE LIFT

- 10.42.1 A clearance distance of at least 1 meter width must be maintained between any moving part of a lifting equipment and any fixed object (e.g. guardrail, building), so far as is reasonably practicable. When this is not possible, access to any place where a person might be trapped between the moving lifting equipment and a fixed object must be prevented with Hard-barriers.
- 10.42.2 The stability and load-bearing capacity of the ground must be sufficient to carry the most important static and dynamic loads, considering slewing torques, wind stresses and shock loading, as well as the weight of the crane and its load.
- 10.42.3 Soft ground must be levelled, ballasted, and compacted to ensure it provides the sufficient load bearing capacity to withstand the weight of the crane and loads.
- 10.42.4 Unless the crane itself and the lifting operation are designed for “pick and carry”, outriggers must be used for all lifting operations, they must be extended fully on both sides of the lifting equipment and laid on steel plates of sufficient thickness and surface area to spread the load.
- 10.42.5 No lifting operation shall be undertaken whenever the wind speed at the location of the lifting or at the maximum height of the crane jib exceeds 20 meters per second for tower cranes, or 14 meters per second for mobile cranes and gantry cranes or when loads with a significant surface are lifted with tower cranes.
- 10.42.6 Two or more separately rigged loads shall not be hoisted in one lift.
- 10.42.7 Riggers shall attach lifting accessories to the load in strict compliance with the requirements of the Lifting Plan.
- 10.42.8 The hook latch must be closed and secured prior to and throughout the lifting operation.



FIGURE 11: CRANE HOOK WITH A SAFETY LATCH CLOSED. PICTURE BY TANAKAWHO, CC BY 2.0

- 10.42.9 Prior to any lifting operation, the crane operator and/or lifting supervisor must ensure that all persons affected by the operation have been warned of the operation commencing and that the area under the foreseen lifting path is clear of unauthorized personnel.
- 10.42.10 Only one competent banksman shall provide signals to the crane operator;

- 10.42.11 The banksman shall be clearly identifiable, for example by a different colored vest or helmet;
- 10.42.12 Direct verbal and/or standard international hand signals and/or radio communication between the crane operator and banksman shall be used.
- 10.42.13 The crane operator shall not engage in any activity that may divert their attention while operating the lifting equipment.
- 10.42.14 The crane operator must obey any instructions to abort or stop the operation, regardless of who gives the instruction.
- 10.42.15 The crane operator shall not leave the crane during the lifting operation, and there shall be no suspended load when the crane operator is not at the controls of the crane.
- 10.42.16 Areas where loads, lifting accessories or lifting equipment may fall shall be considered as hazardous and as such shall be delimited by appropriate visual and physical means:
- Chains, warning tape and warning signs for one-off or single lift, and/or;
  - Hard-barriers and warning signs for multiple lifts in the same zone, and/or;
  - Watchperson/s at the lifting zone boundary, where a common or regular access way is blocked due to the lifting or is otherwise reasonably required.
- 10.42.17 Loose items must be lifted in closed boxes or containers whenever reasonably practicable, or otherwise securely fastened onto pallets before lifting.
- 10.42.18 Non-vertical pulling of loads, swinging loads into position and drawing vehicle with lifting equipment is strictly prohibited.
- 10.42.19 Crane booms must not be worked at a radius greater than specified by the manufacturer and certified by a competent 3rd party.
- 10.42.20 The Safe Working Load of the lifting equipment at the relevant angle and radius of the boom must never be exceeded, except when the equipment is being tested by a competent person.
- 10.42.21 No person shall be positioned under any suspended load at any time, or between a suspended load or element of the lifting equipment and fixed object, where a risk of being crushed exists. This includes operations where persons in the baskets of MEWPs may be crushed.
- 10.42.22 All Measures included in the lifting plan/ Rigging Plan must be checked physically by a different person in order to guarantee what is in the plan is meeting the reality at the operations before lifting starts.
- 10.42.23 Wherever practicable, tag-lines shall be used to guide loads in place (see Figure 12), and shall not be wrapped around any part of the body.



FIGURE 12: WORKERS USING TAG-LINES TO GUIDE THE LOAD DURING A LIFTING OPERATION

10.42.24 Whenever operating near to an overhead power line, the requirements of electrical works shall apply. In addition:

- All ground personnel must keep clear of the crane and load at all times;
- Tag-lines must not be used, instead insulated poles (“hot sticks”) must be used to guide the load;
- The crane shall be grounded;
- The load, lifting accessories and lifting equipment shall be wired together in order to ensure the transfer of any induced voltage to the ground.

### 10.43. LONE WORKING

Lone workers are those who work alone without close or direct supervision, thereby being unable to raise the alarm in the event of them being injured, trapped, etc.

10.43.1 Lone working shall be avoided, so far as is reasonably practicable. Lone working, if any, shall be identified in risk assessments and control measures shall be defined

10.43.2 Electrical Works, works in Confined Spaces, works in areas with potentially hazardous atmospheres, works near or over water, works with moving machinery, works in particularly hot temperatures, lifting operations, work at heights) shall never be performed by lone workers.

10.43.3 A register of the names of all lone workers, of their planned location and activity must be kept by the control room or the direct supervisor.

10.43.4 Communication means must be maintained with lone workers. This shall include:

- the use of a suitable “lone-worker device”, triggering an alarm in case the worker is not moving, and/or;
- Regular radio communication from the lone worker to the supervisor or control room, and / or;
- Scheduled checks on the lone worker by other employees or security personnel.
- Locations where there is no mobile network, a satellite phone should be provided.

#### 10.44. LIVE SYSTEMS & LOTO

10.44.1 Access to live systems must be prevented, so far as is reasonably practicable, in order to avoid unintentional exposure to their inherent hazards. All electrical systems, plant, equipment, apparatus, wires and cables must be presumed live unless proved dead. Consideration must be given to stored energy that may be retained in plant, equipment and apparatus after its disconnection/isolation from the system. Non-insulated conductors shall not be touched whenever cable ends cannot be observed. The following table describes the minimum control measures that must be applied to specific types of systems.

TABLE 2: MINIMUM CONTROL MEASURES FOR LIVE SYSTEMS

Type of system	Risk / Impact	Control
Electrical transformers, substations, electrical rooms.	Electrical shock by direct contact or arc.	<p>Access to live electrical rooms shall be posted with safety signs prescribing the use of insulated or non-conductive tools only.</p> <p>Full enclosure at a distance equal to or greater than the outer limit of the Vicinity Zone from any exposed live part.</p> <p>Access control by a door(s) that remains closed and locked whenever works are not undertaken within the enclosure.</p> <p>Door(s) lock(s) must be operated by unique keys.</p> <p>Door(s) lock keys must be kept by the Authorized Person in charge of the system, and be controlled with a high-control Permit to Work.</p>
Electrical cabinets	Electrical shock by direct contact or arc.	<p>Electrical cabinets closed and locked whenever works are not undertaken inside them.</p> <p>Electrical cabinet tagged with the signs and warnings indicating the presence of electrical hazard. If not reasonably practicable, a restricted area (physical delimitation supported by warning signs) shall be implemented around open live equipment.</p>
Buried systems	Electrical shock by direct contact, explosion, exposure to harmful hazardous substances, contamination of soil and groundwater	<p>Buried services must be marked on as-built drawings.</p> <p>Underground warning mesh must be laid over the buried service, at a distance of at least 50 cm from the service.</p>



Type of system	Risk / Impact	Control
Cable trays and pipe racks	Electrical shock by direct contact, explosion, exposure to harmful hazardous substances, release of greenhouse gases or VOCs to the atmosphere.	<p>Notices displayed every 10 meters on trays or pipe racks as soon as one of their elements is energized.</p> <p>Fire-protection system operational and energized prior to any fuel oil / fuel gas system is energized.</p> <p>Identification of piping with the nature of the fluid they convey, their physical properties (temperature, pressure), and direction of the fluid.</p>
Effluent treatment plant and outfall channels	Exposure to biological agents and pathogens, exposure to hazardous substance, risk of drowning (negative buoyancy zones).	<p>Full enclosure, access controlled by PTW or equivalent.</p> <p>Areas of negative buoyancy fully barricaded.</p>
Site drains (process-water, storm-water, surface-water) and associated systems (e.g. oily-water separator)	Contamination of surface water.	Interceptors and other environmental protection systems must be operational and energized prior to any substance is brought on site that could lead to the contamination of surface water.
Coal / ash conveying systems	Exposure to moving parts, risk of being drawn in mechanical parts.	All moving parts (including the conveying belt) must be protected with suitable safeguarding means.
Fuel oil / fuel gas systems (e.g. tanks, piping, compressors, etc.)	Fire, explosion.	<p>Full enclosure at a distance equal to or greater than the outer limit of explosive zone 1.</p> <p>Access control by a door(s) that remains closed and locked whenever works are not undertaken within the enclosure.</p> <p>Door(s) lock(s) must be operated by unique keys.</p> <p>Door(s) lock keys must be kept by the Authorized Person in charge of the system, and be controlled with a high-control Permit to Work.</p> <p>Fire-protection system operational and energized prior to any fuel oil / fuel gas system is energized.</p>



Type of system	Risk / Impact	Control
Demineralization plant, neutralization sump, other water treatment systems	Exposure to harmful hazardous substances.	<p>Full enclosure of the building / area.</p> <p>Access control by a door(s) that remains closed and locked whenever works are not undertaken within the enclosure.</p> <p>Door(s) lock(s) must be operated by unique keys.</p> <p>Door(s) lock keys must be kept by the Authorized Person in charge of the system and be controlled with a high-control Permit to Work.</p> <p>Emergency shower and decontamination systems operational and energized before charging of any hazardous substance.</p>
Fly-ash silo, bottom-ash silo, electrostatic precipitators, fabric filter houses, ash ducts.	Fire / explosion, exposure to harmful hazardous substances (dust), asphyxiation / engulfment.	<p>Full enclosure of the building / area.</p> <p>Access control by a door(s) that remains closed and locked whenever works are not undertaken within the enclosure.</p> <p>Door(s) lock(s) must be operated by unique keys.</p> <p>Door(s) lock keys must be kept by the Authorized Person in charge of the system, and be controlled with a high-control Permit to Work.</p> <p>Ventilation and fire protection systems operational and energized prior to the charging of any concerned system.</p>
Flue Gas Desulphurization	Thermal burns due to exposure to hot liquid, chemical burns due to exposure to corrosive substances, or combination thereof.	Warning signs applied on all systems where there is a risk of leaks of corrosive or hot substances, and to all external piping where they may be a risk of burn by direct contact.

10.44.2 Exposure to electrical hazard shall be managed according to the requirements mentioned in sections: “10.7” to “10.13”.

#### 10.45. VEHICLES

Unless specifically stated otherwise, this section also applies to vehicles provided by Valtalia to its employees, also when they are used outside of working hours.

10.45.1 All permanent site-based vehicles (excluding passenger only) on project sites must be fitted with operational rotating / flashing lights, reversing sound-alarms, and seatbelts at all seats.

10.45.2 All vehicles on site must be fitted with an operational parking brake.

10.45.3 All permanent site-based vehicles must be equipped with a fire extinguisher, safety triangle and high visibility vest installed in a way to be readily accessible and inspected in accordance with the applicable requirements.

- 10.45.4 Seatbelts, where fitted, shall be fastened when the vehicle is being moved.
- 10.45.5 Windows and windscreens must be constructed with safety glass complying with the requirements of BS 857:1967 'Specification for safety glass for land transport' or equivalent, free of any cracks that hinder vision.
- 10.45.6 All vehicles on site must be fitted with front position lamps, dipped beam headlamps, turn signals, rear position lamps, stop lamps (including center high mount stop lamp, so far as is reasonably practicable), reversing lamps and hazard flashers. All vehicle lights must be fully operating and not damaged.
- 10.45.7 It is strictly forbidden to use the mobile phone while driving a vehicle (including with a hands-free device).
- 10.45.8 Emergency vehicles need to be adapted to local conditions and constraints. They must be identified and have an adequate communication system in place, when possible

#### **10.46. PORTABLE POWER TOOLS**

- 10.46.1 All portable electrical equipment must be provided with GFCIs.
- 10.46.2 Portable electrical power tools shall be grounded (earthed) or double insulated, and connected to the electrical supply through a residual current device
- 10.46.3 Electrical cords shall be in good condition.
- 10.46.4 In possibly wet environment, any electrical equipment where water can come into contact with shall be placed above ground and be of an appropriate water protection degree (minimum IPx4 rating according to IEC 60529, or equivalent).
- 10.46.5 Hoses and tools with quick release valves or fittings shall be fitted with whip restraining systems (anti-whipping system).
- 10.46.6 Portable circular saws, grinders and magnetic drilling machines must be provided with safeguarding around non-active movable parts.
- 10.46.7 All portable power tools must be fitted with a system that prevents unintentional start (e.g. interlock).
- 10.46.8 Hand-held power tools fitted with accessories (discs, wheels, bands, bits, blades, etc.) used for the purpose of cutting or grinding any material must be fitted with a switch that cannot be locked in the "on" position ("non-latching ON switch", "dead-man switch"). Non-impact drills and magnet drills may be exempted from this requirement.
- 10.46.9 It is strictly forbidden to bypass or otherwise tamper with safety devices, including non-latching switches and dead-man controls.
- 10.46.10 Whenever a handle is provided by the manufacturer, the tool must have it fitted. It is strictly forbidden to remove the handle.
- 10.46.11 Operators shall use the tool by holding the tool with two hands, and holding the handle whenever fitted.
- 10.46.12 When changing tools, adjusting, setting up or cleaning a portable power tool, the operator must disconnect it from its source of power (e.g. remove the battery, unplug the power socket, detach the compressed air hose, etc.).
- 10.46.13 Temporary lighting shall be equipped with guards to prevent accidental contact with the bulb.
- 10.46.14 Lights shall not be suspended by their cords.

#### **10.47. PLANT, EQUIPMENT AND MACHINES – REFUELING**

- 10.47.1 Refueling of plant and equipment shall only be performed by competent persons.
- 10.47.2 Refueling of plant and equipment with more than 20 Liters of very flammable fuel (e.g. gasoline) shall be considered as a high control activity and controlled as such (high control Permit to Work).
- 10.47.3 Containers of a capacity lower than 20 Liters must be appropriate and designed for purpose (e.g. jerry-cans), with an appropriate filling spout or funnel.
- 10.47.4 All refueling activities must be done over drip trays; emergency spill kits and adequate fire extinguishers must be immediately available.

#### **10.48. PLANT, EQUIPMENT AND MACHINES – COMPRESSED GAS CYLINDERS**

- 10.48.1 Compressed gas cylinders shall be stored in areas with good ventilation, where the temperature can be easily monitored, and out of direct sunlight.
- 10.48.2 Storage areas must be clearly marked with clear and visible signage to highlight that smoking and naked flames are prohibited.
- 10.48.3 Storage areas for compressed gas cylinders must have a level concrete base. For hazardous gases that are heavier than air (e.g. propane), storage areas must be free of open drains where gases could accumulate and Generate a risk.
- 10.48.4 Compressed gas cylinders must always be stored upright and shall be secured to prevent falls.
- 10.48.5 Cylinders containing flammable gases must be separated from those containing oxidizers (including oxygen).
- 10.48.6 Cylinders used for the transportation of compressed gases must be specifically designed, manufactured and when relevant approved for that purpose.
- 10.48.7 Compressed gas cylinders must be clearly marked with labels identifying their contents. Color coding alone shall not be relied upon to identify the contents of compressed gas cylinders.
- 10.48.8 Compressed gas cylinders and associated equipment must be marked with the date of their last hydrostatic testing and / or the date of their next due hydrostatic testing, and their maximum allowable pressure.
- 10.48.9 Valves and fittings of compressed gas cylinders and other pressurized systems must not be used for lifting and carrying.
- 10.48.10 Compressed gas cylinders and fittings must be kept away from sources of contamination. Any contact between oxygen cylinders (and associated equipment) and oil and greases must be avoided. Compressed gas cylinders shall never be taken into areas with poor ventilation.
- 10.48.11 Protective valve caps must always be fitted onto compressed gas cylinders.
- 10.48.12 Compressed gas cylinders shall never be used for any purpose other than to contain pressurized gases.
- 10.48.13 Compressed gas cylinders and associated equipment must never be painted over, have any labels removed, or have any of their engraved markings changed, even if they are presumed to be empty.
- 10.48.14 It is strictly forbidden to use a flame to detect gas leaks from compressed gas cylinders and associated equipment. Leak detection must always be done by hearing and visual inspection, and / or the use of a soapy water solution.
- 10.48.15 Additional control measures must be implemented when there is a risk of frost bite due to cold temperatures associated with the sudden de-pressurization of a compressed gas or with the

use of a cryogenic fluid. These measures may include but shall not be limited to appropriate PPE such as full-face shield and cryogenic handling gloves.

10.48.16 The use of Teflon tape or other sealants is forbidden on the gas regulator fittings, as they may lead to breaking the retaining nut and therefore cause gas leaks.

10.48.17 Appropriate gas regulator fittings must be used and must not be modified in any way. Selection of gas regulator fittings must take into account the pressure and temperature of the gas and its chemical properties.

#### **10.49. EXTREMELY HOT TEMPERATURES**

10.49.1 The risk levels for working in hot environments (whether they are due to climatic conditions or to the activities undertaken) shall take into account the Dry-bulb temperature (measured in the shade) and the humidity level. The following table defines the Heat Index value for various combinations of Dry-bulb temperature and humidity.

TABLE 3: HEAT INDEX TABLE

		Relative Humidity, %							
		< 30	30	40	50	60	70	80	90
Dry Bulb Temp, °C	50	54	>54	>54	>54	>54	>54	>54	>54
	49	54	>54	>54	>54	>54	>54	>54	>54
	48	53	>54	>54	>54	>54	>54	>54	>54
	47	51	>54	>54	>54	>54	>54	>54	>54
	46	50	>54	>54	>54	>54	>54	>54	>54
	45	49	54	>54	>54	>54	>54	>54	>54
	44	46	52	>54	>54	>54	>54	>54	>54
	43	45	49	>54	>54	>54	>54	>54	>54
	42	43	47	54	>54	>54	>54	>54	>54
	41	41	45	51	>54	>54	>54	>54	>54
	40	40	43	48	54	>54	>54	>54	>54
	39	39	41	46	52	>54	>54	>54	>54
	38	38	39	43	49	54	>54	>54	>54
	37	37	38	41	46	51	>54	>54	>54
	36	36	36	39	43	48	54	54	>54
	35	35	35	37	41	45	50	54	>54
	34	34	34	35	38	42	47	52	>54
	33	33	33	34	36	40	43	48	54
	32	32	32	32	34	37	40	44	49
	31	31	31	31	33	35	38	41	45
	30	30	30	30	31	33	35	38	41
29	29	29	29	30	31	33	35	37	
28	28	28	28	28	29	31	32	34	
27	27	27	27	27	28	29	30	31	
26	26	26	26	27	27	27	28	28	

10.49.2 The following table provides a description of heat-related health & safety risks associated with the Heat Index.

TABLE 4: H&S RISKS ASSOCIATED WITH HEAT INDEX

Heat Index	Health & Safety Risks
≥ 54	Heat stroke imminent.
39 – 53	Heat exhaustion likely. Heatstroke possible with prolonged exposure and physical activity.
32 – 38	Heat exhaustion possible with prolonged exposure and physical activity.
27 - 31	Fatigue possible with prolonged exposure and/or physical activity.

10.49.3 The following must be considered as control measures to reduce the exposure to hot environments or to reduce the likelihood and severity that such exposures would result in injuries:

- Insulate heat sources;
- Shield heat sources;
- Provide good workplace ventilation;
- Provide cool refuges;
- Adapt the working hours in order to avoid working during the hottest hours of the day;
- Reduce the duration and / or frequency of tasks to be undertaken in the hot environment, and allow for frequent breaks (see Table 5: Recommended control measures to reduce the effect of heat);
- Increase the quantity of fresh and cool (10 to 20°C) water per employee and per day and make it available in the immediate working area, so that any worker could drink 50 cL every 15 minutes while working (see Table 5: Recommended control measures to reduce the effect of heat);
- Acclimatization procedures to allow for a gradual physiological adaptation of the person to the change in temperatures (see Table 6: Recommendations for acclimatization to hot and cold environments).

TABLE 5: RECOMMENDED CONTROL MEASURES TO REDUCE THE EFFECT OF HEAT

Heat Index	Work : Rest (minutes)	Water intake per person	Additional Controls
27 – 31	50 : 10	50 cL every 20 minutes	Continuous visual monitoring of workers in direct sun and heavy work. No lone working
32 – 38	40 : 10	50 cL every 20 minutes	No lone working
39 – 53	30 : 10	50 cL every 15 minutes	Work under shade.
≥ 54	-	-	Consider stopping of work.

TABLE 6: RECOMMENDATIONS FOR ACCLIMATIZATION TO HOT AND COLD ENVIRONMENTS

Day	Acclimatization
1 <sup>st</sup>	20
2 <sup>nd</sup>	40
3 <sup>rd</sup>	60
4 <sup>th</sup>	80
5 <sup>th</sup>	100

10.49.4 Whenever there are sources of radiated hot temperatures (e.g. hot surfaces, furnaces) that may cause a risk to the health & safety of persons, the exposure of persons must be reduced by implementing adequate screens to reduce the amount of radiated energy, so far as is reasonably practicable.

10.49.5 Training on identification of signs and symptoms of heat stress illness, including what to do in the event of an emergency;

10.49.6 A buddy is mandatory when working in extreme temperature conditions (working alone is prohibited).

**10.50. EXTREMELY COLD TEMPERATURES**

10.50.1 The risk levels for working in cold environments (whether they are due to climatic conditions or to the activities undertaken) shall take into account the Dry-bulb temperature (measured in the shade) and the speed of wind. The following table defines the wind-chill temperature value for various combinations of dry-bulb temperature and wind speed, and associated level of risk. Wind-chill temperatures in the “cold” zone may cause the skin to freeze within 1 minute.

TABLE 7: WIND-CHILL TEMPERATURES

		Air Temperature (Celsius)																
		0	-1	-2	-3	-4	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60
Wind Speed (km/hr)	6	-2	-3	-4	-5	-7	-8	-14	-19	-25	-31	-37	-42	-48	-54	-60	-65	-71
	8	-3	-4	-5	-6	-7	-9	-14	-20	-26	-32	-38	-44	-50	-56	-61	-67	-73
	10	-3	-5	-6	-7	-8	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63	-69	-75
	15	-4	-6	-7	-8	-9	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66	-72	-78
	20	-5	-7	-8	-9	-10	-12	-18	-24	-30	-37	-43	-49	-56	-62	-68	-75	-81
	25	-6	-7	-8	-10	-11	-12	-19	-25	-32	-38	-44	-51	-57	-64	-70	-77	-83
	30	-6	-8	-9	-10	-12	-13	-20	-26	-33	-39	-46	-52	-59	-65	-72	-78	-85
	35	-7	-8	-10	-11	-12	-13	-20	-27	-33	-40	-47	-53	-60	-66	-73	-80	-86
	40	-7	-9	-10	-11	-13	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74	-81	-88
	45	-8	-9	-10	-12	-13	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75	-82	-89
	50	-8	-10	-11	-12	-14	-15	-22	-29	-35	-42	-49	-56	-63	-69	-76	-83	-90
	55	-8	-10	-11	-13	-14	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77	-84	-91
	60	-9	-10	-12	-13	-14	-16	-23	-30	-36	-43	-50	-57	-64	-71	-78	-85	-92
	65	-9	-10	-12	-13	-15	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	70	-9	-11	-12	-14	-15	-16	-23	-30	-37	-44	-51	-58	-65	-72	-80	-87	-94
	75	-10	-11	-12	-14	-15	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80	-87	-94
80	-10	-11	-13	-14	-15	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95	
85	-10	-11	-13	-14	-16	-17	-24	-31	-39	-46	-53	-60	-67	-74	-81	-89	-96	
90	-10	-12	-13	-15	-16	-17	-25	-32	-39	-46	-53	-61	-68	-75	-82	-89	-96	
95	-10	-12	-13	-15	-16	-18	-25	-32	-39	-47	-54	-61	-68	-75	-83	-90	-97	
100	-11	-12	-14	-15	-16	-18	-25	-32	-40	-47	-54	-61	-69	-76	-83	-90	-98	
105	-11	-12	-14	-15	-17	-18	-25	-33	-40	-47	-55	-62	-69	-76	-84	-91	-98	
110	-11	-12	-14	-15	-17	-18	-26	-33	-40	-48	-55	-62	-70	-77	-84	-91	-99	
		0 to -10 Low			-10 to -25 Moderate			-25 to -45 Cold			-45 to -59 Extreme			-60 Plus very Extreme				

10.50.2 The following must be considered as control measures to reduce the exposure to cold environments or to reduce the likelihood and severity that such exposures would result in injuries:

- Insulate cold sources;



- Shield cold sources and / or provide shelters to protect persons from the wind;
- Provide warm refuges;
- Adapt the working hours in order to avoid working during the coldest hours of the day;
- Reduce the duration and / or frequency of tasks to be undertaken in the cold environment, and allow for frequent breaks in warm refuges
- Provide warm beverages in the immediate vicinity of the work area, and in the sheltered areas and warm refuges);
- Acclimatization procedures to allow for a gradual physiological adaptation of the person to the change in temperatures (see Table 6: Recommendations for acclimatization to hot and cold environments);
- Provide persons exposed to cold working conditions with work clothing that protects as much as possible all exposed body parts. Protective clothing should be constituted of several layers of fabric, so far as is reasonably practicable and the outer layers must be of material that resist to wind and water, whenever relevant. Clothing must be kept dry and, whenever it gets wet, workers must be allowed to change to dry clothes immediately;
- Provide suitable additional PPE as relevant (e.g. gloves).

TABLE 8: RECOMMENDED CONTROL MEASURES TO REDUCE THE EFFECT OF COLD

Wind Chill Temperature (°C)	Maximum work Period	Number of Breaks
0° to -25°	Normal Breaks	
-26° to -34°	75 min.	2
-35° to -37°	55 min.	3
-38° to -39°	40 min.	4
-40° to -42°	30 min.	5
-43° & below	Non-emergency work should cease	

10.50.3 Any PPE provided for protection against the cold shall not diminish the individual protection provided by other PPE.

10.50.4 The wind increases the effects of cold temperatures (wind chill). This must be especially taken into consideration for working at height.

10.50.5 Training on identification of signs and symptoms of cold stress illness, including what to do in the event of an emergency;

10.50.6 A buddy is mandatory when working in extreme temperature conditions (working alone is prohibited)

## 11. INDUSTRIAL HYGIENE

### 11.1. GENERAL SUBJECTS

- 11.1.1 All HSE Risks and Impacts Analyses must consider the potential exposure of persons to chemical, biological and physical agents (including process by-products) that could harm their health.
- 11.1.2 When assessing health risks, the HSE Risks and Impacts Analyses must consider, in particular:
- The hazardous properties of the agent and its potential health effect(s);
  - How the hazard arises (produced or given off by a process, activity or as a result of an accident, incident or work practice, etc.) and the physical form of the substance (powder, vapor, dust, etc.);
  - The level, type and duration of exposure, defining potential acute and/or chronic exposure;
  - The foreseeable entry way of the agent into the human body (i.e. ingestion, inhalation, direct contact, indirect contact – for radiation);
  - The relevant circumstances of the work, including the amount of the substance involved;
  - Any relevant workplace exposure limit or similar occupational exposure limit;
  - The results of exposure monitoring, when available;
  - The results of relevant medical surveillance, when available;
  - In circumstances where the work involves exposure to more than one hazard to health, the risk presented by exposure to such substances or physical agents in combination.
- 11.1.3 Risk reduction measures and specific exposure limits (when existing) are given for the following agents in dedicated sections of this document.
- 11.1.4 As a General and overarching principle, whenever it is suspected that exposure levels are close to, equal or greater than the applicable OEL, quantitative monitoring must be implemented in accordance with the recommended method and / or best industrial practice.
- 11.1.5 Whenever quantitative monitoring confirms that the exposure levels are equal to or greater than the OEL, immediate measures must be implemented in order to reduce the exposure levels, in accordance with the following hierarchy:
1. Eliminate the process Generating the exposure, or the harmful agent (e.g. use Phased-Array Ultrasound Testing instead of gamma radiography);
  2. Substitute the harmful agent by a less harmful agent (e.g. use diluted substances);
  3. Implement engineering / technical measures to reduce the likelihood, duration, or severity of exposure (e.g. use of silencers for steam blow, exclusion zone);
  4. Implement administrative measures to reduce the likelihood, duration, or severity of exposure, or the number of persons exposed (e.g. Permit to Work);
  5. Ensure that all exposed persons use appropriate Personal Protective Equipment.
- 11.1.6 If welding is conducted on Zinc bases, metals or coatings, or stainless steel, a suitable fume extraction system shall be in operation, so far as is reasonably practicable. In addition, all persons potentially exposed to such welding fumes shall wear the appropriate filter-type respirators.

### 11.2. NOISE – OCCUPATIONAL EXPOSURE LIMITS

In absence of local regulations, or in presence of less stringent regulations, the following shall be considered as the occupational exposure limits to be applied on all sites:

TABLE 9: NOISE - OCCUPATIONAL EXPOSURE LIMITS

Duration of exposure	First action level	Second action level	Maximum exposure level
8 hours - average measurement in dB(A)	80	85	87
Short – peak measurement in dB(C)	135	137	140

### 11.3. NOISE – PREVENTION AND HEARING PROTECTION

11.3.1 Noise levels must be maintained below the first action level, so far as is reasonably practicable. In order to do so, the following measures may be implemented:

- Design and install silencers and soundproof enclosures on equipment Generating noise likely to expose personnel to levels higher than the second action level;
- Direct vents and pressure release valves as far away from site personnel or areas likely to have personnel as possible;
- Schedule particularly noisy activities (e.g. piling) at times where it is likely to expose a smaller number of persons;
- Provide “silent havens”, closed rooms well insulated or sound proof where personnel exposed to high noise levels can rest.

11.3.2 Work areas where noise levels may be higher than the first action level shall be specifically marked. In addition, access to areas where noise levels may be higher than the second action level must be physically restricted.

11.3.3 All work plant and equipment that emits a noise level higher than the second action level in normal operating condition must be specifically marked in a way that is visible by its operator(s), and that requires them to use hearing protection while operating the equipment.

11.3.4 If noise levels exceed the first action level, exposed employees must be made aware of the risks and associated control measures. Appropriate PPE must be made available to all exposed persons.

11.3.5 If noise levels exceed the Second Action Level, the use of hearing protection shall be obligatory.

11.3.6 Beyond the maximum exposure level, double protection must be used, i.e. ear plugs combined with ear muffs.

### 11.4. ERGONOMICS

11.4.1 All HSE Risks and Impacts Analyses must consider the following ergonomics hazards:

- Awkward postures (e.g. prolonged work with hands above head or elbows above shoulders, neck bent, squatting, kneeling, handling of objects with back bent/twisted, repeated or sustained bending or twisting of wrists, knees, hips, shoulders, way of sitting / standing, moving space);
- Access into or working within awkward or tight spaces where bodily movement is constrained;
- Forceful manual handling (lifting, pushing, pulling);
- Prolonged repetitive movements;
- Repeated contact with hard or sharp objects;
- Prolonged exposure to vibration;
- Organization of the workplace;
- Lighting, quality of air, temperature, ambient noise;
- General mobility (or immobility) during the execution of work activities.

- 11.4.2 All workplaces must be heated and / or ventilated so to maintain a pleasant temperature, so far as is reasonably practicable.
- 11.4.3 The following equipment must be provided to laptop users at their main work location / workplace, so far as is reasonably practicable:
  - A docking station;
  - An external monitor;
  - A keyboard;
  - A mouse or other suitable pointing system.
- 11.4.4 A specific ergonomic risk assessment shall be prepared for any task which would require unusual or significant manual handling, as well as those involving manual lifting of loads above 25kg for males or 10kg for females or young workers.

## 11.5. RADIATION – NON IONIZING RADIATION, ULTRA-VIOLET AND INFRA-RED

- 11.5.1 Sources of non-ionizing radiation include:
  - Welding;
  - Sunlight;
  - Lasers.
- 11.5.2 Employers must identify the sources of visible, UV and IR radiation that may cause a risk for the health of persons.
- 11.5.3 Any equipment that emits UV radiation and the area where the equipment is located must have appropriate UV warning labels posted.
- 11.5.4 Appropriate training must be delivered to persons exposed to UV & IR radiation on its associated risks.
- 11.5.5 For persons operating in the presence of laser and welding activities, the following controls must be considered:
  - Opaque screens;
  - Visible, UV and IR radiation blocking filters and door interlocking power supplies;
  - Job rotation;
  - Suitable PPE (e.g. goggles with filter lens, welding gloves & clothes).
- 11.5.6 For persons exposed to UV radiation from sunlight, minimization techniques include:
  - Avoiding the outdoors when the sun UV & IR radiation is at its most intense;
  - Providing shade cover;
  - Suitable PPE (E.g. wide brimmed hat, long sleeve shirt, pants, sunscreen, sunglasses etc.).
- 11.5.7 Outlined below is a UV Index (in accordance with the requirements of the World Health Organization, defined in the publication 'WHO/SDE/OEH/02.2 Global Solar UV Index, A Practical Guide') table which describes protection measures depending on the UV index of the site location.

TABLE 10: STANDARD PROTECTION MEASURES AGAINST SOLAR UV RADIATION

UV Index - Sunlight		
UV range	Risk	UV protection measures
11 +	Extreme	Prolonged exposure to extreme levels of UV radiation can pose serious health risks. Attempt to conduct work out of direct sunlight until UV Index levels decrease or really cover up. UV protective clothes and wide brimmed hat must be used along with sunglasses and sunscreen with a protection factor of 30. Seek shade when possible.
8 - 10.9	Very High	A wide brimmed hat shall be used to protect head, face, eyes, neck, and shoulders by creating shade. Legs and arms can be protected with UV protective clothing. Sunscreen with a protection factor 30 or more must be made available to all exposed employees and must be used on exposed skin
6 - 7.9	High	When the UV Index is 'high' there is a real possibility of skin or eye damage. Good UV protection should include sunglasses, a hat, sunscreen with a protection factor of 15 or more, and UV protective clothing.
3 - 5.9	Moderate	If the UV Index level is closer to low not much protection is needed. Otherwise, sunglasses, a hat, and sunscreen with a protection factor of 15 or more applied to exposed areas should provide adequate UV protection.
0 - 2.9	Low	When the UV Index is 'low' there is little risk of exposure. No particular protection is required.

When using protecting clothing or vests, make sure it is compatible with PPE. Also it is important to understand what type of work the person is doing to avoid this clothing to bring additional risks or undermine the protections of PPE.

#### 11.6. BIOLOGICAL RISKS – DISEASES / ANIMALS

- 11.6.1 Special attention should be paid for the health-related subjects, as for instance:
- 11.6.2 COVID19;
- 11.6.3 HIV/AIDS;
- 11.6.4 Prevention and treatment of Malaria, Dengue, Zika, Chicongonha, etc.
- 11.6.5 Local endemic diseases – Typhoid, Cholera, Hepatitis, etc.
- 11.6.6 Wild animals living on, or near, our facilities,
- 11.6.7 Control of plagues as flees, tics, bees, etc.
- 11.6.8 seeking specialized medical help and establishing specific contingency plans according to the level and circumstances of risk identified.

## 11.7. CHEMICALS - USE OF HAZARDOUS SUBSTANCES

- 11.7.1 Exposure monitoring; suitable techniques will be implemented to assess the extent of employees' exposure to substances hazardous to health via all routes (inhalation, ingestion and / or skin).
- 11.7.2 Exposure monitoring is necessary if:
- 11.7.3 The risk assessment shows that an initial exploratory monitoring exercise is necessary to reach an informed and valid judgment about the risks;
- 11.7.4 Failure or deterioration of the control measures could result in a serious health effect, either because of the toxicity of the substance or because of the extent of the potential exposure or both;
- 11.7.5 Any change in the conditions affecting employees' exposure means that adequate control of exposure is no longer being maintained;
- 11.7.6 The risk assessment shows it is needed to monitor for the presence of any biological agents outside the primary physical containment.

## 11.8. DUST

- 11.8.1 Dust of any kind, when present in substantial quantities in the air, becomes a hazardous substance as defined in COSHH regulations. Assessments will therefore be carried out on all works that produce significant quantities of dust.
- 11.8.2 Wherever possible methods of work will be employed that will minimize the production of dust. This may involve work methods that will not produce dust, the use of local extraction units or the wetting down of work areas to minimize the production of dust.
- 11.8.3 Wetting down shall only be carried out where it is safe to do so and shall not be done if there is any risk of contact with live electricity. As an additional measure, any operatives working within dusty areas shall be issued with Personal Protective Equipment determined by the risk assessment for the process.
- 11.8.4 Dust extraction units will be attached on all chasing machines or abrasive wheels used for operations that will produce dust.

## 11.9. FUMES

- 11.9.1 All processes generating fumes shall be fully assessed before any work is carried out. All assessments will be recorded, communicated to those involved, resourced and enforced.
- 11.9.2 Wherever possible, work will be carried out using either an alternative method that does not produce fumes or the work will be carried out off site under controlled conditions.
- 11.9.3 If no alternative methods of work are practicable, work shall be carried out using local fume extraction.
- 11.9.4 As a last resort, and only when fumes are of low toxicity and when work will be carried out in well-ventilated areas, personal protective equipment may be used to protect an operative. The choice of personal protective equipment used will be determined by the assessment carried out.

## 12 BIBLIOGRAPHY

The following is a list of external regulation, standards and norms that are referenced to in this Directive. They do not constitute an overarching framework that this Directive complies with:

“Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards General Safety Requirements”, GSR Part 3, published by the International Atomic Energy Agency.

“Security of Radioactive Sources”, STI/PUB/1387, published by the International Atomic Energy Agency.

“Global Solar UV Index, A Practical Guide”, WHO/SDE/OEH/02.2, published by the World Health Organization.

“ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)”, published in: Health Physics 74 (4):494-522; 1998 by the International Commission on Non-Ionizing Radiation Protection.

Directive 2002/44/EC of the European Parliament and of the Council of 25 June 2002 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration).

Directive 2013/35/EU of the European Parliament and of the Council of 26 June 2013 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields).

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures.

“Chemical warehousing: The storage of packaged dangerous substances”, HSG71, published in 2009 by Health and Safety Executive (HSE). ISBN: 9780717662371.

“Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice and guidance”, L24 (second edition), published in 2013 by Health and Safety Executive (HSE). ISBN: 9780717665839.

EN 455-1 & EN 455-2 Medical gloves for single use

ISO 14122-4 Safety of machinery -- Permanent means of access to machinery -- Part 4: Fixed ladders.

ISO 780 Packaging — Distribution packaging — Graphical symbols for handling and storage of package.

EN 397:2012 Industrial Safety Helmets.

EN 812:2012 Industrial Bump Caps.

ISO 20345:2011 Personal protective equipment – Safety footwear.

EN 166:2001 Personal eye protection – specifications.

ISO 20471:2013 High visibility clothing – Test methods and requirements.

EN396:1994 Lifejackets and personal buoyancy aids.

ISO 12402-3 Personal flotation devices – Part 3: Lifejackets

IEC 60529 Degrees of protection provided by enclosures (IP Code).

EN 12811-1 Temporary Works Equipment – Part 1: Scaffolds – performance requirements and General design.

BS 857:1967 Specification for safety glass for land transport

IOHS – Institute Of Health and safety / NEBOSH Qualification for H&S

HSE – Health and safety Executive – [www.hse.gov.uk](http://www.hse.gov.uk)

ILO – International Labour Organization - Housing Recommendation n° 115



### 13 ATTACHMENTS

#	Definition	Pages
N/A	N/A	N/A