



Exploration & Production

GENERAL SPECIFICATION

STRUCTURAL

GS EP STR 003

Cranes for floating offshore installations

Supplements to API SPEC 2C 6th Edition

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Part 1 - General



1. Scope

This general specification applies to all cranes (and attached lifting tackles) permanently installed 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 completely applicable to the mobile cranes (crawler mounted or on outriggers) used offshore, but can be used for design assumptions.

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).

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.

But, for the purposes of this specification, the boundary between crane pedestals and floating unit 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 specification.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated in the CONTRACT, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT. References to superseded standards that may occur on technical documents will not over-write this clause.

Standards

Reference	Title
ASTM B 633	Standard specification for electro deposited coatings of zinc on iron and steel
ASTM F 1941M	Standard specification for electrodeposited coatings on threaded fasteners (metric)
EN 982+A1: 2008	Safety of Machinery - Safety requirement for fluid power systems and their components - Hydraulics
EN 50014 EN 50014/A1 and A2	Electrical apparatus for potentially explosive atmospheres - General requirement
EN 50018/A1	Electrical apparatus for explosive atmospheres - Flameproof enclosures "d"

Reference	Title
EN 10204: 2005	Metallic products - Types of inspection documents
EN 14399-1	High strength structural bolting assemblies for preloading - Part 1: General requirements
EN 14399-3	High strength structural bolting assemblies for preloading - Part 3: System HR - Hexagon bolt and nut assemblies
IEC 529	Degrees of protection provided by enclosures (IP code)
IEC 60079	Electrical apparatus for explosive gas atmospheres
ISO 2408	Steel wire ropes for general purposes - Characteristics
ISO 4042	Fasteners. Electroplated coatings
ISO 4413	Hydraulic fluid power - General rules relating to systems
ISO 9001	Quality systems - Model for quality assurance in design / development production, installation and servicing
ISO 9927-1	Cranes - Inspections - Part 1: General

Professional Documents

Reference	Title
API RP 2D	Recommended practice for operation and maintenance of offshore cranes
API SPEC 2C 6th Edition	Specification for offshore cranes
API SPEC 9A	Specification for wire rope
ATEX European Directives 94/9/EC	Equipment or Protective system intended or used in Potentially Explosive Atmosphere Directive
EEMUA Publication 140	Noise procedure specification
FEM 1.001 Booklets 1 to 8	Fédération Européenne de la Manutention. (Rules for the design of hoisting appliances)
ICAO	International Civil Aviation Organization "LEBUS" littérature: Drum grooving

Regulations

Reference	Title
Not applicable	

National regulations are not listed in this document due to their high specificity and variability.

However, where national regulations exist, their provisions and those of the standards and codes to which they refer shall apply to the works done in the State, and supplementing or amending the provisions of this document.



Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
BV ALM	BV Rules "Lifting equipment for use at sea"
BV NR 455	Rules for the Classification of Offshore Units
BV NR 526	Rules for the Classification and the Certification of Cranes onboard Ships and Offshore Units

Total General Specifications

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP ELE 001	Electrical design criteria
GS EP ELE 031	Design of earthing and bonding systems
GS EP ELE 079	Electric apparatus for explosive gas atmosphere
GS EP ELE 081	Lighting
GS EP ELE 111	Induction motors
GS EP ELE 141	Power transformers
GS EP ELE 161	Electrical cables
GS EP INS 101	Instrumentation engineering, supply and construction general requirements
GS EP STR 201	Materials for offshore steel structures
GS EP STR 651	General principles for a F(P)SO Design
GS EP STR 901	Design rules and construction standards for ancillary structures of offshore installations

3. Purpose

This specification gives the minimum requirements for pedestal cranes on fixed offshore platforms when **API SPEC 2C** is specified as the applicable external standard.

This specification shall be used together with **API SPEC 2C** for the general requirements for the **Design, Procurement, Manufacture, Painting, Shop testing and FAT, Commissioning, Operation** of the pedestal offshore cranes mounted on floating installations.



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

Note: Crane and associated mechanics (rope, bearings, pulleys, motors, etc.) shall receive ALM certification by Bureau Veritas.

4. Regulation and safety requirements

4.1 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.

4.2 Safety

The devices shall be equipped with all components necessary:

- For the safety of the personnel
- For the safety of equipment
- For operating safety
- For easy and safe access for maintenance

in accordance with the particular requirements stated in Part 2, "Amendments / Supplements to **API SPEC 2C**".

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

The crane shall incorporate all guards, where reasonably practicable to protect personnel against hazards which cannot be eliminated by design. Where it is not practicable to fit guards around any hazardous area, then clear, unambiguous and relevant warning notices should be posted at suitable positions on the crane.

5. General Data and requirements

5.1 General Data: site and environment

5.1.1 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, which 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.

5.1.2 Hazardous area

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

Unless otherwise specified the complete equipment will be installed in a hazardous area: Zone 2 Group II A Temperature class T3, IP part 15: [IEC 60079](#).

5.1.3 Environmental conditions

As a general rule, the handling devices shall be designed for outdoor use in an offshore atmosphere (i.e. humid, salt laden and eventually corrosive and subject to equatorial rains). Attention of SUPPLIER shall be drawn on tightness or full protection of all bearings, sliding or movable parts of the equipment that shall be protected from any ingress as sea water, salt spray, sand or dust.

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)
- Floating support motions and accelerations.

5.1.3.1 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. Crane equipment shall be protected from any radiant heating source.

5.1.3.2 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.

5.1.3.3 Snow surcharge load

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

5.1.3.4 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.

5.1.4 Material obstacles

5.1.4.1 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.

5.1.4.2 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.

The main obstacles to the movements of the boom 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 affect 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. In such a case, anti-collision devices shall be incorporated in both cranes.

5.2 General Data and requirement: Handling device

5.2.1 Choice, capabilities, characteristics

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

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 Project Specification.



The characteristics stipulated (speed, acceleration, accuracy i.e. minimum movement for one control pulse) 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 hook travel distances shall be specified in the Particular Project Specification in all possible directions of travel, including vertical motions.

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.

The Particular Project Specification shall indicate the loads that may be lifted according to outreach and the minimum hook height required (depending on pedestal height / limit of furniture).

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

5.2.2 Limits of supply

Except if otherwise specified, the handling devices shall be supplied by the SUPPLIER in running order. The crane shall be suitable to perform the duties specified in the Particular Project Specification and the Data Sheet

5.2.2.1 Structure

The crane is to be supplied complete with counterweight if any, 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 Project Specification will name the CONTRACTOR who is to perform the welding work.

If it is bolted, the SUPPLIER 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.

Any necessary supports or saddles to allow for the maintenance and off-shore installation/removal shall be provided (jacking stools for slew ring inspection and removal, brackets for sliding table installation for slew ring removal, design of the sliding table...).

5.2.2.2 Piping

Piping interfaces shall be the external face of connecting flanges located at pedestal adapter level, with only one flange per fluid.

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 SUPPLIER who supplies the crane.

5.2.2.3 Instrumentation

The crane shall be provided with its own unit control equipment logic system and alarm annunciation.

Segregated junction boxes, located inside the pedestal adaptor. Output/Input terminals for control, safety systems and associated equipment.

5.2.2.4 Electrical

If the crane is supplied with electricity, the connection will be made to a junction box including electrical protection and breakers or disconnecting switch supplied with the crane. Terminal boxes for power current, lighting, emergency lighting and beacon currents shall be located inside the pedestal adapter.

Earthing: Bonding of the complete crane shall be provided by VENDOR.

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 Project particular specifications, with the limit of supply being the points of connection of the device specified hereafter.

5.2.2.5 Telecom

Terminal boxes for telephone supply and VHF radio supply shall be provided.

5.2.3 Requirement for exceptional conditions

FPSO Motion: As the equipment is installed on a floating unit, MANUFACTURER shall prove that it is designed to withstand and perform satisfactorily, even for the most stringent specified topside motion. Special attention will be paid to the choice of the equipment structural supports, driver motor sizes, lubrication systems, drainage systems, fluids controls (level measurements). In all cases crane shall be useable during tow up to some limiting environment.

Wind loading: Design shall include wind moment analysis.

5.2.4 Transport forces and moments

All equipment and structures (under non-operating conditions) shall be designed to resist the worst conditions during shipping (or towing), as per required acceleration values.

6. General requirement for the construction

6.1 Structures

6.1.1 General

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

6.1.2 Load bearing structures

Load-bearing structures shall as a general rule to 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.

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.

The assemblies of elements that must be dismantled for transport are to be made by bolts or by joining pins with cutter pins; in the case of cuttered joining pins, no play that might cause battering and introduce additional shocks 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.

6.1.3 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, 1800 mm 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. 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, 1500 mm below pedestal flange for ease of access and maintenance to the crane. Access to this platform will be by a ladder from the deck.

6.1.4 Boom

The boom shall be of the ram luffing type with welded box type construction (API SPEC 2C type A or B). Supplier may propose, as alternate, knuckle boom type crane.

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. Means (tools, supports...) shall be provided for maintenance, inspection and removal of boom butt pin.

All bearing shall be fully sealed anti friction type. They shall be designed for dynamic motion even if they have a minor displacement. Facility for bearing replacement shall be incorporated in the construction.

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.



6.1.5 Boom rest

The boom rest shall be designed and supplied by the topsides 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.

If "W" is the width of the boom, the boom rest cradle shall have a top width of 2 times "W" and the bottom part shall be slightly longer than "W". Wooden protection on all parts which could be in contact with the boom shall be provided. In order to avoid any clash with surrounding structures when approaching the boom to boom rest, a free area shall be provided around the boom rest cradle (1.5m on both side) and above.

The resting position of the boom must allow for boom inspection and all maintenance operations (jacking up of the crane for slew ring removal, jacking up and skidding of the boom for boom butt pins replacement...), and facilitate any lengthening or shortening if required.

The crane boom shall be horizontal when laying down on the boom rest.

6.2 Mechanisms

6.2.1 General

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

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.

All systems and equipment shall be designed to allow continuous crane operation during 12 (twelve) hours (including diesel oil tank capacity). Due consideration shall be especially paid to the forced draft air cooling system.

Easy-to-separate mono-block 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 over speed control device acting on the brakes, as described in the paragraphs that follow, shall be provided.

6.2.2 Shafts and couplings

Shafts supported by more than two bearings are forbidden.

Rigid couplings between connecting shafts are forbidden.

6.2.3 Shafts bearings

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

6.2.4 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.

6.2.5 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.

6.2.6 Brakes

Brakes based on hydraulic restrictions (such as shut off valves) shall be capable of withstanding pressure shocks due to brake impacts.

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.

The crane MANUFACTURER shall design the braking system in order to ensure that in no circumstances the drums (lifting winches and luffing winch) will be in a free fall situation.

Brakes shall be accessible and easy to be controlled visually. In addition sensors shall give alarms to the crane operator for any unsafe situation with the braking device, such as hot conditions or wear parts.

Crane design shall take in consideration that load control during a lift shall be first managed by the crane engine capability to slow down any dynamic load motion.

Brakes shall not allow any sliding in parking or stop position even for a long period.

6.2.7 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.

6.3 Heat engines (Not recommended unless otherwise specified)

6.3.1 General

The type of prime mover shall be specified by the Company.

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

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.

For cranes, as a general rule, the Diesel engine shall be placed in a machine cab on 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 Particular specification shall stipulate whether or not the prime mover is located in an explosive zone.

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

Diesel engine shall be isolated from the crane equipment and cabin so as not to transmit any vibration, noise or heat.

Exhaust shall be equipped with a silencer and care shall be taken for its location to minimize smoke troubles.

6.3.2 Auxiliary equipment in the machine house

The equipment listed below has 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 (air receivers, hydraulic accumulators, etc. shall be fabricated and tested to a recognised standard (ASME VIII or equivalent)).

Note: Start systems shall be sized to give a minimum of 6 start attempts per system, each start attempt to consist of 7 revolutions of the crankshaft at minimum cranking speed.

- Connections to the external 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.

6.3.3 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.

6.4 Painting

6.4.1 General

Refer in general to **GS EP COR 350**.

6.4.2 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.

6.4.3 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.

6.4.4 Repairs

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

6.4.5 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.



Part 2 - Amendments / Supplements to API SPEC 2C



Section 1 - Scope

Sub-section 1.6 - Manufacturer supplied documentation

Add new clause 6:

Inspection Dossier as described in “new sub-section” 18.5.