



Exploration & Production

GENERAL SPECIFICATION

STRUCTURAL

GS STR 105

Boat landings and bumpers

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1. Scope

This General Specification applies to the boat-landings and bumpers installed on offshores structures.

It must be used in conjunction with General Specification **GS STR 101 and with the documents referred to therein.**

The purpose of this specification is to establish all requirements for boat-landings and bumpers.

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
API RP 2A	American Petroleum Institute. Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
AISC	American Institute of Steel Construction. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings

Other documents

Reference	Title
Not applicable	



Total General Specifications

Reference	Title
GS SAF 351	Safety Guidelines for Life Saving Appliances
GS STR 101	Design of offshore jackets and subsea structures
GS STR 201	Materials for offshore steel structures
GS STR 301	Fabrication of offshore steel structures
GS STR 901	Design rules and construction standards for ancillary structures of offshore installations

3. Definitions

3.1 Boat-landing

The boat-landing serves for the drawing alongside and moving of supply ships under specified conditions so as to allow for the transfer of Equipment and, exceptionally, the embarkation and disembarkation of personnel.

It is in all cases regarded as an emergency exit.

3.2 Bumpers

These serve to protect the most exposed portions of the platform (legs, risers, etc.) from accidental collisions with ships.

3.3 Geographical zone

The diversity of problems encountered has led to the drawing of a distinction between two geographical zones:

3.3.1 Definitions

One where the meteorological conditions are generally unsuitable for the mooring of ships (e.g. the North Sea).

And one where mooring is possible (e.g. the Gulf of Guinea, the Arabian Gulf).

3.3.2 Delimitation of zones

Geographical Zones	Typical Sites
Sea where mooring is impossible	• North Sea • Baltic Sea • Irish Sea
Sea where mooring is possible	• Gulf of Guinea • Arabian (Persian) Gulf • Indonesia • Red Sea • Mediterranean

3.3.3 Arrangements provided

3.3.3.1 Sea where mooring is impossible

In the first zone, platforms have a system of simple fenders protecting all exposed parts: legs, risers.

In this zone, platforms shall never have boat-landing. Normal access to the platform is by helicopter and Equipment is loaded by air, with the ship standing off.

3.3.3.2 Sea where is possible

In the second zone, platforms whose operating conditions require it must have, in addition to a system of bumpers, one or more boat-landings.

3.4 Types of ship

For each ship that can be expected to draw alongside or approach the platform, the COMPANY shall provide the following information:

- L: Overall length (m)
- W: Width (m)
- T: Loaded draft (m)
- D: Maximum loaded displacement (t)
- S: J keel surface area (m²)
- A: Top-hamper area (m²)

Top-hamper area: Area above water line on which wind acts.

J keel surface area: Area below the water line on which the current acts (median longitudinal section).

The characteristics of the largest ship likely to draw alongside shall be used in all calculations.

4. Design

In a collision, the kinetic energy is absorbed by elastic (or possibly plastic) deformation of the ship, the fender system and the platform.

4.1 Types of collision

Three types of collision are distinguished:

- The “light” collision, by a ship authorized to manoeuvre in the vicinity of the platform and at manoeuvring speed (to be stipulated in the particular specification)
- The “accidental collision”, caused by the same ship at a higher speed (to be stipulated in the particular specification)
- The “catastrophic” collision may result in the destruction of the platform.

4.2 Oceanographic Data

The oceanographic conditions to be used are those stipulated in the particular specification.

A distinction is made between:

- The normal climatic conditions under which manoeuvres by supply ships in the vicinity of the platform are possible and authorized
- Exceptional or hundred-year climatic conditions.

4.3 Kinetic Energy

The only use to be taken into account in the design of the boat-landing or system of fenders is the kinetic energy transmitted by the ship at the moment of impact. This is given in the formula:

$$E = \frac{1}{2} (D + Ma) v^2$$

Where:

E: Kinetic energy in kJ

V: Velocity of the ship (m s^{-1})

D: Maximum loaded tonnage of the ships that may be required to draw alongside or to manoeuvre in the vicinity of the platform (approach to within 500 m) – (t)

Ma: Added mass (t)

$$Ma = \rho \frac{\pi T^2 L}{4}$$

Where:

ρ : Density of water (t m^{-3})

T: Draft of the ship (m)

L: Length of the ship (m)

In the absence of ship data the following values may be used:

Ma = 0.4D for side and 0.1D for front impact

4.4 Wind, current and wave forces

It is not assumed that these forces acting on the ship are added to its own energy during mooring, i.e. when the ship is manoeuvring.

On the other hand, as soon as the ship has moored, or if there is an engine failure, it is entirely governed by these forces.

4.4.1 Wind forces on the ship

This is given by the formula (API RP 2A, January 1981, ref. 1 and 2):

$$F_v = 0.473 v^2 \cdot C_s \cdot A$$

Where:

- F_v: Force (N)
- v: Wind velocity (m/s)
- C_s: Shape coefficient = 1.3
- A: Top-hamper area (m²)

4.4.2 Current force on the ship

This is given by Joessel's formula:

$$F_c = 600 s \cdot v^2$$

Where:

- F_c: Force (N)
- v: Current velocity (m/s)
- s: Keel surface area (m²)

4.4.3 Wave force on the ship

This is given by the formula refs (2) and (3):

$$F_H = \frac{1}{2} \rho g A^2 L \cdot \sin^2 \alpha$$

Where:

- F_H: Force (N)
- ρ: Tensity of the water (kg/m³)
- A: Wave amplitude (m), unless indicated in the particular specification the value will be A = 2.5 m
- α: Angle between the centreline of the ship and the direction of the wave travel
- L: Is the length of the hull (m)
- g: 9.81 m/s²

4.4.4 Wave force on the landing-stage or Fenders only

This is studied and checked as required by specification GS STR 101.

4.5 Distribution of forces

Four types of forces acting on the system of bumpers or boat-landing and jacket are distinguished:

- Normal climatic conditions
- Exceptional climatic conditions
- Light collisions
- Accidental collisions.

Forces of the first two types, including current, wind and wave forces, are distributed over the whole of the bumpers or boat landing.

On the other hand, forces of the last two types may be localized on a portion of the bumper or boat-landing. For example: in the case of a boat-landing of which the shield is attached at four points to two legs of the jacket (two points of attachment per leg), it may be assumed that the energy of the collision may be taken out entirely by the two ties. It is then uniformly distributed over the various ties.

The vertical height of the collision zone shall be determined from consideration of vessel draft, operational wave height and tidal elevation.

It is assumed that the energy transmitted at the time of drawing alongside may be distributed as follows:

- From 100 % in compression (normal)
and 0 % in shear (lateral)
- To 60 % in compression
and 40 % in shear

4.6 Load combinations

The boat-landing and bumpers are designed to withstand, without damage:

- An operational collision under normal climatic conditions
- The forces engendered by the mooring of the ship alongside (not manoeuvring) during loading and unloading operations
- The exceptional climatic conditions stipulated in the particular specification.

The first two cases are considered as normal.

It is accepted that the bumpers or boat-landing may be destroyed in the case of an accidental collision but the load at the head at the moment of crashing must not engender stresses such that the **AISC** ratio (ref. 4) exceeds 1.0 in the jacket. This calculation is for an exceptional case, with stresses upgraded according to **AISC**.

5. Design and constructive arrangements

5.1 Design of the boat-landing

This consists primarily of a shield and of a damping and attachment system tying it to the legs of the jacket.

5.1.1 General situation

The boat-landing must be situated in such a way that a ship that has just drawn alongside and lost manoeuvring control shall not be pushed to the platform by the dominant current, wind and waves.

Furthermore, it must be arranged in such a way that at least one unloading crane can reach the decks of the various ships likely to come alongside there.

5.1.2 Dimensions

The height of the landing stage must be 1 or 1.5 m above the HAT and 1.5 m below the LAT.

If the tide (HAT-LAT) exceeds 2 m, a 2-level boat-landing shall be provided.

5.1.3 Arrangements and access

The outside of the boat-landing, which will be in contact with the hulls of the ships must be covered by pads with neoprene. The pads shall have the followings characteristics:

- Steel friction coefficient:
 - Under 20 bars: 0.2 ± 0.5
 - Under 120 bars: 0.05 ± 0.005
- Density: 0.955 ± 0.005 .

Access to the walkway of the boat-landing shall be by stairs complying with standard **GS STR 901**. This walkway must be made in two parts, one fixed and attached to the jacket, the other mobile and attached to the boat-landing.

The stairs and walkway are regarded as an emergency exit in accordance with specification **GS SAF 351**.

A hand-rail must be installed along the entire length of the boat-landing on the site opposite the ship. It must meet standard **GS STR 901**.

One or more ladders shall be provided for access to the ship alongside. The ramps must meet standard **GS STR 901**. They shall be recessed into the shield of the boat-landing and shall be in a plan perpendicular to it so that the ship is reached laterally from the ladder. For safety reasons, a knotted rope shall be placed alongside the ladder.

The stairs and the walkway must be made of grating. The access platform shall be designed for an overload of 12 m^2 . The grating shall be welded to the joisting.

It must be possible to install a display panel and a telephone set on the walkway. The dimensions of this panel shall be less than 1.00 m x 0.50 m.

Moorings designed for the largest ship likely to come alongside must be placed on the jacket or on the fixed part of the walkway (attached to the jacket).

Moorings will be fixed, in principle, 20 to 50 cm up to the boat-landing walkway level, their final position must be established during the commissioning of the boat-landing.

In addition, two rings will be provided on the shield of the boat-landing for small boats.

5.2 Design of bumpers

In order to protect the legs of the structure a simple system of bumpers must be designed as follows:

- A vertical bar attached top and bottom to the leg; this junction may or may not be equipped with a shock-absorber system.
- The bar must be covered by shock-absorbing skids and neoprene, or with superimposed rings that can move with respect to one another. The skid pad characteristics shall be the same as those specified in 5.1.3.

If the legs presents some special risk (sharp corner or leg containing inflammable liquids), two fenders 90° apart interconnected by a system of horizontal bars must be provided.

For the protection of larger zones, for example, the riser zone, the bumper must consist of a shield comparable to the shield provided for a boat-landing, attached to two legs flanking the zone to be protected. These attachments will be fitted with shock-absorbing devices or not according to energy to be absorbed. The shield must not be covered with skid; on the contrary, its appearance must be such as to dissuade from coming alongside.

5.3 Shock-absorbing devices

Except in the case of small supply ships (less than 500 displacement tons), the fenders and landing-stage must be fitted with shock absorbing devices, connecting the shield portion to the legs of the jacket.

The primary criterion for the choice and sizing of the shock-absorbing devices is the energy to be absorbed as indicated by paragraph 4.5.

It shall be checked that each shock-absorbing device can withstand:

- Absorbing the uniformly distributed energy resulting from an “operational” collision, assuming the worst loading case (compression, shear)
- The exceptional shock resulting from an accidental collision; the normal reaction the strain corresponding to this energy must be less than the maximum allowable load at the head (cf. paragraph 4.6).

5.4 Shield

For bumpers with shields and for boat-landing, the shield must be designed using the stress program for various loading cases, in the case of “operational” collision.

The **AISC** ratio must be less than 1.0 in the shield at all times.

6. Fabrication

Supports of boat-landing and bumpers are first category.

All other parts of the boat-landing and bumpers are second category elements.

Their fabrication must comply with **GS STR 301**.

7. Erection and installation

The system of bumpers and boat-landing shall have an attachment system making them interchangeable.

If a system of shock-absorbing devices is provided, it shall be possible to change the front portion (shield) without dismantling them.

The immersed portion shall be attached by a clamp fitted with non-removable bolts.

The boat-landing, the bumpers and any parts of the latter of which the erection required immersion must not float.

If it has been impossible to erect the boat-landing and bumpers before the launching and installation of the jacket, they must be installed immediately afterwards, so as to protect it during the erection of the platform. In this case, an in-situ height adjustment shall be possible.

8. Contract clauses

8.1 Technical documents to be prepared by the COMPANY

8.1.1 General environmental data

- Site location:
 - Longitude
 - Latitude
 - Distance offshore
- Environmental conditions: Oceanographic and climatic data as specified in paragraph 4.2 and 4.4.3 (value of A to be confirmed).
- Position of the platform with respect to the directions of the prevailing winds, currents and waves
- Site definition (see paragraph 3.3.1).

8.1.2 Limitations imposed by regulations

Stipulate the country having authority over the installation, determining what legislation is to be observed.

8.1.3 List of General Specifications

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

Stipulate any options chosen that might limit the range of choice offered by the norms or standards.

8.1.4 Provisional list of supply ships

This list must indicate the characteristics mentioned in paragraph 3.4.

Stipulate velocity valves for operation and accidental collisions (see paragraph 4.1).



8.2 Technical documents to be prepared by the CONTRACTOR

8.2.1 Project Study

- A conceptual drawing showing the boat-landing and bumpers in their context, the maximum outside dimensions to be observed and the mandatory dimensions
- Corresponding calculation note.

8.2.2 Working study and supplies

- Overall and sub-assembly drawings with corresponding calculation notes
- Data on ship fabrication tests for shock-absorbers, including:
 - Test results
 - Results of gauging operations
 - Weights
 - Composition
 - Guarantee of characteristics: energy, reaction, deflection
 - Guarantee of rubber/metal bonding.