

GENERAL SPECIFICATION

SAFETY

GS EP SAF 221

Safety rules for buildings

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1. Scope

1.1 Purpose

The purpose of this General Specification is to define the safety requirements and recommendations for buildings used in the hydrocarbon production and processing industry.

This document covers four main classes of requirements related to:

- The safety of buildings inside the restricted area
- The safety requirements for electrical equipment inside the buildings
- The safety requirements to comply with during the design of buildings to preserve human life in case of a fire
- The safety of buildings where humans are accommodated.

1.2 Applicability

This specification is **not** retroactive.

It shall apply to new installations and to major modifications or extensions of existing installations.

This specification applies to **onshore** and **offshore** installations with the exception of chapter 7, which is only valid for onshore buildings.

For offshore buildings **IMO SOLAS** (2004 edition) and subsequent amendments shall apply.

This specification is limited to buildings for occupancies commonly used by Company, such as small assemblies, hotels and lodgings (respectively large and small living quarters), offices (business), industrial and storage enclosures. It also covers buildings containing electrical equipment and special equipment such as gas turbines, enclosed process units and internal combustion engines (refer also to **GS EP SAF 222**).

This specification does not cover other types of buildings which are not commonly encountered on facilities operated by Company, e.g. large assemblies, buildings where occupants are not physically or mentally capable, apartment buildings, family dwellings, mercantile where public can access and high-rise buildings.

The present document should not be considered as a substitute for proper design, specification, construction, security, inspection and maintenance of buildings. It does not cover, in particular:

- The design and construction requirements for building and utilities located outside the restricted area (refer to **GS EP CIV 401**)
- The safety requirements for the layout of installations, both onshore and offshore (refer to **GS EP SAF 021** and **GS EP SAF 253**)
- The assessment of the type & degree of the ventilation and the need of pressurization systems (refer to **GS EP SAF 216**)
- The basis of HVAC design (refer to **GS EP HVA 100**)
- The principles of the partition of the installation into fire zones (refer to **GS EP SAF 253**)

- The characteristics of automatic Fire & Gas detection systems (refer to [GS EP SAF 312](#))
- The safety requirements for the emergency control systems (refer to [GS EP SAF 371](#)).
- The design and installation of Active Fire Protection means (refer to [GS EP SAF 311](#), [GS EP SAF 321](#), [GS EP SAF 322](#), [GS EP SAF 331](#) and [GS EP SAF 334](#))
- The use of Passive Fire Protection means (refer to [GS EP SAF 337](#))

The Escape, Evacuation and Rescue means and procedures (refer to [GS EP SAF 351](#))

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
ANSI Z 358.1	American National Standard for Emergency Eyewash and Shower Equipment
API RP 14G	Recommended Practice for Fire Prevention and Control on Fixed Open-type Offshore Production Platforms
ASME/ANSI A 17.1	Safety Code for Elevators and Escalators
ASTM E84-09a	Standard Test Method for surface Burning Characteristics of Building Materials
ASTM E136-09	Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750°C
ASTM F1322-90	Standard Guide for Selection of Shipboard Incinerators
ASTM F1323	Standard Specification for Shipboard Incinerators
DOE (ISBN 0-11-412961)	Offshore Installations: Guidance on design, construction and certification. Health and Safety Executive (previously DOE Department Of Energy), Great Britain, 3rd edition, H.M.S.O London, 1990 - (amendments of 06/1992 and 06-12/1993)
ILO R164	Occupational Safety and Health Recommendation, International Labour Organisation, 22 June 1981
IMO MODU Code	Code for the Construction and Equipment of Mobile Offshore Drilling Units, International Maritime Organisation, (Cons. 2001).
IP 15	Area Classification Code for Installations handling Flammable Fluids: Part 15 of the IP Mode Code of Safe Practice in the Petroleum Industry, 3 rd edition, July 2005

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Reference	Title
ISO 9612	Acoustics- Determination of occupational noise exposure-Engineering method
ISO 13702	Petroleum and natural gas industries – Control and mitigation of fires and explosions on offshore production installations – Requirements and guidelines
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 13	Standard for the Installation of Sprinkler Systems
NFPA 14	Standard for the Installation of Standpipe and Hose Systems
NFPA 17	Standard for Dry Chemical Extinguishing Systems
NFPA 31	Standard for the Installation of Oil-Burning Equipment
NFPA 54	National Fuel Gas Code
NFPA 58	Liquefied Petroleum Gas Code
NFPA 70E	Standard for Electrical Safety in the Workplace
NFPA 80	Standard for Fire Doors and other Opening Protectives
NFPA 82	Standard on Incinerators, Waste and Linen Handling Systems and Equipment
NFPA 90A	Standard for Installation of Air Conditioning and Ventilating Systems
NFPA 92A	Standard for Smoke-Control Systems utilizing barriers and pressure differences
NFPA 101	Life Safety Code
NFPA 220	Standard on Types of Building Construction
NFPA 251	Standard Methods of Tests of Fire Resistance of Building Construction and Materials
NFPA 252	Standard Methods of Fire Tests of Door Assemblies
NFPA 253	Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
NFPA 255	Standard Method of Test of Surface Burning Characteristics of Building Materials
NFPA 257	Standard on Fire Tests of Window and Glass Block Assemblies
NFPA 259	Standard Test Method for Potential Heat of Building Materials
NFPA 265	Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls
NFPA 703	Standard for Fire-Retardant treated Wood and Fire-Retardant Coatings for Buildings Materials

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Reference	Title
Directive 96/82/EC	Council Directive 96/82/EC of 9 December 1996 on the control of major – accident hazards involving dangerous substances
Directive 98/83/EC	Council Directive 98/83/CE of 3 November 1998 on the quality of water intended for human consumption
Directive 2003/10/EC	Council Directive 2003/10/EC of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise)
Decree no. 88-1056 (French Regulation)	Décret pris pour l'exécution des dispositions du livre II du code du travail (titre III: Hygiène, sécurité et conditions du travail) en ce qui concerne la protection des travailleurs dans les établissements qui mettent en œuvre des courants électriques, 24 novembre 1988
Decree no. 95-607 (French Regulation)	Liste des prescriptions réglementaires que doivent respecter les travailleurs indépendants ainsi que les employeurs lorsqu'ils exercent directement une activité sur un chantier du bâtiment ou de génie civil, 6 mai 1995
IMO MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL)" and subsequent amendments
IMO SOLAS	International Convention for the Safety Of Life At Sea (SOLAS), 1974 and subsequent amendments
ASCE Journal	Human Response to Motions in Tall Buildings, Fu-Kuei-Chang, Journal of the Structural Division, Vol 99, N°6, June 1973

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP CIV 401	Minimum requirements for building design and construction
GS EP CIV 403	Temporary construction camps and associated facilities (onshore)
GS EP COR 353	Design and application of passive fire protection coatings
GS EP ELE 081	Lighting
GS EP ENV 001	Environmental Requirements for Projects Design and E&P activities
GS EP ENV 421	Landfill design and operation for E&P sites
GS EP HVA 100	HVAC Basis of Design
GS EP MED 060	Onsite medical structures
GS EP MED 061	Medical support for E&P sites

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Reference	Title
GS EP MED 062	Hygiene on onshore bases and offshore living quarters
GS EP SAF 021	Layout
GS EP SAF 216	Area classification
GS EP SAF 222	Safety rules for turbines, diesel engines, gas engines and process units in sheltered or enclosed areas
GS EP SAF 227	Safety rules for fired heaters
GS EP SAF 228	Liquid drainage
GS EP SAF 253	Impacted area, restricted area and fire zones
GS EP SAF 261	Emergency Shut-Down and Emergency De-Pressurisation (ESD & EDP)
GS EP SAF 262	Pressure protection relief and hydrocarbon disposal systems
GS EP SAF 311	Rules for the selection of fire-fighting systems
GS EP SAF 312	Fire and Gas detection systems
GS EP SAF 321	Fire pump stations and fire water mains
GS EP SAF 322	Fixed fire water systems
GS EP SAF 331	Carbon dioxide fire extinguishing systems
GS EP SAF 332	Water mist and gaseous fixed fire extinguishing systems
GS EP SAF 334	Foam fire extinguishing systems
GS EP SAF 337	Passive Fire Protection: Basis of design
GS EP SAF 351	Escape, evacuation and rescue from fixed installations
GS EP SAF 371	Emergency control facilities

3. Terms and Definitions

There are three types of statements in this General Specification: “shall”, “should” and “may”. They shall be understood as follows:

Shall	Is to be understood as mandatory. Any deviation from a “shall” statement requires a derogation approved by the Company.
Should	Is to be understood as strongly recommended to comply with the requirements of the specification. Alternatives shall provide a similar level of protection and this shall be documented.
May	Is used where alternatives are equally acceptable.

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For the purpose of this document only, the following terms and definitions apply:

Active Fire Protection (AFP)	Equipment, systems and methods which, following initiation may be used to control, mitigate and extinguish fires (ISO 13702).
Authority Having Jurisdiction	Organization, agency or individual responsible for approving an equipment, an installation or a procedure (NFPA 101).
Buildings	Any structure used or intended for supporting or sheltering any use of occupancy (NFPA 101).
Continuous grade release	Release that is continuous or nearly so (IP 15). A release shall be considered as continuous if it is likely to be present for more than 1000 hours per year.
Credible event	Incident likely to occur within a concerned area. Used for the definition of fire zones. Consequences corresponding to a credible event of a given fire zone shall not impact other fire zones (Company).
Escape	Act of personnel moving away from a hazardous event to a place where its effects are reduced or removed (ISO 13702).
Evacuation	Planned method of leaving the installation in an emergency (ISO 13702).
Fire and Gas system	Safety system which monitors the temperature or the energy flux (fire), the concentration of flammable or toxic gases (gas), and initiates relevant actions (alarm, ESD, EDP active fire-fighting, electrical isolation, etc.) at pre-determined levels (Company).
Fuel source	Same as ISO 13702 definition of "source of release": point from which flammable gas, liquid or a combination of both can be released into the atmosphere.
Hazardous Area / Zone	• Zone 0: part of a hazardous area in which a flammable atmosphere is continuously present, or present for long periods (IP 15). • Zone 1: part of the hazardous area in which a flammable atmosphere is likely to occur in normal operation (IP 15). • Zone 2: part of the hazardous area in which a flammable atmosphere is not likely to occur in normal operation and, if it occurs, will only exist for a short period (IP 15).
Ignition source	Source of temperature and energy sufficient to initiate combustion (API RP 14G).

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Installation

Technical unit in which dangerous substances are produced, used, handled or stored, including all the equipment, structures, pipework, machinery, tools, private railway sidings, docks, unloading quays serving the installation, jetties, warehouses or similar structures, floating or otherwise, necessary for the operation of the installation (Company from [Directive 96/82/EC](#)).

Muster area

Designated area where personnel gather and report when required to do so (Company from [ISO 13702](#)).

PAGA

Abbreviation for Public Address and General Alarm.

Passive Fire Protection (PFP)

Coating, cladding arrangements or a free standing system which in the event of fire will provide thermal protection to the substrate to which it is attached or to the protected area and does so independently of a requirement for human, mechanical or other intervention to initiate a response (Company from [ISO 13702](#) and [API RP 14G](#)).

Primary grade release

Release that is likely to occur in normal operation. A release shall be considered as primary grade if it is likely to be present between 10 and 1000 hours per year ([IP 15](#)).

Rescue

Process by which those who, in an emergency situation, have been injured, and/or have been blocked in the escape ways, and/or have evacuated the installation by unusual means, are re-trieved to a place where medical assistance is available (Company).

Restricted area

Area within the boundaries of the installation, and hence under the control of the Company, which is affected permanently by normal operation of the facility or exceptionally by the consequences of an emergency situation caused by a major failure (Company).

Secondary grade release

Release that is unlikely to occur in normal operation and, in any event, will be of short duration. A release shall be considered as secondary grade if it is likely to be present less than 10 hours per year ([IP 15](#)).

Source of release

Point from which flammable gas, liquid or a combination of both can be released into the atmosphere ([ISO 13702](#)).

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Ventilation

Adequate: ventilation, natural, mechanical or a combination of both, sufficient to avoid persistence of flammable atmosphere within sheltered or enclosed area but insufficient to avoid their initial formation or spread throughout the area (IP 15).

Dilution: mechanical ventilation sufficient to maintain generally as non-hazardous an enclosed area containing a source of release or an aperture into a hazardous area (IP 15).

4. Buildings in the restricted area

This chapter does not include “confined spaces”, such as pressure vessels or hulls.

4.1 Pressurization and ventilation

4.1.1 Pressurization

Buildings such as control rooms, technical rooms, electrical rooms or workshops surrounded by a hazardous area and containing ignition sources shall be pressurized (overpressure protection).

It is recommended that buildings, not surrounded by a hazardous area but that can be reached by a flammable gas cloud in case of leak corresponding to the credible events (as defined in the Safety Concept), are critically reviewed to determine whether they ought to be pressurized or not.

This assessment shall be conducted on a case by case basis.

4.1.2 Ventilation

Any building containing a fuel source and/or any contaminating agent, or in connection with a hazardous area, shall be ventilated as follows:

- Buildings containing a continuous or primary grade release shall be provided with adequate ventilation.
- Buildings containing a continuous or primary grade release or in connection with a hazardous area, zone 1, shall be provided with **dilution ventilation** (typical examples: battery room, fume cupboards in the laboratory).

Buildings containing a secondary source of release or in connection with a hazardous area (zone 2) shall be either **adequately ventilated** if it is acceptable that they remain classified zone 2 (typical examples: compressors buildings, enclosed process units protected against rough weather conditions) or provided with **dilution ventilation** if they shall be rendered non-hazardous (typical examples: gas turbine or gas engines fume cupboards).

Buildings containing a secondary grade release or in connection with a hazardous area, zone 2, and provided with an inadequate ventilation, shall be classified as zone 1.

For further details, refer to **GS EP SAF 216**.

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4.1.3 Cooling ventilation

Buildings containing ignition or heat sources, either inside or outside the restricted area, such as machinery, engines skids or fired process equipment shall be equipped with a cooling ventilation system. For further details, refer to [GS EP SAF 222](#).

4.2 Minimisation of ignition sources

4.2.1 Passive and design considerations

All potential ignition sources ⁽¹⁾ in buildings shall be identified and minimised in their number, gathered and located away from the potential fuel sources. For further details, refer to [GS EP SAF 021](#) and [GS EP SAF 216](#).

Note 1: Typical examples of potential ignition sources are chemical reactions, electric sparks and arcs, static electrical sparks, flames, heats of compression or hot surfaces.

4.2.2 Active devices

Any potential source of ignition within the restricted area shall be under control.

Where passive considerations listed in section 4.2.1 cannot result in a sufficient risk reduction, active devices consisting in a gas detection system (refer to [GS EP SAF 312](#)) and/or an Emergency Shut Down (ESD) system (refer to [GS EP SAF 261](#)) shall be implemented in order to isolate or cool down the ignition sources in case of fuel leakage.

4.3 Fire and Gas detection

The following three general rules shall apply to buildings:

- A gas detection system shall be installed in any part of a building where there is a significant risk of occurrence of hydrocarbon or toxic gas leakage or accumulation, either by flammable gas leakage and/or hydrocarbon liquid spillage which may flash leading to unacceptable risks for human life, assets or environment. Furthermore toxic gas detectors shall be installed in the air intakes of premises, where personnel may be present, even outside the restricted area (e.g. large administrative buildings in onshore plants, etc.).
- A fire detection system shall be installed in any part of a building where there is a significant risk of occurrence of fire leading to unacceptable risks for human life, assets or environment; likewise a fixed smoke detection system shall be installed in the HVAC air inlet duct, upstream of the damper, even outside the restricted area.
- In order to adequately close the damper, special considerations should be taken for the Fire & Gas and HVAC systems to react. This could be achieved in two ways:
 - either by providing an increased inlet duct length
 - or by lowering the thresholds settings for the gas detectors.
- Manual alarm call points shall be provided at each exit door of buildings.

For further details, refer to [GS EP SAF 312](#).

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4.4 Blast protection

Any manned buildings or buildings containing critical equipment shall be designed against the blast overpressure resulting from the credible events.

Concerning explosion scenario, method of calculation and criteria for blast protection, refer to [GS EP SAF 253](#).

Buildings shall be located according to the criteria of the [GS EP SAF 253](#) and [GS EP SAF 021](#).

As a general rule, unless otherwise stipulated by local regulations or specified in the Safety Concept, buildings should follow the guidelines hereafter. Risks shall be minimised as follows:

- The doors should be located on the side opposite to the most likely blast pressure
- The windows shall not be located on the sides where blast pressure is likely
- Any window should be of a suitable type
- The roof shall be designed in such a way it cannot collapse on occupants
- Storage of objects above head should be limited.

As a consequence, these buildings shall not be considered as Temporary Refuges. Temporary Refuges, if any in the restricted area, shall be blast-proofed.

4.5 Passive Fire Protection (PFP)

4.5.1 Applicability to buildings

This section deals only with fires **outside** buildings (where a fire hazard can be **inside** the building, the requirements developed in **chapter 7** shall also apply).

4.5.2 General rule

Groups of equipment that cannot be segregated by position (e.g. highly congested offshore installations) shall be separated by firewalls that can withstand the effects of an explosion and then conserve their specified fire ratings.

For further details, refer to [GS EP SAF 337](#).

4.5.3 Materials

Refer to [GS EP SAF 337](#) and [GS EP COR 353](#).

4.5.4 Fire zones

Accommodations shall be in a different fire zone from production, processing, transportation or storage facilities.

Boundaries separating the accommodation area from other fire zones (if close to) shall be at least A60-class divisions and, where the risk of hydrocarbon fire exists, H120-class or J rating class divisions (depending on the risk). Refer to **appendix 1**.

Similar provisions shall be afforded to spaces necessary for Escape, Evacuation and Rescue (escape routes, temporary refuges, muster areas, embarkation posts) and spaces involved in

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Emergency Response (e.g. control room, emergency station, essential switch-room or fire pumps enclosures).

4.5.5 Other requirements inside the buildings

Buildings shall:

- maintain their integrity during a fire (see sections 7.5.1 and 7.5.3)
- be subdivided into compartments in such a way to limit the spread of fire and smoke (see **section 7.5.4**)
- not contain materials propagating flame or developing excessive smoke (see **section 7.5.2**).

4.6 Active Fire Protection

4.6.1 Fire scenario

The fire scenarios shall be defined in the Safety Concept and are dealing only with fire sources external to the building. Where fire sources are internal to the building, refer to **chapter 7** for the generic case where humans are accommodated.

4.6.2 Method of calculation

The calculation methods for fire radiation shall be defined as per **GS EP SAF 253**.

Two models shall be considered: jet fire and pool fire.

Computations shall be conducted by Company's safety engineers or by third parties placed under their direct supervision.

4.6.3 Criteria

Unless otherwise specified in the Safety Concept, the default value of 4.7 kW/m² (1484 BTU/hr/ft²) shall be considered as the maximum radiation level to the building outside the restricted area.

For buildings inside the restricted area, firewalls and adequate protection are required.

The different radiation levels are developed in **GS EP SAF 253** and **GS EP SAF 262**.

4.6.4 Recommended solutions

Where PFP measures listed in **section 4.5** cannot result in a sufficient risk reduction, an AFP system coupled to an automatic fire detection system (refer to **GS EP SAF 312**) shall be implemented.

It shall provide protection (e.g. water curtain reducing the radiation level or cooling the structure) and fight the fire in the concerned fire zone.

For further details, refer to **GS EP SAF 311**, **GS EP SAF 321**, **GS EP SAF 322**, **GS EP SAF 331** and **GS EP SAF 334**.

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4.7 Escape, evacuation and rescue

The requirements for the Escape, Evacuation and Rescue of personnel from buildings are dealt with in [GS EP SAF 351](#). These requirements are not to be confused with dispositions required for egress from buildings outside the restricted area (see [section 7.4](#)).

5. Safety requirements for electrical equipment

5.1 General

5.1.1 Purpose

The purpose of this section is to define the requirements to be applied to avoid any accidental contact between humans and energised equipment and/or conductors under voltage. It is intended to supplement and clarify existing French Regulations rather than replacing existing codes, standards and recommended practices.

5.1.2 Scope and limitation of use

This section should not be considered as a substitute for proper design, specification, commissioning or operation of electrical equipment. It includes:

- the principles of classification of electrical equipment (see [section 5.1.6](#))
- the safety principles to make non-qualified personnel out-of-reach of energized equipment and/or conductors (see [section 5.2](#))
- the principles of restriction of access to electrical rooms (see [section 5.3](#))
- the layout and protection requirements in electrical rooms (see [section 5.4](#))
- the first aid devices requirements (see [section 5.5](#)).

5.1.3 Reference documents

In the absence of more stringent local regulations or particular specifications, this chapter refers to the [Decree no. 88-1056](#) amended by the [Decree no. 95-607](#).

In some countries where American standards are applicable, the reference document is [NFPA 70E](#). This document is not further mentioned in this section.

5.1.4 Classification of people

- **Personnel:** human beings from Company, assigned to the installation, and at work inside the restricted area of the installation
- **Contractors:** human beings and organizations outside Company, at work inside the restricted area of the installation
- **Visitors:** human beings not assigned to the installation and not at work, but inside the restricted area of the installation
- **Public:** human beings, flora, fauna, installations and organizations outside the restricted area of the installation.

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5.1.5 Qualification of parties

- **Authorised person:** human being allowed to access to a restricted room or area
- **Designated person:** member of personnel who is specifically and in writing authorised by, or on behalf of the Installation Manager, to access to a restricted room or area and perform particular duties
- **Manager** (of the installation): member of personnel who is responsible, onsite, of the installation and of the safety of people
- **Qualified people or organizations:** individuals and/or organizations able, through training, experience or both, to perform particular duties safely
- **Trained personnel:** individuals or groups in the process of gaining, or having gained, through series of training sessions, the ability to perform particular duties safely.

5.1.6 Classification of material

Table 1: Level of voltage

Terminology	Decree no. 88-1056	AC (Volts)	DC (Volts)
VLV	TBT	$U \leq 50$	$U \leq 120$
LV	BTA	$50 < U \leq 500$	$120 < U \leq 750$
MV	BTB	$500 < U \leq 50\,000$	$750 < U \leq 1500$
HV	HTA HTB	$U > 50\,000$	$1500 < U \leq 75000$ $U > 75000$

5.2 Out-of-reach of electrical equipment

5.2.1 The different methods of out-of-reach

Under **normal** operating conditions, in any working place within the installation, there shall be no conductive piece which may be under voltage within the reach of personnel, Contractors or visitors.

Note: this requirement prohibits the use of contact lines for the powering of e.g. gantry cranes or trolleys in the installation. It also applies to neutral conductors and grounding conductors.

This requirement can be achieved by:

- out-of-reach by position and safety distances, or
- out-of-reach by protection, or
- out-of-reach by isolation of conductors, or
- any combination of these.

It is, however, inevitable that some equipment cannot meet this requirement in **abnormal** operations such as maintenance, inspection or modification works.

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Then, electrical equipment shall be:

- Properly segregated between VLV, LV, MV and HV levels of voltage
- Installed in dedicated electrical rooms with access restrictions (see **section 5.3**).

5.2.2 Out-of-reach by position and safety distances

If out-of-reach is only achieved by position and safety distance, the safety distance shall be established taking into account objects that personnel can normally handle in the workplace.

The permanence of the safety distance shall be guaranteed by adequate sizing and design of the surrounding pieces of structure to prevent weakening, fall or collapse.

5.2.3 Out-of-reach by protection

If out-of-reach is achieved by protection, the permanent effectiveness of the protections shall be ensured by their design, dimensions, sitting, strength, stability, and isolation, considering the normal constraints they may be exposed to.

Protection can be made of partitions or doors which can be of plain material, perforated with holes, expanded metal guarding or latticework. In the last three cases, the size of the holes or the mesh shall not jeopardize the protection.

For VLV or LV equipment, the protections can be removed with the equipment under power for abnormal operations of short duration such as maintenance, inspection, minor modifications, providing a specific operating procedure has been given by a Supplier, a Vendor or Engineering, and approved by the Company. For MV and HV equipment, it shall be prohibited and/or made physically impossible to remove the protection before de-energising the equipment or conductors under voltage.

If a protection can be removed without any tool, a notice shall be adequately posted to remind this prohibition:

- For MV voltage, the equipment and conductors shall be automatically de-energised by the removal of the protection and/or be protected by a key-locked protection
- For HV voltage, the equipment and conductors shall be protected by a key-locked protection and the removal of the protection shall be made physically impossible if the equipment has not been de-energised.

The use of keys shall be limited to personnel specifically designated by, or on behalf of, the Installation Manager.

5.2.4 Out-of-reach by isolation of conductors

If out-of-reach is achieved by isolation, the permanent effectiveness of the isolation shall be ensured by an adequate design, considering the risks of damage (e.g. mechanical constraints, friction, shocks or chemical actions) they can be exposed to during the whole lifetime of the installation.

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5.3 Restriction of access to electrical rooms

The rooms, or more generally, the working areas containing the equipment listed below shall be delimited, and of restricted access:

- Production, conversion and distribution systems of electrical power (see **sections 5.4.1 to 5.4.4**)
- Electrical equipment workshops and testing facilities (see **section 5.4.5**)
- Equipment handling a large quantity of dielectric liquids (see **section 5.4.6**)
- Instrument technical rooms and testing facilities
- Telecommunication equipment rooms

The access to these rooms or working areas can be **authorised** only to:

- a) personnel specifically designated by, or on behalf of the Installation Manager, and adequately trained, including qualified Contractors;
- b) in case of necessity, other personnel, Contractors or visitors who have been briefed and under the permanent responsibility of, and accompanied by the personnel detailed in a).

These rooms or working areas shall meet the following **requirements**:

- Notices shall be posted on doors and access ways to remind the hazard and the prohibition of entry or access of non-authorised people
- Rooms containing HV equipment shall be key-locked outdoor but allowing in any case an easy escape from indoor
- Working area surrounding the electrical equipment shall be of sufficient dimensions to allow easy and safe works; it shall never be used as a way or a storage area.

5.4 Layout

5.4.1 Out-of-reach by position and safety distances

The minimum heights above ways for equipment or live conductors are (refer to **appendix 2**):

- LV: 230 cm above ways
- MV: 230 cm above ways
- HV: $200 + U$ cm above ways, U (kV) and 250 cm minimum.

5.4.2 Out-of-reach by protection

- **LV** (refer to **appendix 3 – fig. 2**):
 - Minimum dimensions of protection: 20 cm beyond equipment
 - Minimum distance between protection and conductors: 5cm if plain and rigid protection, 10 cm otherwise
 - Minimum width of way around protection: 60 cm.