

GENERAL SPECIFICATION

SAFETY

GS EP SAF 021

Layout

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1. Scope

1.1 Purpose

This general specification lays down the minimum safety requirements for the layout of **installations**, both onshore and offshore.

The main recommendations for the **layout** of installations and the main steps of the methodology are included in Appendix 1 of this document.

1.2 Applicability

This specification is **not** retroactive.

It applies to new installations and to major modifications or extensions of existing installations, both onshore and offshore.

This specification does **not** cover:

- Exploration drilling temporary facilities
- FPSO's (refer to **GS EP SAF 380**) except when explicitly mentioned
- LNG plants (refer to **GS EP SAF 521**)
- Jetty and shoreline terminals
- Subsea facilities

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 addendums, is the latest revision published at the effective date of this document.

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Reference	Title
API RP 14J	Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities
CAP 437	Standards for Offshore Helicopter Landing Areas
Directive 2012/18/EU	Directive 2012/18/EU of the European Parliament and of the Council of the 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC – Seveso III
EI 15	Model code of safe practice Part 15 – Area classification for installations handling flammable fluids (Previously IP Code, Part 15 or IP 15)
IMO SOLAS	International Convention for the Safety of Life at Sea
IOPG Report No. 377	Guideline for managing marine risks associated with FPSOs, April 2006
ISO 13702	Petroleum and natural gas industries – Control and mitigation of fires and explosions on offshore production installations – Requirements and guidelines

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

Reference	Title
GS EP CIV 201	Design and construction of roads and stabilized areas
GS EP ELE 001	Electrical design criteria
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP ELE 364	Electrical installations
GS EP EXP 201	Operations preparation during project – Maintainability & Inspectability criteria
GS EP LSO 110	Environmental effects considerations for helidecks
GS EP SAF 041	Technological risk assessment methodology
GS EP SAF 216	Area classification
GS EP SAF 221	Safety rules for buildings
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

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Reference	Title
GS EP SAF 253	Impacted area, restricted area and fire zones
GS EP SAF 261	Emergency Shutdown and Emergency Depressurisation (ESD & EDP)
GS EP SAF 262	Pressure protection relief and hydrocarbon disposal systems
GS EP SAF 311	Rules for the selection of active fire protection systems
GS EP SAF 321	Fire pump stations and fire water mains
GS EP SAF 337	Passive Fire Protection: basis of design
GS EP SAF 341	Location and protection of onshore hydrocarbon storage
GS EP SAF 351	Escape, evacuation and rescue from fixed installations
GS EP SAF 380	Safety engineering requirements for an F(P)SO
GS EP SAF 521	Safety specific requirements for LNG onshore liquefaction plants and export
GS EP STR 002	Crane for fixed offshore installations
GS EP STR 101	Design of offshore jacket and subsea structures

3. Terminology and definitions

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

Shall Is to be understood as mandatory. Deviating from a “shall” statement requires 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.

For the purpose of this specification, the following definitions apply. When no external reference is indicated between brackets, the terms are defined by Company as proposed.

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.

Emergency Control Centre Place where emergency response personnel go to undertake their emergency duties.

Equivalent to ISO definition of “Control Station”. ([ISO 13702](#))

Emergency Response (ER) Action taken by personnel on or off the installation to control or mitigate a hazardous event or initiate and execute abandonment. ([ISO 13702](#))

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Equipment	Any component or group of components specifically identified and itemised on the P&IDs.
Escape, Evacuation and Rescue (EER)	Range of possible actions including escape, muster, refuge, evacuation, escape to the sea and rescue/recovery. (ISO 13702)
Escape Route	Route from an area of an installation leading to a muster area, Temporary Refuge (TR), embarkation area or means of escape to the sea. (ISO 13702)
Fire zone	Area within the installation where equipments are grouped by nature and/or homogeneous level of risk attached to them. The partition into fire zones is such that consequences of a fire, flammable gas leak or an explosion corresponding to the credible event likely to occur in the concerned fire zone, does not impact other fire zones to an extent where their integrity could be put at risk.
Flammable limits (or range)	The limits of combustibility of flammable gases or vapours when mixed with air. Note: These terms are synonymous with explosive limits (or range). (EI 15) The Lower (LFL) and Upper (UFL) flammability limits are used to define the range of combustibility of a compound or mixture.
FPSO	Floating, Production, Storage and Offloading system includes, in addition to storage and offloading capability, facilities for receiving crude oil from producing wells and processing it for export by separating water and gas. (IOGP Report No. 377)
General Arrangement (GA)	Also called Overall Plot Plan. Action of sorting and grouping equipment into units, defining their location considering environment, neighbourhood, unit inter-dependence and spacing to match safety and operability requirements.
Hazardous area and zone	A three-dimensional space in which a flammable atmosphere is or may be expected to be present at such frequencies as to require special precautions for the construction and the use of electrical apparatus. All other areas are referred to as non-hazardous areas in this context. In a hazardous area three types of zones are recognised. (EI 15)
Ignition source	Naked lights, fires, certain electrical equipment, hot surfaces above ignition temperature, or a spark or flame produced by any other means. (EI 15)
Impacted Area	Area that extends beyond the boundaries of the installation but which is nevertheless affected either permanently by normal operation of the facility (e.g. noise, radiation) or exceptionally by the consequences of an emergency situation caused by a major failure.

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Installation	Technical unit in which dangerous substances are produced, used, handled or stored; it includes 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. (Directive 2012/18/EU)
Layout	Action of selecting the location of the installation, defining unit general arrangements and placing equipment within units.
Local Authority	Organisation, body, office or individual responsible for approving the installation with regards to local applicable regulation and for defining jointly with Company, approving and enforcing the Site Contingency Plan.
Major Failure	A conceivable incident that can possibly occur on the facility. Used for the definition of the facility restricted area and impacted area.
Restricted Area	Area within the boundaries of the installation and hence under the control of Company, which is affected permanently by normal operation of the facility (e.g. noise, radiation) or exceptionally by the consequence of an emergency situation caused by a major failure.
Site Contingency Plan	Plan describing all the measures planned for dealing with the scenarios deduced from the major risks calculated for the installations.
Source of release	For the purpose of hazardous area classification, a point from which a flammable gas, vapour or liquid may be released into the atmosphere. Three grades of release are defined in terms of their likely frequency and duration: continuous, primary and secondary. (EI 15)
Survival Craft (or TEMPSC)	Craft capable of sustaining the lives of persons in distress from the time of abandoning the installation. (IMO SOLAS) In this document, it is referred as TEMPSC (Totally Enclosed Motor Propelled Survival Craft) according to ISO 13702 abbreviation.
Temporary Refuge (TR)	Place provided where personnel can take refuge for a predetermined period while investigations, emergency response, and evacuation preplanning are undertaken. (ISO 13702)
Units	Areas within the installation resulting from its partition into a reasonable number of geographical and functional groups of equipment.

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4. Site selection for the installation

The location of any new installation or any major extension of an existing installation shall be approved by Company.

The Local Regulation in force shall be complied with (e.g. the requirements imposed by the **Local Authority**).

The final location of the installation shall always be justified, particularly when several locations can be initially envisaged.

4.1 Selection of a location

The following surrounding facilities and their foreseeable extension shall be identified:

- Other petroleum or industrial installations
- Access roads, ground, sea (waterways) and air transportation networks
- Electrical power, water, telecommunication, distribution networks
- Presence of any sensitive ecosystem (e.g. protected areas, wetlands)
- Presence and density of population, public buildings

The following environmental conditions shall be identified:

- Soil conditions, relief
- Local specific risks such as seismicity, landslides (either onshore or submarine), floods, sand storms, permanent frost, typhoons
- Meteorological conditions (temperature, hygrometry, sun, rain, wind, snow, ice, fog, lightning)
- Sea conditions (water depth, swell, currents, salinity)
- Cold environment critical for EER (sea, river, air)
- Protection of nature (site, fauna, flora) and visual impact
- Security risks

The different criteria, factors and rankings in the decision-making process are recorded for further follow-up, especially if several options are initially envisaged. It is expected that the results of this initial screening are documented.

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4.2 Impacted area / restricted area

Once the geographical location has been selected:

- The impacted and restricted area around the installation is defined by the major failures scenarios using the consequence analysis methods and criteria as specified in **GS EP SAF 253**. The constraints with regards to the position of the fence (i.e. **limit of the restricted area**) are identified.
- Permanent settlements, public places and transport corridors encroaching the impacted area are particularly identified. None of these external facilities shall be inside the restricted area. The need to relocate them shall be specifically addressed.

5. General arrangement

5.1 Methodology

Different approaches are possible to determine minimum distances between different fire zones and between units within the same fire zone.

Company's practice is to proceed as follows:

- **At Preliminary and Conceptual stages, a preliminary General Arrangement** is issued based on the recommendations based on this specification (refer to Appendix 2), and/or Company engineering expert judgment and/or by comparison with similar installations. Consequence analysis according to **GS EP SAF 253** may be carried out at these earlier stages for projects with specific configurations (e.g. presence of toxic gases, new technologies, and manned installations with layout constraints).
- **At Pre-Project stage**, plot plans and **improved partitions between fire zones and units** shall be issued, using the consequence analysis methodology described in **GS EP SAF 253**.
- **At Basic Engineering stage, layouts of equipment in the fire zones** are produced, the consequence analysis study carried out at the previous phase is updated. Outputs of CFD (Computational Fluid Dynamics) studies, when these are required by Company, should be taken into account from this stage.
- **At Detailed Engineering stage, Vendor data are incorporated to finalise equipment layouts** (refer to Appendix 3 for equipment location requirement and recommended distances between equipment).

Detailed work on General Arrangement shall not commence before:

- The location of the installation has been selected (refer to Section 4).
- The installation has been split into fire zones and safety distances have been defined according to **GS EP SAF 253**.
- The restricted and impacted areas have been defined according to **GS EP SAF 253** and physically delimited (e.g. fence at the restricted area).

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Early coarse layouts may be issued without the necessary level of details defined above. The General Arrangement of any new installation or any major extension of an existing installation shall be subject to approval by Company. It shall incorporate all provisions for temporary facilities and/or potential future extensions.

By default, safety distances between fire zones displayed in Appendix 2 shall be implemented for onshore developments up to the Conceptual Phase.

5.2 Fire zoning strategy

5.2.1 Main Principles

- **The number of fire zones** and the number of units constituting the fire zones prevent escalations of hazardous consequences, but it also ensures a proper operability of the plant as indicated in [GS EP SAF 253](#).
- **Fire-fighting and emergency capabilities:** The capability for the active fire-fighting and emergency systems to operate efficiently on the biggest units within their fire zones and with maximum acceptable risk for the assets is ensured. Specification for firewater demand in a fire zone is defined in [GS EP SAF 321](#).
- **Emergency isolation and depressurization requirements:** Specifications for emergency isolation and depressurization in a fire zone are defined in [GS EP SAF 261](#).
- **Risk level:** Partition should be such that each fire zone is composed of elements (equipment and/or components) having comparable process risk levels (e.g. process and utility fire zones).
- **Process flexibility and availability:** The break-down into units and fire zones should be such as to allow optimum operational flexibility and required availability. For instance in the case of an installation composed of two separators and two compressors, the assessment could be to preferably group them into two identical processing trains comprising one separator and one compressor each, or into a separation unit (comprising both separators) and a compression unit (comprising both compressors). Input for such arrangement should be provided by the Operating Philosophy and by the Project Execution Plan (i.e. how the project will be implemented, in one or several development phases).
- **Interconnection between units:** An interconnection between units is mainly composed of all-welded piping with few flanges, or single run cables with few junction boxes. A pipe-way within a single process unit or with numerous flanges, valves, vents, drains, etc., is considered as being part of the unit it pertains to. Offshore, bridges between platforms are interconnections between units. These specific pieces of equipment do not constitute their own fire zone and they are usually excluded from the fire zones they might link.

5.2.2 Units

Each unit shall be included into one, and only one, fire zone. One fire zone can incorporate one or several units. Units are further divided into pieces of equipment, and bulk. Each fixed piece of equipment belongs to one, and only one, unit.

With reference to [API RP 14J](#), units are sorted out into nine different categories (flares and vents have been segregated). These are defined in Table 1.

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The objective is two-fold:

- (i) Achieve segregation of fuel sources from ignition sources by segregating the units.
- (ii) Define compatibility of units between each-other (refer to Section 5.2.3).

Table 1 – Type of Units

Group	Type	Main equipment	Hazard
T1	Wellhead	Wellheads, chokes, wellhead manifolds and headers	Fuel source
T2	Unfired process	Manifold and headers, separators, heat exchangers, water treatment, pumps, compressors, unit enclosures, finger type slug catcher, metering	Fuel source
T3	HC storage	Storage tanks, sump tanks, produced water treating tanks	Fuel source
T4	Fired process	Fired equipment, fired heaters, TEG reboilers	Ignition source
T5	Machinery and power generation	Generators, electric equipment, air compressors, engines, turbines	Ignition source
T6	Buildings	Living Quarters, technical buildings, maintenance areas and buildings, offices, control room, sewage disposal, water makers	Ignition source
T7	Pipelines and risers	Risers, pig launchers, pig traps, pipelines	Fuel source
T8	Vents	Vent tip	Fuel source
T9	Flares	Flare tip, burn pit, burner boom	Ignition source

5.2.3 Compatibility

Units are compatible when they can be located in the same **fire zone**:

- Either without particular precautions dictated by safety that would come in addition to other considerations such as constraints of construction, operability or maintenance
- Or providing supplementary precautions are duly implemented (e.g. enlarged distance or separation wall).

Two **units** indicated as non compatible shall be located in two different **fire zones**.

Table 2 indicates whether units are compatible.

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Table 2 – Compatibility between units

Unit Compatibility	T1	T2	T3	T4	T5	T6	T7	T8	T9
T1 Wellhead	Y								
T2 Unfired process	N ⁽¹⁾	Y							
T3 HC storage ⁽²⁾	N	N ⁽⁴⁾	Y ⁽⁵⁾						
T4 Fired process	N	Y ⁽⁶⁾	N	Y					
T5 Machinery	N ⁽³⁾	Y	N	Y	Y				
T6 Buildings	N	N ⁽⁷⁾	N ⁽⁷⁾	N ⁽⁷⁾	N ⁽⁷⁾	Y			
T7 Pipelines and risers	Y	Y	N ⁽⁸⁾	N	N	N	Y		
T8 Vents ⁽⁹⁾	N	N ⁽¹⁰⁾	N	N	N	N	N ⁽⁸⁾	Y	
T9 Flares	N	N ⁽¹⁰⁾	N	N	N	N	N ⁽⁸⁾	N	Y

Note: “Y” (Yes) means “Compatible” and “N” (No) means “Not Compatible”.

- (1) Not compatible as a general rule however exception for unfired process units attached to wellhead unit e.g. test separator or manifolds.
- (2) This category includes both liquid hydrocarbon and liquefied hydrocarbon storage.
- (3) Except for wells with lift pumps or with pumps associated to manifolds.
- (4) Not compatible as a general rule except (i) unfired process units attached to storage unit e.g. pumping station for hydrocarbon transfer and (ii) small (less than 50 m³) propane storage used in cooling units and providing they are suitably protected (additional distance and embankment).
- (5) Liquid hydrocarbon storage is not compatible with liquefied hydrocarbon storage.
- (6) Units indicated as non compatible by [API RP 14J](#) but considered compatible by Company if sufficient distance is provided (as per Appendix 2 or according to the results of consequence analysis as per [GS EP SAF 253](#)).
- (7) Buildings where personnel are present on a permanent basis are not compatible with any other units. This restriction does not apply to technical buildings housing process (hazardous or non-hazardous) or utilities. Pressurised enclosures are not accounted for as long as [GS EP SAF 216](#) requirements are applied.
- (8) Not compatible as a general rule but it is tolerated that pipelines (excluding risers, manifolds, pig traps) can cross storage units or flare/vent areas if they are without flange and suitably protected against explosion (from storage units) and radiation (from storage units and flare/vent).
- (9) Cold vents (as per [GS EP SAF 262](#)) only. Degassing vents (as per [GS EP SAF 262](#)) are compatible with all other units, except buildings.
- (10) Units indicated as non compatible by [API RP 14J](#) but Company tolerates that flare/vent drum and auxiliaries (e.g. condensate pumps, purge/pilot gas skid) are in the flare/vent fire zone providing radiation criteria given in [GS EP SAF 262](#) are fulfilled.

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On highly congested installations, particularly offshore, fire zones cannot always be segregated by position. In order to provide sufficient independence, they shall be separated by passive fire and blast protection that can resist to the effects of a fire or an explosion following credible events and conserve their fire and blast ratings after the fire or explosion has occurred (for passive fire protection, refer to **GS EP SAF 337**).

To be noted that loading posts or jetties are not included in this segregation as they constitute their own fire zones.

5.3 Site configuration

5.3.1 Objectives

The configuration of fire zones is such that the main safety objectives listed below are fulfilled:

- Generic for any industrial installation:
 - To prevent logistics accidents, and in particular to pay attention to security and control of access (refer to Section 5.3.2), traffic (refer to Sections 5.3.3 and 5.3.5) and lifting (refer to Section 5.3.6).
 - To ease operability and maintainability of the installation with a special emphasis on accesses to working areas (refer to Section 5.3.7) and space reservations around equipment (refer to Section 5.3.8) with associated handling and lifting requirements. It is not the purpose of this specification to define inspection and maintenance requirements.
- Specific to hydrocarbon production, processing and storage installations:
 - To take into account the topography of the site (e.g. avoid locating liquid hydrocarbon storages above administrative areas to prevent from flooding risks).
 - To locate ignition sources and fuel sources with due consideration of wind, in order to prevent ignition after a gas release (refer to Section 5.3.9).
 - To locate fuel sources with due consideration of wind, sea swell and current, to minimise the consequences of fires (refer to Section 5.3.9).
 - To ease mitigation measures, and in particular facilitate access for mobile fire-fighting means (refer to Section 5.3.10).
 - To provide adequate arrangements for safety to life, and in particular EER (refer to Section 5.3.11).

5.3.2 Security and control of access (onshore only)

The installations under the control of Company shall be closed to general public and access to the buildings shall be controlled.

The installations under the control of Company shall be fenced (see Figure 1).

The installations are divided into a general service area and a plant area as defined below:

- The **general service area** comprises activities in relation with the outside world (T6 classification) and that cannot cause hydrocarbon hazards, such as parking lots, workshops, warehouses, offices, living quarters, control rooms, muster areas, embarkation area, bus stations or helidecks.
- The **plant area** (also called process area) incorporates activities that can cause hydrocarbon or other chemical and ignition hazards, such as well heads (T1); process units, unfired or fired (T2 and T4); hydrocarbon storage units (T3); machinery and power generation (T5); pipelines and risers (T7); vents (T8); flares and burn pits (T9).

Entry point(s) from outside the installation to the general service area shall be located to meet **security requirements**. **Entry points from the general service area to the plant area** shall be located to meet **safety requirements**.

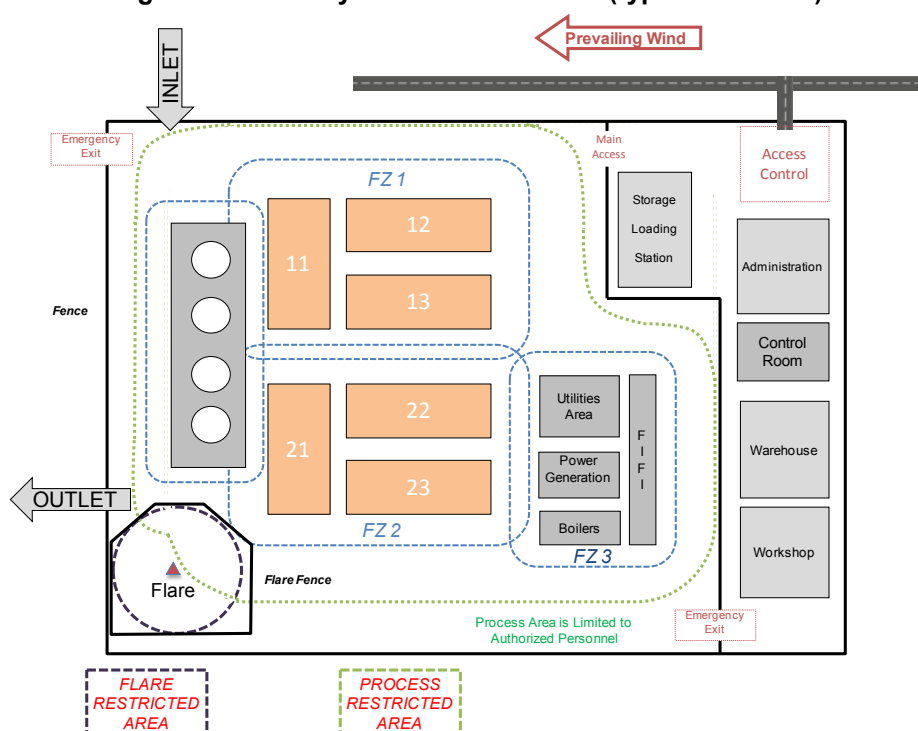
Direct access of public to the plant area shall be made impossible under credible circumstances (to be defined by Security or in the Security Concept).

Access of public to the general service area shall be made normally possible **via one single main entrance with a security check-point**.

Other means of access, including between the general service area and the plant area, shall be normally closed and limited to exceptional or emergency purposes e.g. exceptional heavy loads, Emergency Response or emergency exits.

The access from the general services area to the plant area shall be limited to authorised personnel only. This access shall be made normally possible via a limited number of main entrances, preferably one.

Figure 1 – Security and access control (typical onshore)



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5.3.3 Access roads (onshore only)

5.3.3.1 General for all access roads

Access roads to units shall be practicable all year round and of adequate type for the vehicles that are likely to be used, in particular for the following: overall maximum weight, maximum axle weight, head and width clearance, roadway width and bending radius.

Special consideration shall be paid for snow, ice, thawing and heavy rains conditions.

At least one access road leading to a safe area shall remain passable in any combination of fire scenario and environmental conditions.

Provision for the specific hazards to the installation and its environment is to be considered. For example: cattle guards, lighting requirements at night or under fog conditions, extreme cold climate, water flood or heavy rains (e.g. monsoon).

Identified SIMOPS (Simultaneous Operations) are taken into account for the accesses.

5.3.3.2 Additional requirements in the installation

Inside the installation, the restrictions for traffic use and directions to reach the loading/unloading posts or the parking lots shall be clearly identified and marked.

Access roads shall conveniently stop at the muster areas in the general service area.

5.3.3.3 Additional requirements in the plant area

Access ways in the plant area shall provide safe and easy access for any service vehicles (e.g. mobile fire-fighting means, crane or heavy truck).

In particular, the following features are to be looked at carefully:

- Adequate headway and width at overhead pipeline crossing points
- Capacity to bear the biggest load
- Adequate turning bend radius
- Where necessary, protection of access road nearby piping equipment against vehicle collision

Refer to Section 5.3.10 and Appendix 3 §1.1 for more information.

A typical onshore general arrangement is shown on Figure 1 as an example.

5.3.3.4 Roads

The nearest edge of the roads inside the plant shall be located 9 meters away from the border of any Zone 1 or Zone 0, and 2 meters away from any Zone 2.

More details on Hazardous Area Classification are available in [GS EP SAF 216](#).

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5.3.4 Boat approach (offshore only)

Boat landings shall not be on the same platform side as risers.

Boat landings shall not be located above sea lines that are not suitably protected against maximum dropped object impact. In the opposite case, a dropped object study shall be carried out.

Furthermore the boat-landing position shall take into account risks due to:

- Flare, vent and exhaust locations (refer to [GS EP SAF 262](#))
- Wind, sea swell and current direction (refer to Section 5.3.9) to prevent collision
- Hazardous areas, including when wire-line operations are performed on the wells (refer to [GS EP SAF 216](#))

Boats should normally approach the boat-landings against swell and current as far as practicable.

Ideally boat landings should be downstream of the most stringent prevailing wind, swell or tidal current (see Figure 2) downwind of the platform.

A perpendicular position (see Figure 3) to the prevailing weather and sea might be acceptable, but then there could be limitations on the operational envelop of the boat.

The position and operation of the boat landing shall take into consideration the possible presence of a jack-up or tender support rig alongside the platform including flaring from the platform, jack-up or tender support rig.

If the boat landing platform does not comply with the above, a derogation request with appropriate justification is issued to Company.

5.3.5 Helicopter approach

Helideck position shall take into account risks due to:

- Flare, vent and exhaust locations (e.g. 10% Lower Flammability Limit concentration from vents)
- Wind direction (refer to Section 5.3.9)
- Hazardous areas

Helicopter should normally approach helidecks into the wind. The 210° approach sector shall be free, up to 1 km away, of any obstacle to air navigation and in particular of any flare, drilling mast/pole, crane and exhaust chimney.

For further details, refer to [GS EP LSO 110](#) and to [CAP 437](#).

5.3.6 Location of cranes and lifting devices

Cranes and lifting devices shall be located aside loading/unloading posts.

Loading/unloading posts shall be close to the main ways of access but shall not encroach upon them.

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- **Offshore and shoreline crane**

- Operational swing zones are prohibited above sea lines and risers unless they are suitably protected against maximum load impact. In that case, a Dropped Object Study shall demonstrate that the design load of the protection is adequate.
- The routine operational swing zones of permanently installed cranes shall not pass over, across or close to live equipment unless said equipment has been designed for resistance to impact from loads dropped by the crane or properly protected.
- Crane movement above such live equipment is systematically considered a critical lift and shall be limited to heavy maintenance activities. A lifting operation criticality assessment shall be performed according to Company local rules.

- **Onshore**, the same recommendations shall be applied regarding swing zones over equipment containing hydrocarbon. Where a mobile crane is given preference over a set of fixed cranes, its possible and foreseeable operational locations shall be reserved and reinforced with concrete slabs where necessary. The safe access of mobile crane to its operational spots shall be demonstrated.

In all cases the crane operator shall have view over the whole swing zone and traffic around.

Crane movements above permanently manned buildings and critical safety equipment (e.g. firewater pumps) shall be forbidden.

The adequacy of the position of the cranes shall be confirmed by a Dropped Object Study that could also be required for structural design (e.g. deck impact load resistance).

Specifications for cranes are given in **GS EP STR 002**.

5.3.7 Access to working areas

Access arrangement for all routine operations should be straightforward and simple.

Operation and inspection points should be accessible and visible from main floors or aisles, preferably without the help of ladders.

Any piece of equipment requiring human intervention (for operation, maintenance, inspection, etc.) with a periodicity of at least once a month shall be provided with permanent and fixed access devices. More details are available in **GS EP EXP 201**.

Equipment, instruments, valves hand-wheels, storage areas and piping shall not protrude into access ways so as to cause a hazard or to obstruct the escape ways. More details on escape ways are available in **GS EP SAF 351**.

For further details dealing with the minimum clearances of the access ways, refer to Appendix 3 § 1.1.

5.3.8 Space reservations around equipment

Provisions shall be made to ensure that all routine operation involving handling of materials and equipment can be conducted in a safe manner.

Where SIMOPS may take place between drilling or work-over and production, sufficient space shall be made available for drilling utilities and specific activities (e.g. pipe handling) without interfering with the safety of personnel or with the safe operation of the installation.