



Exploration & Production

GENERAL SPECIFICATION

STRUCTURAL

GS STR 002

Permanent lifting or handling devices for offshore installations

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1. Scope

This general specification applies to all cranes (and attached lifting tackles) permanently installed on fixed offshore installations or on floating units (FPSO, FSO, FPU, Lifting vessel or barge, Supply Boat, etc.), used either for installation, loading and unloading purposes or/and personnel transfer.

This specification is not applicable to the mobile cranes (crawler mounted or on out-riggers) used offshore.

The following are excluded:

- Devices used for underwater installations
- Devices used for manned submarine/diving equipment handling operations
- Special drilling devices
- Supporting structures (crane pedestals).

For the purposes of this specification the boundary between a floating crane and its support is generally assumed to be as follows:

All load carrying structural components where stresses are primarily caused by loads on the crane and not by buoyancy are considered to be part of the crane.

The boundary between crane pedestals and platform structure is set at the first horizontal weld following the flange in a downward direction, normally not less than 1.5 x the pedestal diameter from the flange. When bolting a pedestal to the structure, the limit is set at the lower pedestal flange including the bolted connection to the structure.

Note: The use of cranes for lifting of persons may be subject to specific national regulations. Nevertheless the cranes must at least satisfy all the requirements of this specifications

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
EN 12077-2	Cranes safety – Requirements for health and safety – Part 2: Limiting and indicating devices
prEN 12077-3	Cranes safety – Part 3: Guarding
prEN 13586	Cranes - Access
prEN 13852-1	Cranes – Offshore cranes – Part 1: General purpose offshore cranes
prEN 13852-2:2000	Cranes – Offshore cranes – Part 2: Floating cranes
prEN 12644-1	Cranes – Information for use and testing – Part 1: Instruction
prEN 12644-3	Cranes – Information for use and testing – Part 3: Fitness for purpose

Reference	Title
ASTM F 871	Standard specification for electro deposited coatings on threaded components (metric)
ASTM B 633	Standard specification for electro deposited coatings of zinc on iron and steel
ISO 9927-1	Cranes – Inspections – Part 1: General
ISO 4042	Fasteners. Electroplated coatings
EN 50014: 1992	Electrical apparatus for potentially explosive atmospheres - General requirement
EN 50018: 1994	Electrical apparatus for explosive atmospheres - Flameproof enclosures “d”
DIN 15401	Norme allemande relative aux dimensions des crochets (German standard for hook dimensioning)
EN 982	Safety of Machinery – Safety requirement for fluid power systems and their components - Hydraulics
EN 10002-1	Tensile testing of metallic materials
NF A 03-152	Essais de dureté Brinell de l'acier (Brinell hardness testing)
NF A 03-153	Essais de dureté Rockwell de l'acier (Rockwell hardness testing)
NF A 03-154	Essais de dureté Vickers de l'acier (Vickers hardness testing)
EN 10045-1	Charpy impact test on metallic materials
NF A 03-157	Essais de pliage de l'acier (Cold bending testing)
NF A 35-551	Aciers de construction pour traitements thermiques (Construction steels for heat treatments)
NF A 35-551-1	Additif 1 à NF A 35-551 (Appendix to NF A 35-551)
NF A 35-552	Aciers de construction non alliés et alliés spéciaux pour traitement thermique - Nuance et qualité - Demi-produit, barres et fils machines (Iron and steel products - Unalloyed and alloyed heat-treated steels - Grades and types. Semi-finished products, bars and wire rods)
NF A 35-552-1	Additif 1 à NF A 35-552 (Appendix to NF A 35-552)
NF A 35-553	Aciers de construction non alliés et alliés spéciaux pour traitement thermique - Nuances et qualités - Feuillards (Iron and steel products - Unalloyed and alloyed heat-treated steels - Grades and types - Straps)
NF A 35-554	Aciers de construction non alliés et alliés spéciaux pour traitement thermique - Nuance et qualité - Tôles et larges plats (Iron and steel products - Unalloyed and alloyed heat-treated steels - Grades and types - Sheets and large plates)
NF E 01-000	Aciers non alliés et alliés normalisés d'usage recommandé en mécanique (Steels recommended for mechanical applications)

Reference	Title
NF E 02-350 NF E 05-015 NF E 05-016	Tolérances dimensionnelles (Dimensional tolerances) États de surfaces des produits (Surface conditions of products - Regulation 1 General, terminology, definitions) États de surface des produits (Surface conditions of products - Regulation 2)
NF E 27-701	Boulonnerie à serrage contrôlé destinée à l'exécution des constructions métalliques - Spécifications techniques (Locking bolts and nuts intended for use in metal constructions - Technical Specifications (Protected or not protected bolts)

Professional Documents

Reference	Title
FEM Section I Booklets 1 to 9	Fédération Européenne de la Manutention. (Design rules for heavy lifting appliances)
FEM Section IX API 2C API 9A API RP 2D	Fédération Européenne de la Manutention. (Design rules for heavy lifting appliances) "LEBUS" littérature Specification for offshore cranes Specification for wire rope Recommended practice for operation and maintenance of offshore cranes

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS COR 350	External protection of offshore and related structures and equipment by painting
GS ELE 001	Electrical design criteria
GS ELE 031	Design of earthing and bonding systems
GS ELE 079	Electric apparatus for explosive gas atmosphere
GS ELE 081	Lighting
GS ELE 111	Induction motors
GS ELE 141	Power transformers
GS ELE 161	Electrical cables
GS STR 001	Weight monitoring and weighing offshore units
GS STR 100	Fixed offshore steel platforms - General
GS STR 102	Design of offshore topsides structures
GS STR 201	Materials for offshore steel structures
GS STR 301	Fabrication of offshore steel structures

3. General

3.1 Purpose

The purpose of this specification is to establish the necessary but not exhaustive general requirements for the:

- Design
- Choice
- Manufacture
- Painting
- Shop testing and FAT
- Commissioning
- Operation

of the offshore cranes mounted on fixed or floating installations.

Additional or variable requirements specific to each device shall be dealt with in the particular specification.

3.2 Use

This specification is to be used in conjunction with the General Specifications **GS STR 100** and **GS STR 102** and with the specifications indicated therein.

4. Definition of the installation

4.1 Requirements and general data

4.1.1 The site, the zone in the site

The site is the geographical location of the installation on which the handling device in question is installed. It is defined in the basic data by:

- Its name
- Its location (latitude, longitude, distance from the coast)
- The jurisdiction having authority over it.

The zone in the site is the portion of the installation within the handling device operates; it is defined in the particular specification, within includes in particular:

- A descriptive text
- A drawing showing the location and characteristics of the device
- The classification based on the probability of the existence of an explosive gas/air mixture.

4.1.2 Hazardous area

All equipment shall be designed and supplied in accordance with the hazardous area classification as specified on data sheets.

4.1.3 Environmental conditions

As a general rule, the handling devices shall be designed for outdoor use in an offshore atmosphere.

Except for transfer operations, all handling devices must be useable with a maximum service wind of 25 m/sec.

The maximum wave conditions under which transfer operations are allowed are those specified in the basic data; they may vary according to the loads; the “wave/load” relationship is to be specified in the particular specification. The other specifications to be taken into account are those specified in the basic data, namely:

- Design temperature (average of the coldest month minus 5°C) and corresponding humidity of the air
- The maximum temperature (average of the hottest month) and corresponding humidity of the air
- Ambient temperature
- The extreme wind with the device not in operation: the maximum wind to be expected in a 100-year period, lasting 3 seconds, acting in any direction
- Snow surcharge load (device not in operation)
- Ice surcharge load (device in operation and device not in operation)
- Earthquake risk: site conditions
- Floating support motions and accelerations.

4.1.3.1 Temperature

If the device is exposed to discharges of hot gases at a temperature higher than the maximum temperature specified above, it must be designed accordingly.

4.1.3.2 Worst-case wind

For cranes of which the booms may be placed on a support with the device not in operation, this position may be assumed in the most unfavourable one. It shall however be assumed that this position must be reached with the extreme wind but with no load.

4.1.3.3 Snow surcharge load

Since the devices are mobile, it is assumed that snow does not build up when they are in use.

4.1.3.4 Ice surcharge load

Two cases shall be considered:

- The surcharge load with the device in operation, i.e., the surcharge load such that the mechanisms and/or pivot points of the structural elements can operate
- The surcharge load with the device not in operation, i.e., the surcharge load prevents all movements by locking the mechanism and/or the pivot points of the structural elements.

4.1.4 Material obstacles

4.1.4.1 Definition

Material obstacles are all elements of the installation that may have an effect either on the setting of the device or on its shape (within limits acceptable for the technology of the device), or its movements or those of the load and suspension elements associated with it.

4.1.4.2 List of obstacles

This list is to be drawn up as soon as possible as the use of a handling device is planned; since the device and obstacle affect each others setting requirements, this list is to be drawn up in the order of arrival of the obstacles at the installation, so as to provide a permanent statement of the configuration of the environment at all times during the erection stage.

In the case of cranes, the main obstacles to the movements of the booms and loads are the installations they pass over, located below the plan of gyration, and the projecting structures located above the plane of gyration, such as: derrick, radio mast, helidecks, quarters and miscellaneous equipment. Zones of discharges of hot gases that may effect the design of the device shall also be treated as obstacles.

If a second crane is installed on the installation, special attention shall be paid to possible interactions with the first crane.

For hoists, beams and overhead cranes, the main obstacles are constituted by the supporting structures delimiting the clearance (columns, girders, floors, crane girders) and by the installations they pass over.

4.1.5 Regulation and safety requirements

4.1.5.1 Legislation

The country having authority over the installation is designated in the particular specification, as a basic data.

The handling device must comply with the legislation of this country, and be such that it can be accepted in accordance with the conditions imposed or recommended by this legislation. If the country has no specific legislation or less stringent legislation than in Europe, it is European legislation that should be taken into account.

Any certificates of compliance with legislation required by the country having authority shall be supplied with the device.

4.1.5.2 Safety

The devices shall be equipped with all components necessary:

- For the safety of the personnel
- For the safety of equipment
- For operating safety

in accordance with the particular requirements stated in chapter 5, "Specifications for the construction of the devices".

If the legislation, which prevails over this document, imposes more stringent requirements, the constructive arrangements shall be altered accordingly.

The crane shall incorporate guards in accordance with [prEN 12077-3](#), where reasonably practicable to protect personnel against hazards which cannot be eliminated by design. Where it is not practicable to fit guards around any hazard area, then clear, unambiguous and relevant warning notices should be posted at suitable positions on the crane.

Means of access for operation and/or maintenance shall comply with [prEN 13586](#).

4.1.5.3 Maximum allowable noise levels

Measurement to be taken:

- On idle and crane controls in neutral position
- At full throttle with and without maximum rated loads
- In controls cabs, 70 dB(A).

For "manned" platforms or floating supports measures shall not be greater than:

- Equipment under hoods located on the floors of the installation, 80 dB(A), measured one meter from the hood and from any engine exhaust.
- Equipment in machine cabs (e.g. cranes), 85 dB(A), measured one meter from the outside of the cab and from the engine exhaust.

For normally "unmanned" platforms values up to 90 dB(A) as per API 2C can be accepted.

4.1.6 Classification of the device according to FEM rules

Hoists, winches in light duty and not used for any transfers shall be dimensioned in accordance with the requirements of Section IX of the FEM rules.

All cranes and in particular all devices used for equipment transfers, shall be dimensioned in accordance with the requirements of Section I of the FEM rules.

If the device is to be used for the transfer of personnel, refer to the special safety specification.

4.1.6.1 For all devices

The environmental conditions stipulated in 4.1.3 prevail over overloads of the FEM rules.

4.1.6.2 For the device used for equipment transfers

For devices installed on fixed offshore installations, the crane and its foundation shall be in accordance with annex A, B, C and D of the European Norm [prEN 13852](#) Part 1 and FEM Rules.

- Classification of the structure in group 6:
 - Coefficient $M = 1.2$
 - Coefficient ψ , except as otherwise specified
 - = 1.6 cranes

If the equipment has a wave compensation device of acknowledged effectiveness, lower values of ψ may be proposed, but shall applied only with the approval of the COMPANY.

The forces resulting from the non-vertical lifting of loads shall be determined by combining the inclinations of the cables as follows:

Velocity measured 10 m above the surface of the sea (in km/h)	Wind force Beaufort No.	Case 1		Case 2	
		α° Offlead	β° Sidelead	α° Offlead	β° Sidelead
7 to 12	1-2	5	2	2	5
10 to 28	3-4	6	3	3	6
50 to 61	5-6	8	4	4	8
62 to 74	7	10	5	5	10

α = for a crane, angle in the plan of the boom

β = angle in the crane perpendicular to the foregoing

Except as otherwise specified, the minimum operating time of the mechanisms in intermittent operation is set at 6300 hours, as follows:

- In two years (duration of erection and drilling, 2300 hours
- In 18 years (operating life), 4000 hours
- Corresponding FEM operating Class, V2.

In the case of mechanisms in continuous operation during use (diesel engines, hydraulic pumps, etc.), the theoretical service life shall be equal to or greater than 25000 hours.

The number of cycles and associated loads shall be defined by detail mechanical handling study.

Except if otherwise specified, the load condition to be taken into account is that as follows:

- During the first two years:
 - State 3 - Loadings close to maximum loading.
- During the 18 years of operation:
 - State 2 - Light, moderate and maximum loadings during substantially equal periods of time
 - Resultant state close to state 3.
- Resultant minimum class for mechanisms in intermittent operation:
 - Operating class V2, loading state 3, group 3 m.

For devices installed on floating units, the crane and its foundation shall be in accordance with annex B, C, D and E of the European Norm [prEN 13852](#) Part 2 and FEM Rules.

4.1.6.3 For equipment not used for transfer of material

Classification of the structures and mechanisms in accordance with the FEM rules, according to the intensity of service and the spectrum of loads lifted specified in the particular specification.

4.2 Definition of the handling operations to be performed

4.2.1 Classification of the handling operations

The handling operations shall be classified into two categories:

- Handling operations performed during the erection stage (start-up of the installations)
- Handling operations performed during the operation stage.

Special attention must be paid to the definition of the handling operations of the erection stage, which generally impose more stringent demands on the equipment.

4.2.2 Characteristics of the loads

The most significant loads shall be defined in the particular specification by the following characteristics:

- Mass
- Main dimensions
- Points of suspensions
- Any limitations on the maximum acceptable elastic deformation during handling.

4.2.3 Movement of the loads

An erection cinematic diagram must be prepared for loads concerning which there is uncertainty as to their path between the obstacles during handling operations or during their installation.

This cinematic diagram must show, in the most significant images, the simultaneous positions:

- Of the load
- Of the handling device, together with the cables and lifting ancillaries
- Of the control station
- Of obstacles to the load and the device
- Of obstacles to visibility of the load.

The most significant images must show, among other things:

- The picking up of the loads
- The characteristic points of its routing (in the vicinity of obstacles, changes of the orientation of the load and the means used)
- The setting down of the load.

4.2.4 Characteristics of the movement of the device

The main characteristics of a movement are:

- The speed
- The acceleration
- The accuracy (minimum movement for one control pulse).

The velocities shall be stipulated in the particular specification. The acceleration and accuracy are to be proposed in the CONTRACTOR's proposal.

During loading and unloading of supply vessels, the hook speed is to be high enough to ensure that after the load is lifted in a way that a second wave does not cause the vessels motion to cause re-contact with the load. The minimum steady hook velocity for the actual SWL to be lifted shall be for cranes installed on fixed offshore installations: $V_{Hmin} = 0.1 (H_{1/3} + 3)$ (m/s). $H_{1/3}$ is the significant wave height (m). For cranes installed on floating units, unless specified otherwise the values given hereafter are applicable:

Floating unit	Minimum steady hook velocity V_{Hmin} (m/s)
Semi-submersible	$0.23 H_{1/3} + 0.3$
F (P) S O	$0.35 H_{1/3} + 0.3$
Barge	$0.65 H_{1/3} + 0.3$
Supply boat and support vessel	$0.75 H_{1/3} + 0.3$

4.2.5 Lifting ancillaries

The lifting ancillaries are the additional items of equipment that are placed between the tackle of the device and the loads, such as: hooks, spreader bars, slings, chains, shackles, etc.

As a general rule, these ancillaries are to be specified in the course of the handling study; a list should be drawn up giving their main characteristics and their assignments.

They shall satisfy the requirements of chapter 5, "Specifications for the construction of the devices".

4.3 Design of the handling device

4.3.1 Choice, capabilities, characteristics

As a general rule, the choice should be made among routine manufacture devices (lower cost and shorter delivery time, proven technology).

No device may be used outside the range of capabilities for which it was designed; in case of doubt, the extreme utilisation cases are to be specified in the particular specification.

The characteristics stipulated in paragraph 4.2.4 must be acceptable for the type of device chosen. If the device is not self-powered, characteristics imposed must be compatible with the power available on the installation; if necessary, distinguish between the power available during the erection stage and the power available during the operating stage.

The classification of the device according to FEM rules shall be specified in accordance with the requirements of paragraphs 1 and 2.

The hook travel distances shall be specified in the particular specification in all possible directions of travel.

In the case of devices used for transfers, the maximum vertical travel distance must allow for the lowest water level including the trough of the maximum wave level at which operations are authorised. If the transfer is performed by a crane, the lifting travel must also allow for the highest position of the boom the least favourable reeving.

For cranes, the particular specification shall indicate the loads that may be lifted according to outreach.

For all devices, it must be possible to move the maximum load that can be lifted over the entire amplitude of all movements.

4.3.2 Connection with the structures of the installation

The following loads and interfaces are to be specified by the CONTRACTOR for the various types of device.

4.3.2.1 Cranes

- Weight and COG, complete, without load, and dimensions
- Static resultant of vertical loads in normal service
- Corresponding moments
- Static resultant of vertical charges with test surcharge load
- Corresponding moments
- Directions and amplitudes of horizontal forces others than those resulting from wind
- Corresponding moments
- Forces resulting from the maximum service wind
- Corresponding moments
- Forces resulting from the extreme wind with the device not in operation
- Corresponding moments

- Diameter and thickness of the structure at the point of connection to the pedestal, if the connection is made by welding
- Diameter and thickness of the flange, diameter of the bolting circle, diameter and number of bolts, if the connection is bolted
- Other characteristics as necessary.

4.3.2.2 Winches

- Weight, complete, without load, and dimensions
- Directions and static amplitudes of normal and exceptional stress
- Corresponding moments on the base of the winch
- Dimensions of the base, arrangement, number and dimensions of attachment bolts.

4.3.2.3 Blocks

- Weight, complete, without load, and dimensions
- Minimum and maximum acceptable dimensions of the flange of the supporting shape
- Minimum height of the shape (IPN or IPE)
- Wheel diameter and centres.

4.3.2.4 Suspended travelling beams

- Same characteristics as for blocks, plus the minimum and maximum loads on the wheels at the extreme positions of the load on the beam
- State the weights of the beam and block separately.

4.3.2.5 Supported travelling beams, overhead cranes and gantries

- The weights of the beams or cranes and blocks or carriages, separately
- Clearance requirements of the device, block or carriage in all positions
- Dimensions of the rail to be attached to the installation
- Centres of the running wheels, minimum and maximum loads at the extreme load positions
- Positions and characteristics of the buffer stops at the ends of the bolsters
- Impact speed equals 0.7 maximum speed except if otherwise specified.

4.3.3 Operating connections

If the devices are not self-powered, the particular specification should stipulate:

- The power source (electric, hydraulic, pneumatic)
- The characteristics of the source (voltage, frequency, pressure, flow rates)
- Its location with respect to the device
- The characteristics of the connections (cables, pipes, etc.)

- The characteristics and position of the point of connection of the links (junction box, disconnecting switch, joints or flanges for tubes, etc.)
- The allowable voltage drops or pressure drops in steady operation and at starting up in the connections supplied with the installation and in the connections supplied with the device; the CONTRACTOR must confirm the characteristics of the connections supplied with the device.

In the particular case of diesel hydraulic cranes, if the diesel engine is placed on the installation, off the crane, it is up to the CONTRACTOR to specify the dimensions and weight of the set and the characteristics of connections to the device and to the fuel supply (see paragraph 5.2.7.3, "Heat engines").

4.3.4 Limits of supply

Except if otherwise specified, the handling devices shall be supplied by the CONTRACTOR in running order.

4.3.4.1 For all devices

Indicators and safety connections (gas detection, fire detection, grounding, etc.) are to be supplied with the devices in accordance with the requirements of this specification or of the particular specifications, with the limit of supply being the points of connection of the device specified hereafter.

4.3.4.2 Cranes

The crane is to be supplied complete with counterweight, including the welding or bolting receptacle, with the single exception of the boom rest and the lifting ancillaries planned for operation.

If the crane is welded to the pedestal, the particular specification will name the CONTRACTOR who is to perform the welding work.

If it is bolted, the CONTRACTOR who supplies the device also supplies the bolts; in this case, it is strictly forbidden to limit the supply to the bolted connection at the slewing assembly, which must be installed on the base at the works.

The safety connections are made to the crane in a suitable room.

If the crane is supplied with electricity, the connection will be made to a junction box or disconnecting switch supplied with the crane.

If the crane is supplied with fuel oil, the connection shall be made to the flanges of the tank supplied with the crane; if the diesel set is separate from the crane, the connections between this set and the crane shall be supplied and installed by the CONTRACTOR who supplies the crane.

Any necessary supports or saddles to allow for the maintenance and off-shore installation/removal shall be provided.

The working tolerances for the connection between the base and the pedestal are specified in paragraph 7.3.3.

4.3.4.3 Mobile devices (blocks, beams, overhead cranes, gantries)

The devices shall be supplied complete with their supply lines, to be attached to the structure of the installation (generally the runway beams or rails), up to and including the junction box or

disconnecting switch upstream of this line, to be placed on a walkway of the installation whose location shall be specified in the particular specification.

The safety connections shall also be made upstream of the supply line, on the walkway mentioned above.

The runways, the rails attached to these runways and the buffers placed at the end of the runways are included in the supply of the structure of the installation.

The support rails of the supply lines or of the mobile control boxes independent of the devices are supplied as follows:

- By the CONTRACTOR who supplies the device, in the case of rails made of special shapes determined by the specifications of the cable carriages
- By the CONTRACTOR who supplies the structure, in the case of rails consisting of standard shapes.

In all cases, the supports of these rails form part of the structure.

5. Specifications for the construction of the devices

5.1 Structures

5.1.1 General

The requirements of **GS STR 201** are applicable to the handling devices with allowance for the following particular specifications.

In accordance with the definitions of the importance of elements as specified in **GS STR 100** and **GS STR 102**:

- The main load-bearing structures of the devices are to be regarded as elements of first category
- The secondary load-bearing structures of the devices are to be regarded as elements of second category
- Non load-bearing structures such as miscellaneous access (walkways, ladders, and stairs) and enclosures (control cab, equipment cab) shall be regarded as non-structural.

Note: Boom lift cylinders for an API 2C type A or B crane are to be considered as structural elements of first category.

The steels must be specified and procured in accordance with **GS STR 201**, in accordance with the classification of the elements as being of first or second category, and with the tables of chapter 4 of **GS STR 201**.

Assemblies shall be welded, except in the case of elements that must be dismantled either for transport or for maintenance.

To combat corrosion, the minimum thickness indicated in **GS STR 101** and **GS STR 102** will be observed.

5.1.2 Welded assemblies

The welding and the corresponding examinations shall be carried out in accordance with **GS STR 301**.

Special care must be taken in the execution of “special quality” welds bearing high fatigue loading, for which:

- Changes of cross-section must be gradual
- The welds shall be made using an automatic process with a solid flux mandatory, giving a suitable surface appearance
- No undercuts can be allowed; in the case of butt welds, the surfaces of the beads must be flat or very slightly convex; in the case of fillet welds, the surfaces of the beads must be concave
- If welds made by a manual process or repairs should be inevitable, the beads **must** be ground down in the appropriate direction, to eliminate all surface defects or defective connections
- The welds must be made with complete penetration.

5.1.3 Bolted assemblies

The diameter of the bolts must be not less than 14 mm.

All Carbon steel bolting shall be zinc plated and bichromated according to [ISO 4042](#) (class Zn-12/C/Fe or Cd-12/C/Fe) or [ASTM F 871](#) and [B 633](#) (class Fe/Zn-12.SC3), and coated according to [GS COR 350](#)

In the case of the main structures:

- The assembly bolts shall in principle be of the fitted type, and, with the special approval of the COMPANY of the HR type as per standard [NF A 27-701](#).
- The fitted bolts are to be placed in holes bored after assembly of the elements; the cylindrical barrel to the bolts must project beyond the ends of the plates in such a way that the joint between the cylindrical barrel and threading occurs within the thickness of the washer, by a tested arrangement. On structural shapes, shims or taper washers are to be attached by spot welds; these welds must not introduce stresses detrimental to the strength of the elements.
- For controlled tightening bolts, the ratio of the Tightened Length (TL) to the bolt diameter (d) shall not be less than 5 ($TL/d \geq 5$).

5.1.4 Load-bearing structures

Load-bearing structures shall as a general rule be of the box or solid web type, except for crane booms, which may be of crossed construction (structural shapes and/or tubes).

Machine-welded chassis supporting mechanisms must undergo post-welding stress relieving before machining, in particular the chassis holding the directional rings of cranes.

In the case of crossed crane booms, the centrelines of the neutral fibers of the elements must intersect at the assembly knots; any other arrangement must be submitted to the COMPANY for approval; weld joints must be special quality.

For the beams of overhead cranes having a span less than 12 m, the flanges shall be in one piece, without welded joints.

For the beams of overhead cranes having a span of greater than or equal to 12 m, no flange joint is allowed in the centre portion, over a length of 12 m.

Maximum deflection of the beam on two supports shall be less than $L/500$ with L = span between two supports unless otherwise specified. Same criteria shall be used for a cantilever beam.

In case of curvature of the runway beam, at least three supports shall be installed.

The design of the runway beam supports shall account for vertical loads and all horizontal loads (due to inertial force created by the movement of the FPSO, wind, braking, inclined lift,...).

In the design of overhanging monorail, suspended travelling beam, ..., for trolley hoisting device, the local flange check is required.

Note: reinforcement of a runway beam by welding a plate under the bottom flange is not allowed.

The assemblies of elements that must be dismantled for transport are to be made by bolts (paragraph 5.1.3) or by joining pins with cutter pins; in the case of cuttered joining pins, no play that might cause battering and introduce additional chokes and stresses is allowed; the battering pressure must be low enough with respect to the characteristics of the material not to cause any incrustation that would prevent the withdrawal of the joining pins.

5.1.5 Recommendations specific to cranes

5.1.5.1 Adapter on pedestal

Whether the adapter is bolted or welded to the pedestal, a centring cone shall be provided; in addition, in the case of a welded joint, all arrangements necessary to assure the proper squeezing of the joints shall be provided.

A grating platform shall be provided inside the pedestal adapter, 1800mm downwards from the top of the flange.

Hole cut out's shall be provided on pedestal adapter for all electrical services required to crane from platform or floating unit. These should be designed to minimise stress concentration.

Junction boxes for all electrical services to be installed inside pedestal adapter.

An external 360° grating platform is to be provided around the pedestal adapter, 1500mm below pedestal flange for ease of access and maintenance to the crane. Access to this platform will be by a ladder from the deck.

5.1.5.2 Boom

The boom can be either of the ram luffing type with welded box type construction (API 2C type A or B) or of the wire rope luffing type with lattice construction (API 2C type C, D or E).

For a box boom type crane two luffing rams shall be provided, where one ram shall be capable of supporting the boom and maximum load in the event of failure of the second ram.

Boom and luffing ram pins/bearings etc shall be designed against corrosive seizure. Grease nipples shall be provided for lubrication. Where access to grease nipples is difficult, grease lines shall be installed to an accessible point.

All bearing to be fully sealed anti friction type.

Guide and support rollers for wire ropes shall be provided over the boom.

A boom walkway shall be installed along the top of the boom, or alongside, unless otherwise stated in the data sheets with handrails providing access to cat-head sheaves, dead end connection, anti-two-block, lights etc for maintenance and reeving of main block.

5.1.5.3 Boom rest

The boom rest shall be designed and supplied by the topsides or hull fabrication CONTRACTOR. The VENDOR/MANUFACTURER responsible for the crane must specify the placement instructions (distance to the centreline of the crane), the dimensions of the plan of support, the loads to be taken out, and the damping devices.

The boom rest shall be designed not only for the “Out of Service” conditions but also for the sea transportation conditions. Special attention shall be taken for fatigue analysis during transport and for compatibility of crane boom stiffness and boom rest stiffness.

The resting position of the boom must allow for boom inspection and all maintenance operations, and facilitate any lengthenings or shortenings if required.

5.1.6 Non-load-bearing structures

5.1.6.1 General

The non-load-bearing structures consist of the accesses (walkways, stairs, and ladders) and cabs containing equipment, other than control cabs.

As a general rule, the accesses must be such that they allow the personnel to move about in complete safety either to reach the control station or for maintenance of the equipment; all accesses to the devices shall provide a minimum width of 500 mm clear of all fixed or moving obstacles to a height of 2.2 meters.

Stairs, ladders and walkways shall be built in accordance with standards defined in [GS STR 901](#).

Except if otherwise specified, all flooring shall be made of grating complying with [GS STR 901](#).

Structures used as walkways must be given a non-skid coating in conformity with [GS STR 901](#).

5.1.6.2 Access to cranes (refer also to [prEN 12077-3](#) and [prEN 13586](#))

There shall be clear and unobstructed escape route from the operator cabin to the platform or floating unit with the crane boom in any position.

Access shall be provided as shown by the diagram of appendix 2; the number of secondary walkways in the structures of the crane shall be determined on the basis of the locations of the equipment; these arrangements must be submitted to the COMPANY for approval.

A hoop ladder from the platform/floating unit deck to the 360° access platform on the pedestal adapter shall be provided.

A ladder between machinery house/cab level and the 360° access platform shall be provided. This ladder will be bolted to the crane and be able to rotate with crane providing access to 360° platform at all times.

Walkway shall be provided at machinery house/cab level for access and maintenance.

Access and walkway shall be provided at winch(es) location, boom foot pins and luffing ram pins location for maintenance.

5.1.6.3 Access to overhead cranes and gantries

Access shall be provided as shown by the diagrams of appendices 3 and 4.

Walkways shall be provided in accordance with the same rules as for cranes.

5.1.6.4 Access to travelling beams and electric blocks

These devices have no walkways of their own: in principle, all components must be accessible from the fixed walkways on the structure of the installation, as shown by the diagram of appendix 5.

For these devices, the switch gearboxes shall be placed on the travelling beams or at a fixed station, never on the blocks.

5.1.6.5 Access to lubrication and maintenance station

Special attention shall be paid to the question of access to lubrication and maintenance points.

5.1.6.6 Machine cab

Cabs for machinery shall be enclosed as required by the site and by the equipment they shelter.

Openings, doors, hatches, removal panels are to be provided for maintenance.

Hooking points or monorails shall be provided for the necessary blocks, tackle, "TIRFOR" or equivalent.

The enclosing materials shall meet the requirements of the COMPANY's standards or approximate them if the cabs are of standard construction; in the latter case, the materials proposed must be submitted to the COMPANY for approval.

Sound proofing shall be used to minimise noise levels (refer to section 4.1.5.3).

Natural lighting and artificial lighting giving a lighting level of 150 Lux shall be provided.

Access to these cabs shall be separate from access to the control cabs, even if only a single wall separates them.

The doors shall be of the hinged type, opening to the outside.

5.2 Mechanisms

5.2.1 General

All parts shall be dimensioned to guarantee the theoretical life corresponding to the classification of the device under FEM rules.

Easy-to-separate monoblock assemblies should be used where possible, to allow repairs to be made in shop.

Cantilever installation should be avoided; where it is used, reliable receptacles or supporting arrangements must be provided.

The quality of all components must be suitable for use in the particular offshore environment of the site in question.

The use of cast iron is forbidden at low temperatures and in all load-holding mechanisms.

Milled bolts and screws are forbidden; hex socket head bolts and screws must be used instead.

Bolts and screws must be locked; the locks must be breakable.

Shims are to be provided under components that must be re-levelled after replacement.

Hoods or equivalent safety arrangements must cover shafts coupling and other revolving part it would be dangerous to approach.

Components not located inside the cabs, in particular brakes and clutches, must be suitably protected from the environment.

For certain movements, in which the load may exert a driving force, an overspeed control device acting on the brakes, as described in the paragraphs that follow, shall be provided.

5.2.2 Components common to all devices

5.2.2.1 Shafts and couplings

Shafts supported by more than two bearings are forbidden.

Rigid couplings between connecting shafts are forbidden.

5.2.2.2 Shafts bearings

Bearings exposed to the elements shall be of the sealed offshore type.

5.2.2.3 Force fits

If components are hot-fitted onto shafts and must be removable for maintenance, a device for removal using oil pressure shall be provided; the shapes and machined surfaces of the parts must assure a uniform distribution of the clamping pressures.

5.2.2.4 Reducers

Speed reducers are of the sealed oil-bath type, with an oil pump and heating devices if necessary; they are to be equipped with a practical and accessible breather, gauges, and oil-change fittings.

If certain mechanisms require outside gears (to be avoided in so far as possible), they shall be placed inside a sheet-metal case as closed as possible.

5.2.2.5 Brakes

All machinery for hoisting, luffing, telescoping, travelling and slewing shall be provided with fail safe brakes (ref. to [prEN 13852](#) Annex J).

Regardless of the type of device, all movements shall be equipped with brakes:

- The brakes may be of the disk, jaw or belt type. They shall be dimensioned for the service provided by the device under the most difficult conditions, even if they are used only as parking brakes, with braking being provided by the motor (hydraulic, pneumatic or electric)
- If the mechanism has both service brakes and safety brakes, the later shall be placed either on the shell of the drums (jaw brakes and belt brakes), or on a flange of the drum (disk brakes).

The brakes are normally equipped with wear take-up and braking torque adjustment systems.

5.2.2.6 Drums

The drums are made of steel (tube or rolled plate or cast to be approved by COMPANY).

They are of the single-layer or multi-layer type.

The winches of overhead cranes are equipped only with single-layer drums with two symmetrical windings; the use in exceptional cases of the two-layer drums with four windings must be submitted to the COMPANY for approval.

The drums of cable hoists are of the single-layer type with one winding in the most general case and with two windings when the vertical movement of the hook must not deviate.

Multi-layer drums are to be used only for fixed winches and crane winches, when the use of single-layer drums is impossible.

Single-layer drums must be grooved as follows:

- Flanges: Practical cable $\varnothing \times 2.5$
- Screw pitch: Practical cable $\varnothing \times 1.1$
- Groove radius: Practical cable $\varnothing \times 1.05$
- Groove depth:
 - 1.5 mm for cable $\varnothing \leq 15$ mm
 - 2.5 mm for cable $\varnothing 15 < \varnothing \leq 20$ mm
 - 3 mm for cable $\varnothing 20 < \varnothing \leq 30$ mm
 - 4 mm for cable $\varnothing > 30$ mm

The capacity of the hoist drum shall be such that there are at least 3 turns of wire rope left on the drum when the hook and the boom are in the most adverse positions.

A maximum of four layers of rope shall be wound on the drum. The drum flange shall be of such a dimension that it protrudes above the last layer of wire rope by 2.5 rope diameters.

The grooves of heavy-duty drums (transfer devices, for example) shall have a minimum surface hardness of 320 HB.

Multi-layer drums must assure perfect winding on of the cable; the drums shall be supplied with LEBUS grooving (or equivalent); proven additional systems such as "transcannage", the LEBUS corrector system, or equivalent shall be used when the angle of deflection of the cable is large; any other arrangement must be submitted to the COMPANY for approval. As a general rule, the angle of deflection of the cable (fleet angle) shall be less than 5°.

5.2.2.7 Cables

Steel wire rope shall be galvanised to relevant standards, impregnated and lubricated with a suitable lubricant during production to prevent water penetration and subsequent corrosion.

They must be of a rotation resistant type. They shall have a high resistance to both crushing and fatigue.

The attachment of the cables to the drums must be simple, perfectly suited to the type of drum, and require no preparation of the ends of the cable. All wire rope anchorages shall be easily accessible for inspection.

For use on multi-layer drums, the OWNER of the grooving “know-how” must guarantee the type of cable chosen.

Safety coefficients are determined in accordance with FEM rules and annex G of the [prEN 13852 Part 2](#); Safety factor shall never be less than 5 for material transfer and 10 when handling personnel.

Rope termination shall be by wedge socket, if otherwise they shall be clearly described in the proposal. The efficiency of the wire rope and terminations shall be substantiated.

5.2.2.8 Hooks

As a general rule, hooks must be of non-ageing forged steel requiring no periodic annealing; die-forged hooks are allowed only in the case of hand-operated slings and hoists.

They shall be dimensioned in accordance with standard [DIN 15401](#), according to the classification of the device.

Attachment of the safety catch by welding is forbidden; forged bosses, or possibly clamps on the body of the hook, shall be used.

5.2.2.9 Pulleys/Sheaves

Pulleys/sheaves can be made of forged, stamped or welded steel. They must be coated with a non-sparking and corrosion resistant material, or they can be made of NYLATRON material. They must be suitable for hazardous area use.

The grooves of pulleys for heavy-duty devices shall have a surface hardness of at least 320 HB; in other cases, the hardness is limited to 180 HB. The hardness value shall be compatible with the rope as recommended by the rope MANUFACTURER.

The rope fleet angle from sheaves shall not exceed 3°.

Sheaves shall be run on fully sealed anti-friction bearings.

Sheaves bearings shall be lubricated via a grease nipple on the pin (with the exception of load sensing pins).

Effective devices shall be provided to prevent the cables from escaping from the grooves of the pulley.

5.2.2.10 Blocks

Single and multiblock shall incorporate single point hooks which shall rotate on fully sealed anti-friction bearings. A spring safety latch with locking facility shall be fitted.

The cases of blocks shall be fully enclosed.

Multiblock shall be designed to facilitate ease of re-reeving.

All hooks shall be profiled to prevent snagging.

Hook assembly shall be of adequate weight to ensure tension in the wire rope at all times.

Grease nipples shall be provided to lubricate anti-friction bearings.

5.2.3 Non-sparking equipment

In the absence of a precise legal specification, when the devices are used in an explosive area, the components likely to produce sparks by shocks or friction shall be made of special materials:

- Bronze (running wheels, outside pinions or rings gears, hook catches, chain wheels)
- Bronze coating at least 0.6 mm thick on hooks
- Buffers equipped with rubber or equivalent pads.

5.2.4 Specifications particular to crane mechanisms

5.2.4.1 General

The power and operating characteristics of all mechanisms must be adequate for the anticipated conditions of use; all mechanisms must be equipped with the safety and monitoring devices necessary for their use.

5.2.4.2 Brakes

All machinery for hoisting, luffing, telescoping, travelling and slewing shall be provided with fail safe brakes (ref. to [prEN 13852](#) Annex J).

Mechanical brakes shall preferably be placed directly on the winch drum.

Brakes based on hydraulic restrictions (such as shut off valves) shall be capable of withstanding pressure shocks due to brake impacts. Fluid loss prevention shall be provided according to [EN 982](#).

All brakes shall automatically be activated when the motion control lever is returning to neutral position, at power failure, control failure or at emergency stop.

All brake components shall be designed for a load of minimum 1.6 times the rated capacity of the winch. Braking shall not cause dynamic effects that can damage the crane or its components and shall not produce overheating.

5.2.4.3 Load lifting mechanisms

In addition to service brakes, lifting mechanisms shall have safety brakes that act automatically when the mechanism is stopped or if there is any failure of the mechanism that might result in an overspeed of the load during lowering.

A holding device, separate from the brakes, operated by the crane operator of the cab, shall make it possible to hold the load indefinitely in a given position without any special attention on the part of the crane operator once the device has been operated.

The cable capacity of the drum is to be determined for the hook travel distances specified in paragraph 4.3.1.

Control of the lowering of the load using brakes only is forbidden.

5.2.4.4 Boom raising mechanism

This mechanism must be capable of raising or lowering the boom under load and of holding it in a fixed position without special attention on the part of the crane operator.

Control of the lowering of the boom using brakes only is forbidden.

Safety brakes acting automatically like those of the load lifting mechanism are to be provided.

An additional positive safety device of the ratchet or equivalent type is to be provided; it shall be possible to start this movement only if the safety is unlocked.

The cable capacity of the drum must be sufficient for travel from the fully lowered position (10° below the horizontal) to the fully raised position for all possible boom lengths.

For API 2C type A or B cranes:

- Two luffing cylinders shall be used
- One cylinder shall be capable of supporting maximum SWL
- Piston surfaces shall be suitably protected for the working environment
- Cylinders shall be closed when in the parked position with pistons fully protected.

5.2.4.5 Slewing system and slewing movement

Refer to Annex H of European Norm [prEN13852](#) Part 2.

Slewing shall be achieved by a slew bearing with integrated gear ring which shall be driven by a slew pinion.

Slew drive shall consist of slew pinion gearbox with integrated multi disk brake powered by hydraulic motor. Brakes shall be spring applied and pressure released.

Two independent slew drives shall be provided.

Slew bearing gear shall be internal.

Slew bearing to be of single ball or 3 row roller type.

Slew bearing retention device to be supplied for 3 row roller type.

Slew bearing shall be lubricated from a battery of grease nipples at a centralised point, readily accessible. It shall have 4 off grease sampling ports.

It must be possible to control accelerations and decelerations so as to avoid swinging to the load.

Braking should preferably be provided by the mechanism, possibly with the help of the brakes, which must be able to hold the crane in the desired orientation under the specified service conditions.

An additional positive locking device is to be provided; this device is interlocked with the operation of the slewing mechanism to prevent accidental engagement or disengagement.

5.2.4.6 Miscellaneous safety devices

- **Boom stopper**

Hydraulic or equivalent dampers must be placed on the superstructures of the cranes to stop the boom in the fully raised position, in addition to any devices for stopping the movement automatically at this limit.

- **Controls, indicators and limiting devices** (refer to [prEN 13852](#) Part 2, Section 5.4)

A load condition monitor is mandatory. Cranes shall be equipped with a safe load indicator for all hoists giving continuous display to the crane operator of the actual hook load, with respect to the safe working load, and the radius with an accuracy of +/- 2.5% full scale

reading. It must enable the crane operator to monitor the load limit according to outreach at all times. This device must deliver an audible warning signal as soon as the torque reaches 90 % of the limit and stop the movement in the direction of aggravation when the limit is reached. Rated capacity indicators shall be in accordance with [EN 12077-2](#). All information provided by the indicators and displays shall be visible from the control position. Audible indicators shall comply with [EN 457](#).

- **Limit switches**

Limit switches, duplicated for raising and lowering movements, are to be provided on all movements, in all directions of operation.

5.2.5 Specifications particular to the mechanisms of overhead cranes

5.2.5.1 General

The general rule specified in paragraph 5.2.4.5 is applicable.

5.2.5.2 Winch-type lifting mechanism

The drive unit provides the braking and holding of the load; the brake acts when the device has come to a stop and if the driving unit fails.

In the case of overhead cranes used for load transfers, an additional safety brake is to be provided as stipulated for the lifting movements of cranes.

The drums must be driven directly by their shafts unless this is absolutely impossible.

The two cables are joined on a fixed bridge of the load-beam type; this load-beam and the idler pulleys must be accessible from above the carriage.

5.2.5.3 Travel and crabbing mechanisms

Drive by wheel-on-rail friction must allow for use under the climatic conditions of the site; in the case of highly exposed installations for which wind or ice may pose problems, other procedures shall be used, such as cable drive or possibly the use of racks.

In the case of friction drive, the wheels shall be driven directly by their shafts.

5.2.5.4 Various safety devices on the mechanisms

Limit switches are to be provided on all movements in all directions of movements; on the raised position of the lifting movement, an additional limit switch, separate from the first and operated by the block, shall serve as overtravel safety.

Buffers are to be provided for the cranes and carriages, at the ends of the runway rails; the crane buffers shall be supplied with the structure of the installation.

A safety device shall prevent overloads; it should be adjusted to the value above the normal limit of use judged dangerous by the crane MANUFACTURER.

5.2.6 Specifications particular to hoists

This type of device, whether used separately or mounted on the carriage of an overhead crane, shall be assigned to transfer only with the approval of the COMPANY.

The cable guides of cable hoists shall be reinforced.

All hoists shall be equipped with lowered and raised overtravel limit switches and with a load limiter.

5.2.7 Specifications particular to lifting ancillaries

5.2.7.1 Cable slings

Cables shall be galvanised wires.

Safety factor applied to ultimate tensile strength at least 6.

5.2.7.2 Chain slings, rings, shackles, hooks

The use of high-carbon non-alloy steels is forbidden.

The steel used shall be non-ageing and shall not require periodic annealing.

Stamped hooks are allowed.

Safety factor applied to ultimate tensile strength at least 6.

5.2.7.3 Load beams

Load beams shall be made in accordance with the instructions concerning the structures of the handling devices.

Safety factor applied to ultimate tensile strength at least 5.

5.3 Heat engines

5.3.1 General

Engines shall be used to drive the hydraulic power sets whenever electric motors cannot be used.

For cranes, as a general rule, the engine shall be placed in the machine cab of the crane; separate placement is authorised only in the case of cranes with telescoping booms derived from self-propelled units, for which the engine may be placed on the support chassis.

The engines can be diesel or electrical engines.

The particular specification shall stipulate whether the motor is located in an explosive zone.

Except if otherwise specified, the engine must be equipped with all accessories necessary for its operation and control.

All equipment and accessories downstream of the connection to the fuel feed and possibly to the starting compressed air feed are to be supplied.

The engines shall be equipped with an exhaust silencer; noise level specified in paragraph 4.1.5.3.

The particular specification shall stipulate:

- The characteristics of the fuel oil and oils available on the installation
- The characteristics of the starting compressed air or oil circuit, if the engine does not have its own starting source.

5.3.2 Particular specifications for explosive zones

No hot spot on the engine in operation under full load may exceed the temperature specified for the explosion-protection zone in question.

In the absence of a particular stipulation, class T3, 200°C max. shall apply.

The operation of the engines is under the control of the fire, gas and air ionisation detection system.

Transmission belts shall be avoided; if this is impossible, they shall be of an anti-static type.

Except as otherwise specified, the exhaust manifold shall be water-cooled.

An anti-spark device shall be provided on the exhaust silencer.

The intake shall be blocked-off automatically, causing the engine to stop, if there is an operating malfunction resulting in a temperature rise or detection of a fire or dangerous atmosphere.

On special request, an automatic fire-extinguishing system shall be provided.

If the engine is placed on the installation outside the crane, it shall be fully hooded; panels that close automatically if a fire or dangerous atmosphere is detected shall be provided.

5.3.3 Auxiliary equipment in the machine cab

The equipment listed below is to be supplied; this list is not exhaustive:

- Hydraulic or pneumatic starting system: if the compressed air circuit of the installation cannot be used, the engine shall be equipped with cylinders, with a compressor and with the necessary circuits
- Connections to the externals circuits with the necessary check and gate valves
- Filter for fuel oil, lubricating oil and air
- Overflow circuits with returns to the tanks having the necessary check and gate valves
- Easy-to-drain retention tanks
- The necessary control panels and instruments.

5.3.4 Engine monitoring equipment in the crane Operator's cab

The following list of equipment to be supplied is not exhaustive:

- Tachometer
- Hours run meter
- Lubricating and fuel oil level gauges
- Fuel oil low level alarm
- Oil pressure gauge
- Oil and water (engine and exhaust cooling) temperature gauges
- Monitoring of the ventilation circuit
- Gauge giving temperature of exhaust gas and, if possible depending on the power of the engine temperature of exhaust gas per cylinder.

5.4 Hydraulic equipment

All of the equipment shall be treated for operation in an offshore environment.

Cylinder plungers shall be nickel-, and chrome-plated:

- Thickness of nickel plating 10 to 15 μ
- Thickness of chrome plating 15 to 25 μ after polishing.

The hydraulic transmission and control circuitry shall meet the requirement of [ISO 4413](#).

The hydraulic oil supply system shall include heaters or oil coolers as necessary, capable of maintaining the working fluid at a temperature such that viscosity of the fluid is most suitable for the components employed.

The power demand by the hydraulic systems shall not exceed the power capability of the prime mover.

Reservoir shall be manufactured from stainless steel type 316L, with bottom sloped to enable complete drainage of the tank through a drain valve. Openings/Inspection covers on the tank to be raised and gasketed. Level gauge with maximum and minimum markings to be provided.

10 micron absolute filter shall be provided for filling the reservoir with hydraulic oil.

All hydraulic components including hoses shall be clearly identified with permanent tags to match circuit diagram nomenclature.

Hoses and fittings shall be protected from damage in all exposed areas.

All main hydraulic components such as pumps, motors, filters shall be designed for easy replacement without the need for draining the hydraulic tank.

Hydraulic system shall have provision for manual operation for lowering main hoist, luffing cylinders or luffing winch, and slewing the crane in the event of electrical power loss or prime mover failure.

5.5 Electrical equipment

5.5.1 General

The equipment shall comply with the standards specified in paragraph 2 and shall satisfy the legal requirements of the country having authority over the installation.

The particular specification shall stipulate the zone determining the degree of protection; in the absence of a particular specification, the equipment shall be classified in group IIA of the CENELEC rules, type (Ex)e protection.

All of the equipment shall be given offshore protection and as required tropical impregnation.

Control boxes, switchboards, junction boxes and motors shall be equipped with anti-condensation heating.

Level of protection for switchboard and boxes:

- IP 65 when located out of the doors
- IP 54 when located in a cab.

Motors classes:

- Insulation, class F
- Temperature rise, class B.

Except as otherwise indicated the equipment shall be dimensioned for operation at a temperature of 40°C.

In the case devices exposed to sunlight, covers with ventilation shall be provided if necessary.

5.5.2 Supply to the equipment

The devices shall be supplied from the available power source of the installation; the voltage and frequency shall be stipulated in the particular specification.

The point of connection to the installation is stipulated in paragraph 4.3.4. Vendor shall be responsible for supplying and installing junction boxes in the pedestal adapter through which the platform supply can be terminated. From the junction box upwards, Vendor shall be responsible for supplying all electrical equipment.

Electrical Starting System for the main motor shall be of the soft starting type and will be located inside the machinery house.

Except as otherwise specified, maximum voltage drops between points of connection and motors will be given by the crane fabricator and be always less than:

- 5 % during starting
- 2.5 % in steady operation.

All mobile devices shall be supplied by festoon cables; the cable trolleys and the runway beam or rail, together with the attachments to the installation, form a part of the device.

All cabling to be adequately supported throughout its length and shielded from mechanical damage.

All junction boxes shall be provided with labels which correspond with the electrical circuit references, firmly bounded to the front cover of each box.

All wiring shall be fitted with indelibly marked identification ferrules at both ends.

5.5.3 Switch gear

Except if required by an additional specification, the following shall be provided:

- One switch locked line disconnecting switch placed at the point of connection to the installation
- A hand-operated switch placed at the point of access to the device, capable of cutting off all power
- General protection with high braking capacity fuse circuit breakers and magnetothermal relays
- Each movement shall be isolated and supplied via a disconnecting switch, contactors, high-breaking capacity fuses, and magnetothermal protection
- In the case of small devices (hoists and travelling beams), the equipment of all movements may be grouped

- Control circuits will be equipped with under-voltage relays
- Limit switches shall be selected from rugged series; their number and functions shall be specified in paragraphs 5.2.4, 5.2.5 and 5.2.6.

5.5.4 Grounding

Every equipment (either electrical or not) shall be grounded by a special conductor to be connected to the grounding of the installation at two different points very far from each other.

5.5.5 Lighting

5.5.5.1 Lighting levels

Cab, machinery house, pedestal adapter, access way and ladders shall have adequate lighting.

	Normal	Emergency
Control cab	200 lux	20 lux
Machine cab or room	150 lux	20 lux
Switchboards	150 lux	20 lux

5.5.5.2 Positions lights

Aircraft warning light conforming to International Aviation Standard shall be provided. Devices located in the superstructures of the installation, above the level of the helicopter pad, shall be equipped with 50 W omni-directional lights at their high points.

Examples:

- For cranes, one light at the boom cathead and one on top of the machinery house/A-frame.
- For overhead cranes or gantries, one light at each of the four top corners.

If the cranes boom may project more than 10 meters above the level of the helicopter pad, one additional light shall be provided for every 10 meters of extra boom length.

The additional colour arrangements required by paragraph 5.8.4 shall be provided for crane booms.

5.5.5.3 Lighting of the work area

Flood light system (two swivel-mounted spotlights, each having a power of at least 400 W) shall be installed on the cranes, overhead cranes and gantries to ensure adequate illumination of the platform deck area and of the suspended load at all times in all positions of the boom.

5.6 Control stations

5.6.1 General

According to the particular specification, the controls may be located:

- In a cab
- On a console at a fixed station
- On a mobile pushbutton box.

The station must be judiciously located on the device or on the structure so as to assure the best possible visibility of the entire travel of the hooks; in difficult cases, television may be used to provide additional visibility, or one or several control stations, suitably located, with interlocks among them, may be provided; refer to the requirements of paragraphs 4.2.3 concerning the study of handling operations.

Remote control by radio may be used only in exceptional cases, with the prior approval of the COMPANY.

An indestructible set of operating instructions in the operator's language shall be placed on the station within view of the work position.

As a general rule:

- Devices used for transfers are controlled from cabs
- Small cranes and devices used for small movements may be controlled from a fixed station
- Small devices used for maintenance (hoists, travelling beams, small overhead cranes) shall be controlled by mobile pushbutton boxes. It shall normally be possible to move the box independently of the load either along the monorail or along the travelling beam or the overhead cranes.

5.6.2 Specifications particular to cabs

If cabs are located in dangerous area, they have to be high-pressured designed except if the inside equipment is of safety type.

5.6.2.1 Operator's compartment

All cabs shall be of the enclosed type, weather proof and shall provide adequate room for the crane operator and an instructor; they shall be air-conditioned as required by site conditions to obtain an inside temperature of 20°C in cold or temperature regions and 25°C in hot regions.

Inside noise level as specified in paragraph 4.1.5.3.

Cabs shall be made of non-inflammable, fireproof materials.

The means of attachment to the devices shall assure complete safety and must not transmit abnormal vibrations. If the cabs are suspended from the devices, special safety devices shall be provided in case of failure of the attachments.

Sides shall be made of plate at least 3 mm thick and floors of plate at least 4 mm thick.

Outside windows shall be of the safety type, at least 6 mm thick. In the case of air-conditioned cabs, the windows may be double-glazed; suitably designed to eliminate any possibility of condensation between the panes and eliminate any mirror effect.

Front window shall extend down to the floor with protection bars (at least one safety bar at one metre height from floor, which shall give minimum obstruction to the crane operator view.

Windows shall be equipped with rugged motor-driven wipers.

A defrosting system shall be provided for installations in cold areas.

Air-conditioned cabs shall be specially insulated.

Inside dimensions must not be less than:

- Width: 1 200 mm
- Depth: 1 500 mm
- Height: 2 200 mm

The depth is measured from the back of the seat to the ends of the feet, possibly resting on pedals.

The inside dimensions must allow for access to the seat and for the opening of the windows for maintenance.

Cabs shall be equipped with a fully adjustable seat; i.e. height, forward/backward and backrest angle; this seat may tilt or swivel to facilitate access; it shall be locked in the working position.

5.6.2.2 Controls

All controls, whether for manoeuvres or for ancillaries (heating, air-conditioning, lighting, etc.) shall be within reach of the operator seated in the working position.

Controls levers shall be placed in such a way that the Operator's forearms are approximately horizontal.

The movements of the controls shall match the directions of the movements they control.

So as to avoid movement of the body, the amplitude of arm movement shall be limited to 0.65 m to either side of the centreline of the seat, and exceptionally to 0.75 m in the extreme position; the maximum amplitude of lever travel shall be 125 mm in all directions about the neutral position.

Any pedals shall have a maximum travel of 100 mm; they must not hinder the Operator when not in use.

Pedals shall be designed in such a way that the foot cannot slip when operating them; the pedal action shall be power assisted when the force to be applied becomes excessive.

The point of action of pedals shall be 0.95 m from the seat back when all the way back and 0.85 m when all the way forward.

Indicators shall be placed in front of the Operator outside of his field of view of the load and of movements of the device.

Control pushbuttons shall be grouped on a console, preferably combined with the console on which the levers are mounted.

5.6.2.3 Summary of in-cab controls and indicators

- The control levers of each movement or joystick to operate the crane.
- The control pedals of each movement.

- Control pushbutton (start, stop, selection of speed or flow rate, various engagement and disengagement functions, air-conditioning, external lights switches, etc.).
- Operating monitoring indicators (power “on” indicator, “on/off” indicator for diesel engine, lamps, warning devices, load monitor or limiter, overload and wind speed alarms, miscellaneous indicators, mechanical radius indicator, etc.)
- Emergency red shut-down push-button.
- The monitoring indicators of the diesel set (if any) stipulated in paragraph 5.3.4.
- Voice links with the control cab of installation.
- Personnel safety devices: alarms (fire, gas, detection, evacuation, etc.), horn for warning of the start of movement of the device or load and its control, extinguisher, etc.
- Crane level indicator for cranes installed on floating units given the inclination in degrees to one decimal place in the longitudinal and transverse direction of the installation. This indicator shall be connected to the control centre in order to maintain overall stability of the installation during crane operations.
- The load charts (both in static and dynamic cases) shall be mounted in an easily visible position inside the crane operator’s cabin.

This list is not exhaustive, and may be completed in the particular specification.

As an option the following can be installed:

- Slack rope indicator and/or slack rope limiter.
- Indicator for drum motion.
- Wind speed indicator.
- Emergency load release system (ELRS).
- Motion compensator (cable tensioning system and heave compensator system)

5.6.3 Specifications particular to fixed-station controls

Controls, monitoring devices, and indicators shall be grouped on a console.

The operator shall work in a standing position.

Connections between the device and the console shall be supplied and installed by the SUPPLIER of the device.

For outdoor operations, a protective canopy shall be provided; it must not interfere with the visibility of the load.

5.6.4 Specifications particular to controls on boxes

The boxes shall comply with the safety requirements of the zone in question.

Each box shall include:

- One green pushbutton operating the “START” circuit-breaker
- One red pushbutton tripping the “STOP” circuit-breaker
- One non-latching pushbutton that must be held down for the duration of the movement for each direction of movement

- One horn pushbutton
- One switch for the lighting (if any)
- One "POWER ON" indicator lamp.

When a movement has two speeds, the pushbutton may be of the double pressing type, making it possible to start up in low speed, shift to high speed, and shift back to low speed before stopping.

In the exceptional case of control with continuous speed variation, the box shall be replaced by a case and the movement control pushbutton by manipulators.

Key-lock system: It shall not be possible to start using the lifting equipment without un-locking the "control box" with its dedicated key.

5.7 Particular requirement for personnel transfer operations

Refer to European Norm [prEN 13852](#) part 2.

Cranes intended for lifting or moving persons shall be equipped with the specific following features in addition to the other requirement of this specification:

5.7.1 Safe Working Load

The safe working load shall not exceed 50% of the rated capacity for lifting of loads. This information shall be given in the instructions of use, load chart and by the Safe Load Indicator whenever the mode for lifting of persons is selected.

5.7.2 Rope and chains

Where fitted as accessories, ropes shall have a minimum safety factor of 10 and chain shall have a minimum safety factor of 8, related to the Safe Working Load.

5.7.3 Secondary brakes

Hoisting and luffing winches shall be equipped with a secondary brake in addition to the normal working brake.

A secondary brake shall act directly on the winch drum and be operationally independent with respect to the working brake.

Means shall be provided for the user to conduct individual test of the secondary brake.

5.7.4 Mode selection for personnel lifting

The control station shall be equipped with a manual key selection switch for the purpose of lifting persons. The switch shall be lockable in both positions with a removable key and have an adjacent warning light continuously indicating when it is activated. The light shall not illuminate unless selection for personnel lifting is made. Selection of modes shall only be possible without load on the hook.

When the mode for personnel lifting is selected, the following functions shall be maintained:

- All brakes shall automatically be activated when the controls are in neutral position and in case of emergency stop being activated or the event of power failure
- Where fitted, motion compensator (i.e. cable tensioning systems and heave compensator systems) shall be overridden

- The Emergency Load Release System (ELRS) shall be overridden.

5.7.5 Communication

The crane operator shall have means of continuous radio communication with the personnel to be lifted.

5.7.6 Lifting devices

Lifting of persons shall only be performed using special lifting accessories designed for the lifting of persons by offshore cranes. Such lifting accessories shall fulfil [prEN 12077-5](#)

5.8 Paintwork

Refer in general to [GS COR 350](#).

5.8.1 Guarantee

The devices shall be given protection guaranteeing a life of five years as per photograph Re 2(8) of the European standard degree of rusting for rust proofing paint.

5.8.2 Application

The preparation of the plates, the grades of paint, the number and thickness of the coats, and the application process shall be submitted to the COMPANY for approval.

5.8.3 Repairs

Before commissioning, any repairs made necessary following transport and erection shall be done at the CONTRACTOR's expense.

5.8.4 Crane booms

Crane booms capable of projecting above the level of the helideck shall be painted in white and red zones as required by air safety regulations.

6. Technical documents

6.1 To be prepared by the COMPANY

6.1.1 General environmental data

- Site location
 - Longitude
 - Latitude
 - Distance from coast.
- Level data
 - Low water level
 - Levels of the various floor to be served
 - Level of installation of the devices
 - Level of the helicopter pad.

- Environmental conditions
 - Forward a statement of the characteristics mentioned in paragraph 4.1.3.

6.1.2 Requirements imposed by regulations

Indicate the country having authority over the installation and determining the legislation to be complied with.

6.1.3 List of general specifications

Confirm or, if necessary, modify the list of specifications and standards mentioned in this general specification.

Specify any options chosen that might limit the range of choice offered by the standards.

6.1.4 Provisional list of main handling devices

Draw up this list to indicate: the type (pedestal crane, deck, travelling beam, gantry), the zone it is desired to have covered by each device, and the main functions of the devices.

6.1.5 Timetable of requirements

Indicate the events of the general installation timetable justifying making the main handling devices available.

6.1.6 Specification of equipment examination and testing principles.

Confirm, amplify or modify the scope of the examinations stipulated in chapter 7.

6.2 To be prepared by the CONTRACTOR (Engineering portion)

6.2.1 Finalisation of the list of devices

The list of devices will be completed gradually as the design work and definition of requirement progress.

The devices shall be studied in order of decreasing completion time (the completion time to be taken into consideration includes the times taken by specifying the device, by the call for tender, by the selection of the SUPPLIER, by the drawing up and signing of the order, and by the construction acceptance, transport and erection of the device).

6.2.2 Preparation of the packing list

The list shall be as precise as possible and shall include all objects that might affect the handling studies and the specifications of the equipment.

6.2.3 Handling studies

These studies shall be carried out in accordance with the instructions of paragraph 4.2.

The CONTRACTOR shall attempt to define as quickly as possible the necessary and sufficient characteristics making it possible to draw up the call for tender within the time allocated.

The CONTRACTOR shall prepare the cinematic diagrams of erection of the most significant parts in accordance with the instructions of paragraph 4.2.3.

6.2.4 Particular specifications, tender documents

The tender documents include, per device:

- A particular specification stating the general data, the use, the expected performance, and list of specifications and standards imposed by the COMPANY, possibly completed by the CONTRACTOR
- A specification drawing showing the device in context, the maximum outside dimensions to be observed, the travel distances of the hooks, the levels and areas served, the positions and specifications of interfaces, and essential dimensions that cannot be stipulated and must be indicated by the tenderer in his tender.
- The general terms and conditions of purchases imposed.
- The terms and conditions of acceptance of the equipment.
- The terms and conditions for transport, erection, and commissioning at the yard and/or the site.
- An estimated timetable indicating the deadline for tendering, the order date, the date of works completion, the possible period of erection and testing at the yard and the period of erection and testing at the site.
- A standard questionnaire to assure receipt of uniformly presented tenders that are easy to use for price and technical comparisons. The drafting of this questionnaire must apply to the tenderer to reply point by point to all specifications.
- All other documents deemed necessary.

6.2.5 Comparison of Tenders

The studies shall include the drawing up of tables of technical comparison and commercial comparison.

The technical comparison includes, for all Tenders, the points of the questionnaire of the call for Tender, to which are added the comments and evaluations necessary for the technical choice.

The price comparison, also detailed for each Tenderer, must show:

- The basic prices for comparable supply
- The various options
- The costs of various services (tests, transport, erection, commissioning)
- The cost of emergency spares and spares for two years' operation
- Conditions of sale (indices of preparation of Tender, revisions, spreading out of payment, exchange rates of currencies, etc.)
- All other comparative information considered necessary, in particular completion times.

6.2.6 Particular specifications, contract documents

The contract documents include:

- The particular specification, which repeats the terms of the specification of the call for Tender, personalised to match the Tender selected
- The specification drawings, revised on the basis of the information contained in the Tender selected
- Commercial documents
- The detailed timetable giving:
 - The completion time (design, construction, transport, erection, commissioning)
 - The dates of submission of necessary documents to the CONTRACTOR and to the COMPANY
 - The dates of key events making it possible to check progress of the work (placement of sub-orders, procurement, key fabrication work, start of works erection, inspection, acceptance, etc.).

6.3 To be prepared by the CONTRACTOR (working studies and supply portion)

6.3.1 When tendering

The Tenderer shall provide with his quotation a list of specific exclusions, if any, otherwise the quotation shall be considered to be in accordance with this specification and in the event of placement of an order any subsequent claims arising out of non-compliance will not be considered.

The Tenderer shall fill out the questionnaire submitted to him and shall reply to all points without exception.

He shall attach to this questionnaire the drawings and descriptive manuals making it possible to judge the construction and compliance with imposed specifications and dimensions and to complete the dimensions not stipulated on the drawing of the call for Tender.

The Tenderer must submit the statement of loads required by paragraph 4.3.2.

In the case of cranes, the Tenderer shall submit the load x outreach diagram of the machine proposed, specifying, very clearly, the corresponding dynamic coefficient, stipulated in this specification or possibly mentioned in the particular specification of the call for Tender.

The Tenderer shall submit his price offer, broken down in accordance with the instructions of the call for Tender, including a proposal for replacement parts.

The Tenderer shall also furnish one standard outline of a maintenance manual.

6.3.2 In the course of design and fabrication

The following documents shall be submitted in accordance with the timetable established at the time of ordering.

6.3.2.1 Co-ordination documents

- Confirmation of the statement of loads
- Confirmation of the dimensions of the device

- Confirmation of the interface characteristics
- Periodic submission of the updated timetable
- Packing list.

6.3.2.2 Check of compliance with technical clauses

- Submission for approval or remarks on assembly and subassembly drawings of non-standard equipment or a detailed descriptive manual including plates for standard equipment
- Submission of the engineering notes of the structures and main mechanisms covered by FEM rules
- Submission of hydraulic, pneumatic and electrical diagrams.

6.3.2.3 Relations between CONTRACTOR and SUB-CONTRACTOR

- Submission of sub-orders (instructions, completion times, prices excepted).

6.3.2.4 Production fabrication inspection

- Submission for approval of the list of fabrication inspections normally planned by the CONTRACTOR
- Notice, within the prescribed times, to any agencies that are to witness fabrication inspections or take charge of partial acceptances
- The COMPANY must be notified of such inspections and acceptance at least 15 days in advance.

6.3.2.5 Miscellaneous formalities

Comply with formalities and execute all necessary documents specified in the contract intended for banks, forwarding agency, customs and other agencies.

6.3.2.6 Spare parts

Confirmation of the proposal for emergency spares and spares for two years' operation.

6.3.3 At shipment

All final technical documents called for in the General Terms and Conditions, including:

- All assembly and sub-assembly drawings
- All hydraulic, pneumatic and electrical diagrams
- Complete descriptive and operating manuals
- Instruction manuals
- Complete maintenance manuals
- The dossier of inspections performed at the works during the course of manufacture.

6.3.4 After testing and commissioning

Entering in the permanent documents of all changes made to equipment during this period (modified or additional pages or documents).

7. Inspections and acceptances

7.1 Inspections and acceptance

7.1.1 Designation

The devices shall be inspected at three levels:

- By CONTRACTOR
- By the COMPANY
- By the Inspection/Certification Authority.

7.1.2 Roles, services, compensation

The CONTRACTOR carries out all inspections during manufacture at his own expense.

The COMPANY may carry out any inspections in additions to those of the CONTRACTOR that may be deemed necessary because of the importance of the device; these inspections are made in the works and at erection by the COMPANY.

The Inspection/Certification Authority carries out and certified the acceptance inspections imposed by the reference legislation; the COMPANY may have its own inspections carried out by the Inspection/Certification Authority.

7.2 Scope of inspection

7.2.1 General

The COMPANY reserves the right to witness all inspections in the CONTRACTOR's plant.

If the equipment is found to be abnormal, the inspections shall be extended, as required, by mutual agreement between the COMPANY and the CONTRACTOR; the additional inspections are at the CONTRACTOR's expense.

7.2.2 Inspection during manufacture

7.2.2.1 Structures

- **Testing of materials:** The CONTRACTOR shall submit the acceptance documents issued by the steel works in compliance with specification **GS STR 201**, possibly as modified by the particular specification.
- **Inspection of welded structures:** The CONTRACTOR must have his welders and welding procedures approved by the designated Inspection/Certification Authority and submit the corresponding certificates to the COMPANY. Welds shall be examined using non-destructive methods in compliance with **GS STR 301** as modified by Table 1 of this specification.

The Certification Authority must accept the inspectors.

7.2.2.2 Machinery

- **Castings:** Certificates of analysis and conformity, detection of internal defects by non-destructive examination (explosion-proof enclosures, drums, brake pulleys, cable pulleys).
- **Machine-welded parts:** Certificates of conformity of materials and examinations of annealing.
- **Forging:** Certificates of analysis, heat treatment and mechanical testing (hooks, hook cross-pieces, suspension rods and clevises). Acceptance of these parts shall be by the Certification Authority.

Table 1 - Minimum scope of non-destructive examinations

Elements category (cf. 6.1.1)	Type of weld	Visual examination (2)	Radiography (2)	Ultrasonic (1) (2)	Dye penetrant or magnetic particle examination (2)
First	Butt	100 %	100 %	-	10 %
	Complete penetration		-	100 %	10 %
	Partial penetration		-	100 %	20 %
	Fillet		-	-	10 %
Second	Butt	100 %	10 %	-	-
	Complete penetration		-	10 %	-
	Partial penetration		-	10 %	10 %
	Fillet		-	-	5 %
Non-structural	All	100 %	Spot check (3)	-	Spot check (3)

Notes:

- (1) Applies to thickness over 12 mm.
- (2) The percentage is referred to the total weld length in the category of element in question.
- (3) "Spot Check" means an examination percentage between 0 and 5 % at the discretion of the COMPANY or the Inspection/Certification Authority.

In case of identified defects, the examination percentage shall be increased at the discretion of the COMPANY or the Inspection/Certification Authority.

- **Machining:** Gauging, conformity to drawings (dimensions, tolerances, surfaces conditions, round-offs and grooves limiting stress concentrations, finishes of gear teeth, etc.).
- **Lifting cables, slings and chains:** Certificate of conformity and testing issued by the SUPPLIER, to be submitted for acceptance by the Certification Authority.
- **Standard sub-assemblies ordered from catalogue:** Certificates of conformity guaranteeing the materials, treatments, workmanship, running in and life for the intended use.
- **Non-catalogue sub-assemblies:** Same requirements as for the parts considered individually.

7.2.2.3 Electricity

- **Non-explosion-proof equipment:** Examination of characteristics and conformity to specification.
- **Equipment classified explosion-proof, regardless of class** certificates of conformity issued by approved laboratories, to be submitted to the Certification Authority for approval; examination of characteristics and of conformity to specification.

7.2.3 Plant erection examinations

Lifting devices shall be erected at the plant and presented to the Inspectors delegated by the COMPANY and by the Certification Authority for a general examination of compliance with the contract technical specification.

7.2.3.1 Structures

- Examination of main dimensions and interfaces for connection to the installation: pedestal cranes, stands and clearances for travelling beams, overhead cranes and gantries
- Examination of wheel alignments in the case of travelling equipment.

7.2.3.2 Mechanisms

No-load operating tests to detect sticking points in transmissions, shocks, vibrations, and leaks.

7.2.3.3 Electrical equipment

- Inspection of the attachment of the equipment
- Examination of identification in accordance with the diagrams.

7.2.3.4 Paintwork

- Examination of surface preparation
- Examination of thickness and adherence.

7.2.3.5 Safety components

- Check of their presence and, if possible, of their operation
- Examination of means of access (means of access, walkways, etc.).

7.2.3.6 Control cabs

- Examination of the equipment and of the layout of controls and indicators.

7.2.4 Factory Acceptance Test (FAT)

7.2.4.1 General

As a general rule, acceptance in shop of the devices shall be under load; exceptionally, if this is absolutely impossible, at the yard.

If the unit does not meet with the criteria defined in the project crane specifications, it shall be shortly rectified and validated during a subsequent repeat test.

The acceptance test must include:

- One general examination for conformity to the specification
- One static test with overload
- One dynamic test with overload
- And dynamic test at normal load.

The tests are carried out under the supervision of the Certification Authority in the presence of the Inspectors named by the COMPANY.

The CONTRACTOR provides the necessary personnel (adjustments, operation, and handling of test loads), together with the loads and slings.

In the exceptional case in which testing is at the yard, with the devices pre-erected on the installation, the CONTRACTOR shall assign the adjustment and operating personnel to the site; the yard shall furnish the loads and slings and perform the handling of the loads.

7.2.4.2 General examination for conformity

This examination is specified in paragraph 7.2.3. If, exceptionally, the test is conducted at the yard, the examination shall concentrate on any parts that might have undergone alterations following dismantling for transport and re-erection.

7.2.4.3 Static test with overload

Except as otherwise specified, the overload is set at 50 % of the nominal load.

The overload shall be set down gradually on the load without drifting or else the load and overload shall be placed on jacks that shall be retracted after gradual tensioning of the slings.

For cranes, this operation shall be performed:

1. With the boom raised at the maximum angle and in both cases: maximum and minimum length with the maximum load corresponding to that minimum outreach
2. With the boom lowered at the minimum angle and in both cases: maximum and minimum length with the maximum load corresponding to that maximum outreach
3. With the boom set in a position, which gives the most strenuous conditions for the luffing winch or luffing cylinder.

For other types of equipment, the test load is placed in the middle of the span of the device.

During this test, it shall be checked that the resulting sags are less than or equal to the sags calculated by the SUPPLIER and that, once the loads have been set down, there is no residual sag.

Point 1 allows testing the main hoist brake

Point 2 is included in the so-called "creep test".

7.2.4.4 Dynamic test with overload

Except if otherwise specified, the overload is set at 20 % of the nominal load.

The various movements are tested with no allowance for the temperature rises and speeds obtained. The test load is moved in the direction of maximum movement amplitude.

All safeties and indicators, together with their tripping devices, shall be checked during this test, including the normal safety brakes.

For cranes, the test is repeated with the loads corresponding to the various extreme lengths and inclinations of the booms.

7.2.4.5 Dynamic test at nominal load

The load is moved in the direction of maximum movement amplitude; the following shall be checked:

- Travel distance in all hook directions
- Speeds and accelerations
- Temperature rises
- Flow rates, pressures and power consumption
- Noise levels
- Safeties (limit switches, load limiters, etc.).

7.2.4.6 “Creep test”

The acceptance criteria is:

- For an API type C, D or E crane
 - No lowering of the load
 - No slippage of the winch brake.
- For an API type A or B crane
- During the static overload test, at maximum radius and maximum boom length (or in the most strenuous condition for the luffing jack), during one hour, the lowering of the load must not be greater than 100 mm or the slippage of the cylinder rod must not be greater than 10 mm depending which value is reached first.

7.2.5 Yard test:

All functional, operational and overload tests already performed during shop tests (FAT) shall be carried out again by the CONTRACTOR with the assistance of the VENDOR/MANUFACTURER after installation of the crane on the deck (part of the commissioning of the crane). The overload tests shall be performed with the same overload, as for the FAT, in order to check the pedestal and all other equipment which have not been tested at the MANUFACTURER plant.

7.2.6 Initial test:

Re-load test of the crane shall be performed after transportation/final installation. This is a requirement of the certifying authorities Lloyds, BV, DNV etc.

After the offshore installation of the platform, after the commissioning of all equipment and before the crane is put into use the first time the Initial Test (load test with 10% or 25% overload, depending on the actual SWL of the crane, according to API RP 2 D or BV (DNV, Lloyds, ABS, etc.) requirements) shall be performed and witnessed by a recognised Certification Authority.

7.3 Definition - Criteria

7.3.1 Materials

- Structural steels: testing as per **GS STR 301**
- Steels for mechanical applications: characteristics and testing as per the following French and European standards:
 - **NF E 01-000**
 - **NF A 35-551 to 554**
 - **NF A 03-152 to 154**
 - **NF A 03-157**
 - **EN 10002-1**
 - **EN 10045-1**

7.3.2 Application

- Machining: examinations as per French Standards
 - **NF E 05-015 and 016**
 - **NF E 02-350**
- Welds

Welded joints shall be examined in accordance with the requirements of **GS STR 301**.

7.3.3 Erection

7.3.3.1 Tolerance for connection of crane to pedestal - except if otherwise specified

7.3.3.1.1 Weld assembly

- Ovalization of shaft at welding plan $\pm 0,5$ % of nominal diameter
- Opening of welding bevel angle $\frac{+5}{-0}$ degrees
- Thickness of weld toe: 0.8 mm.
- Perpendicularity of joint plan with respect to shaft centreline: ± 1 degree
- Verticality of shaft centreline: ± 0.5 degree.

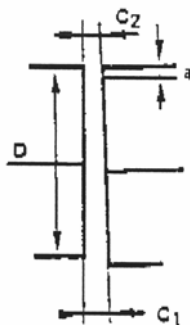
7.3.3.1.2 Bolt and flange assembly

- Diameter of bolting circle: ± 1 mm
- Diameter of bolt holes: ± 0.2 mm
- Centres of two consecutive bolts: ± 0.1 mm
- Flange warp, ± 0.5 mm, measured at four points 90° apart on the bolting circle
- Conicity of the flange contact face, $\frac{D - d}{2} \times 0.0002$.

7.3.3.2 Alignments of associated machine shafts

Examinations of concentricity and parallelism using comparators.

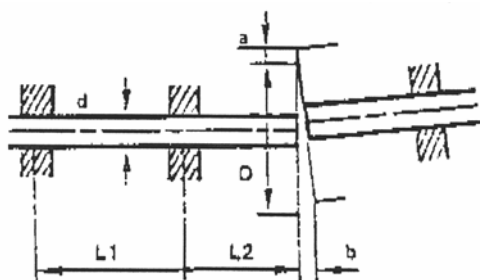
7.3.3.2.1 Tolerances for shafts coupled by deformable sleeves



$$\text{Tolerance } \frac{a+b}{D} \leq 0.04$$

$$\text{With } b = C1 - C2$$

7.3.3.2.2 Tolerances for shafts coupled by rigid plates



$$\text{Tolerance } a + b \leq \frac{L1+L2}{10000}$$

with L2 not very different from D

$$d \text{ not very different from } \frac{L2}{6}$$

- Out-of-round of brake drums or warp of brake disks, tolerance less than or equal to 0.1 mm.
- Examination of spans, levels and wheel alignments for travelling equipment:
 - Measurement made using a theodolite
 - Tolerance as per [FEM section I](#), addendum "Tolerances for lifting equipment and gauges".
- Balancing: Machines revolving at high speed shall be dynamically balanced. Tolerances shall be set by agreement with the COMPANY.

7.3.4 Functional characteristics

Tolerances:

- Lifting forces, no negative deviation allowed
- Speed, maximum negative deviation less than or equal to 5 %
- Acceleration, ± 10 % of specified value
- Hook travel, no negative deviation allowed.

7.4 Summary

All examinations shall be written up in a report; the examinations carried out and the results shall be stated in this report.

All documents concerning examinations shall be grouped in a dossier to be submitted with the equipment, as stipulated in paragraph 6.3.3.

This dossier shall include:

- Certificates of conformity
- Reports of examinations
- The certificates of approval issued by the Certification Agency
- Testing and acceptance reports.
- Certification by the SUPPLIER that all drawings and manuals furnished are in conformity with the equipment as-built.

8. Maintenance

8.1 General

All the equipment shall be furnished with descriptive manuals, operating manuals and maintenance manuals, all forming a single volume, either in hardback or in a rigid file folder.

The documents included in this volume shall be in formats A4 or A3, in accordance with the indications of **GS STR 100**.

The form and the language used for each of the documents listed below must be approved in advance by the COMPANY.

8.2 Descriptive manuals

The descriptive manuals shall include:

- The functional characteristics of the device
- Reduced assembly and sub-assembly drawings
- Cut away and exploded views of all equipment
- Hydraulic, electrical or pneumatic diagrams
- The identification of all component equipment and their identification in the assembly
- The principles of operation of the device.

8.3 Operating manuals/Instructions

The instructions for use shall specify the duties of the crane operator before, during and after crane operation.

The operating manuals shall contain:

- The chronological list of the checks to be carried out by the Operator before starting up
- The operations to be performed for each of the movements to be performed



- The interpretation of monitoring indications and the attention that should be paid to them
- The sequence of operations to be performed in case of an operating difficulty.

Remark: This manual shall be in agreement with the instructions displayed in the operator's station of the device.

8.4 Maintenance manuals

With reference to the views, drawings, diagrams, etc., and to the identifications appearing in the descriptive manuals, the maintenance manuals shall indicate:

- Necessary periodical checks, intervals and objects of inspections
- The intervals and objects of adjustments
- Troubleshooting procedures
- Dismantling and re-assembly procedures
- The tools required and how to use them
- Diagrams and views specific to maintenance.

The maintenance procedure provided shall comply with [prEN 12644-1](#).

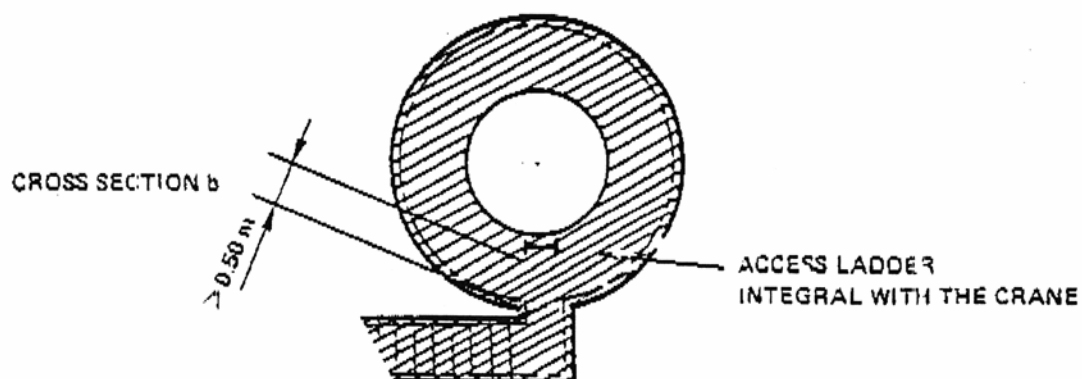
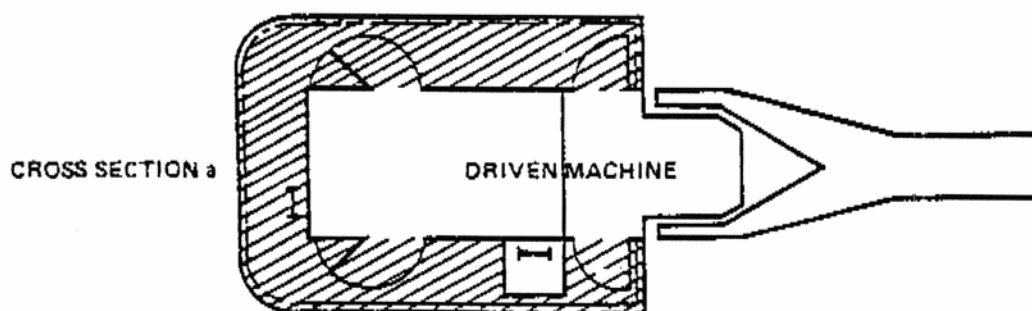
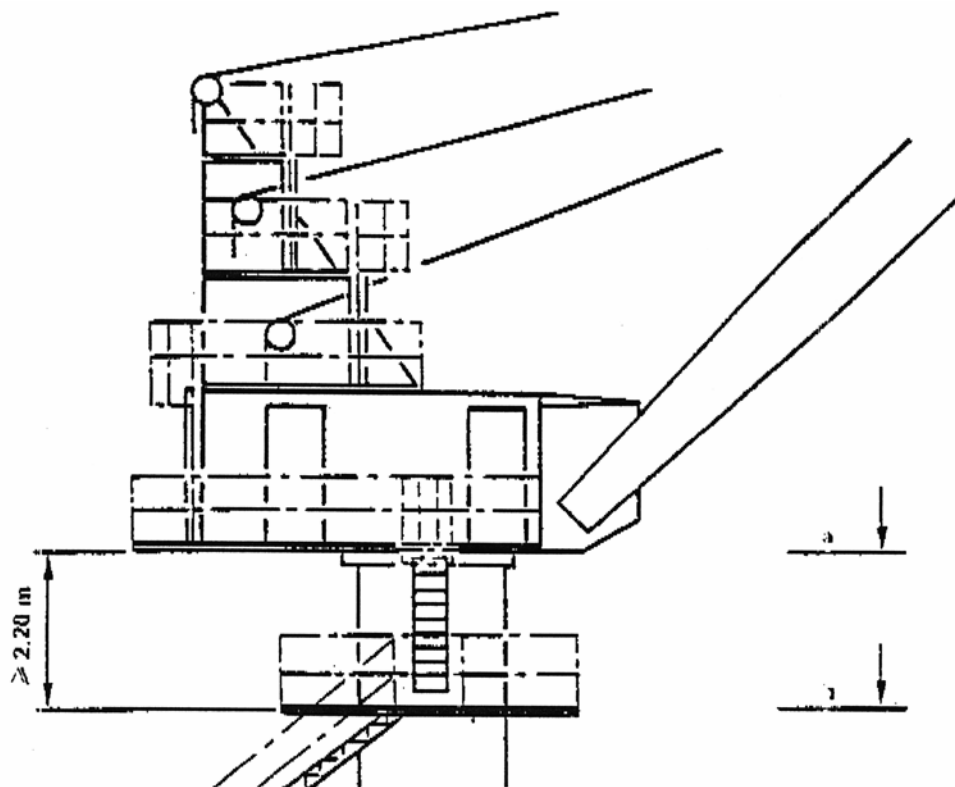
Regular and unscheduled inspection shall be described based on [prEN 12644-3](#) and [ISO 9927-1](#).

Appendix 1 Summary table of roles and responsibilities

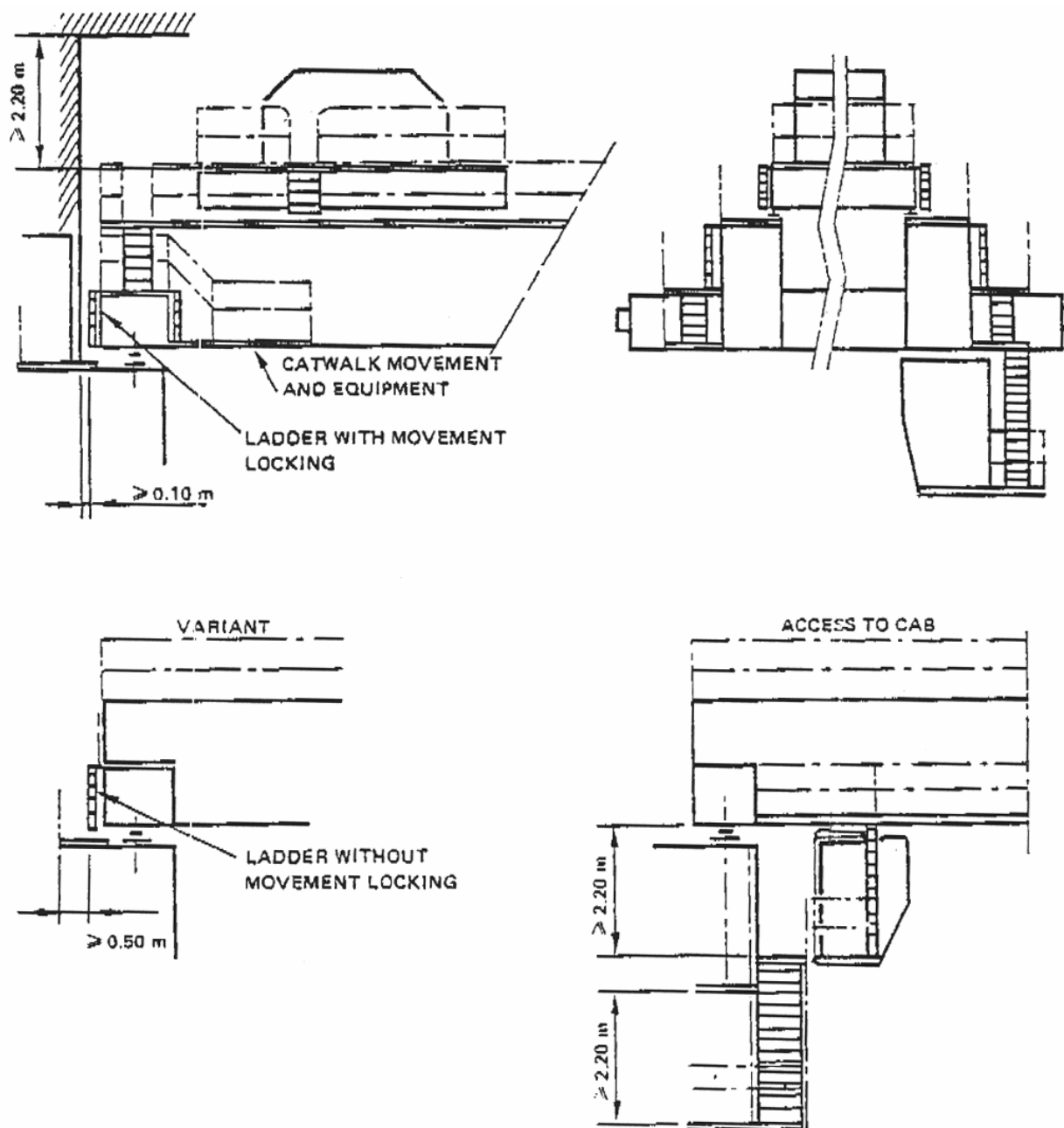
	CY	CR		CA
		Eng.	WSS	
Basic data	e	i		ap
General environmental data	e	i	i	ap
Regulation requirements	e	i	i	ap
Confirmation of options	e	i	i	i
Provisional list of main devices	e	i		i
Final list of devices	ap	e		i
Packing list	i	e		
Basic time-table	e	i		
Detailed time-table per device	ap	e	i	
Instructions for examination and testing	e	i	i	
Selection and compensation of Certification Agency	i	i	i	ap
Study of handling operations	ap	e	i	
Particular technical specifications and documents for call for tender	ap	e	i	i
Submission of tenders in proper form	i	i	e	
Comparison of tenders. Selection proposal	ap	e		
Selection of CONTRACTOR	e	i	i	i
Particular technical specifications and contract documents	ap	e	i	ap
Equipment drawings and documents	ap	ap	e	ap
Co-ordination between supply and project	s	e	w	
Examination of equipment drawings and documents	s	e		ap
Execution of supply	s	s	e	ap
Normal inspections during manufacture	s	s	e	e
Erection inspection by Certification Agency	e	w	w	e
FAT before shipment by Certification Agency	e	w	w	e
Final documents	i	ap	e	
Site test after crane installation on the platform	w	w	e	w
Initial test of the crane after platform installation	w	w	e	w

CY	COMPANY
CR	CONTRACTOR
CA	Certification Agency
Eng	Engineering
WSS	Shop drawings, studies and supplies
e	must execute
ap	must approve
i	must be informed for action
s	must supervise
w	must witness

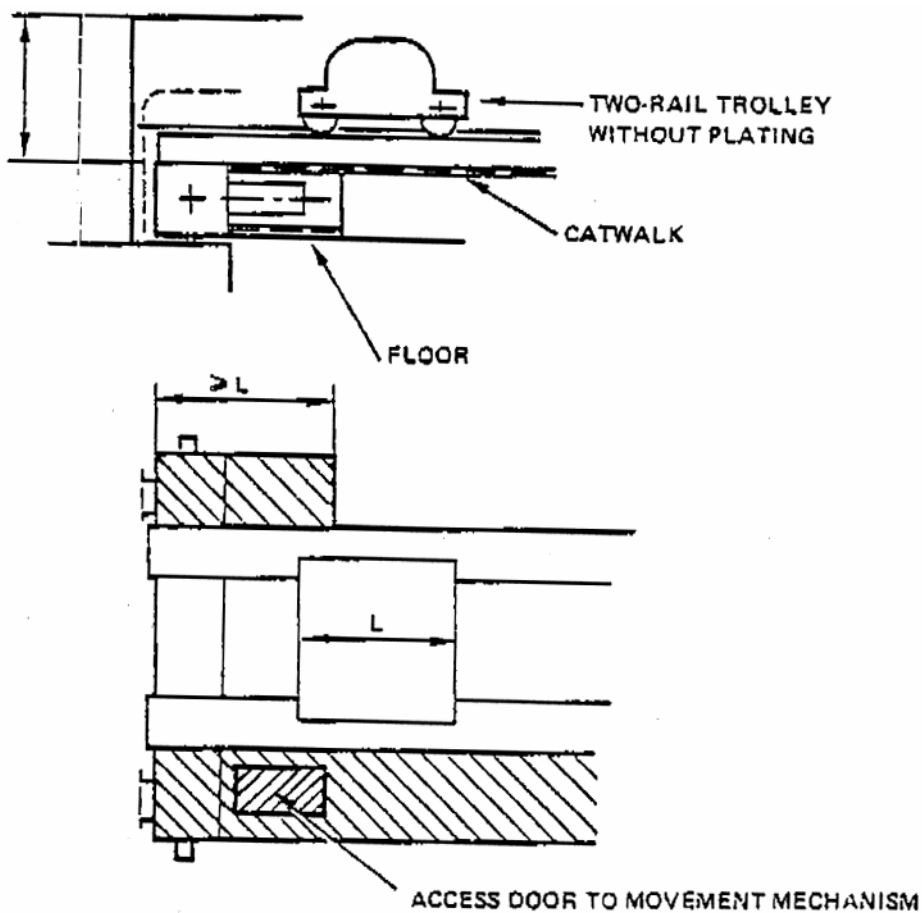
Appendix 2 Access to cranes



Appendix 3 Access to large overhead cranes



Appendix 4 Access to small overhead cranes



Appendix 5 Access to travelling beams and hoists

