



Exploration & Production

GENERAL SPECIFICATION

STRUCTURAL

GS STR 404

**Marine aspects for load-out, transportation and
installation of offshore structures**

02	10/03	Change of Group name and logo
01	10/02	Added reference to GS STR 101 section 1.3, revised section 3.1.1
00	02/01	First issue
Rev.	Date	Notes



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1. Scope

1.1 Purposes

This General Specification defines the conditions and methods required by COMPANY for load-out, towing, sea transportation and installation of offshore structures and cargos.

1.2 Scope of application

This specification shall apply to steel structures and/or loose items to be transported on board a cargo barge, the cargo barge being towed by tug.

The specification states COMPANY' requirements through three different chapters as follows:

- The tow (cargo barge) (chapter 3)
Item being towed as a cargo barge carrying a cargo.
- The tug (chapter 4)
Defined as the vessel performing the towage.
- The towing gears (chapter 5)
Incorporating all equipment and materials between tow and tug allowing the towage.

The present General Specification shall be supplemented by a Particular Specification to cover the particular circumstances and requirements of a given Project.

1.3 Contractual documents

The documents to be used by the CONTRACTOR are listed below in order of priority:

- The Particular Specification of the project
- This specification used in conjunction with COMPANY's General Specifications **GS STR 401, GS STR 101** and **GS STR 102**
- Bureau Veritas: Rules for towing
- Guidelines for the Design and Construction of Offshore Supply Vessels Resolution A.469 XII - International Maritime Organisation
- Local legislation relating to marine operations.

1.4 Marine surveyor

When Marine Surveyor is elected by COMPANY, the Particular Specification will stipulate:

- Type and number of interventions to be carried out by the Marine Surveyor
- Share-out of responsibilities between the COMPANY, CONTRACTORS, Certification Authorities, Marine Surveyor and Warranty Insurance Surveyor, if any.

1.5 Studies (refer to **GS STR 401**)

A feasibility study shall be carried out by CONTRACTOR at an early stage based on known characteristics of the cargo/structure and assumed characteristics of cargo barge (basic engineering).



A final study shall then be carried out in due time before load-out by CONTRACTOR using the actual conditions of the operations, namely:

- Characteristics of the structure and equipment to be transported
- Characteristics of the loading/off loading site
- Means planned to be used for the loading/off loading operations
- Towing routes and distances
- Weather/oceanologic conditions at the scheduled period of transport.

The final study shall indicate:

- The actual size of the cargo barge
- The requirements for barge deck reinforcement and sea fastening structure
- The tug size and power (minimum Bollard Pull)
- The requirements for towing equipment
- The route and estimated towage duration.

Both studies shall be submitted to COMPANY for comments and approval.

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
Not applicable	

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

**Other documents**

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS STR 101	Design of offshore jacket and subsea structures
GS STR 102	Design of offshore topsides structures
GS STR 401	Load-out, sea-fastening, transportation and installation of offshore structures

3. Cargo barge**3.1 Cargo barge selection****3.1.1 Size**

Cargo barge selection shall be made by CONTRACTOR taking into account:

- Overall size of the barge - to accommodate the cargos, and in view of transportation and also load-out and off loading operations
- Strength of hull and deck
- Water tight compartmentation.

The selected barge shall be submitted to COMPANY for approval, at least three months prior to load-out operations.

The barges shall be classed by a recognized Classification Society, and inspected by the Marine Surveyor and COMPANY.

3.1.2 Cargo barge documentation

The following documents shall be forwarded to COMPANY for review:

- Certificate of class issued by a recognized Classification Society
- Certificate of Registry
- Tonnage Certificate
- Certificate/Approval of navigation lights and shapes issued by a recognised Authority
- International load line certificate
- Deratisation certificate.

3.1.3 Cargo barge preparation for towing

As soon as the cargo barge has been selected and approved by COMPANY the CONTRACTOR shall prepare the procedures, calculation notes and drawings in order to allow safely:

- The load-out of the structure on the cargo barge
- The sea fastening
- The transportation
- The installation.

3.2 Requirements for load-out operations

3.2.1 Calculations

Loading operations shall be performed in accordance with Specification **GS STR 401**.

The documents prepared by CONTRACTOR shall be submitted to COMPANY for approval at least one month prior to the beginning of the load-out.

The dossier shall include calculation notes demonstrating the capability of the cargo barge structure to support the static and dynamic loads induced during loading.

Calculation notes shall cover the load distribution during each step of loading operation taking into account the ballasting sequences.

The cargo barge behaviour shall be checked accurately and the stability of the barge shall be calculated for each sequence.

3.2.2 Procedures

The load-out procedure shall also be submitted to COMPANY's approval at least one month prior to load-out. In particular, this procedure shall define:

- The method selected for loading
- The mooring system of the barge
- The draft of barge when fully loaded
- The water depth and the pier configuration
- The current and wind conditions
- The material and equipment planned to be used
- The loading scenario, back up equipment and contingency plan
- The calculation note to demonstrate the acceptability of loads generated in the barge structure, and any corresponding reinforcement required (above and below deck)
- The behaviour of the cargo barge shall be considered for one (or more) sudden mistake during loading (mechanical break down of ballast pump, free surface effect during ballasting, etc.)
- The procedure shall show any additional reinforcement or modification of the barge (surelevation of manholes, additional piping, etc.)

- The procedure for loading onto the cargo barge shall allow for:
 - Variations in levels due to tide
 - Variations in cargo barge level trim and list during loading.

If applicable, the procedures shall detail the calculations and systems which allow:

- Certain compartments to be ballasted/unballasted
- The transfer of water between ballast compartments.

The procedures shall also specify the checks required on the barge deck strength and the barge behaviour during loads transfer.

3.3 Requirements for sea fastening operations

Sea fastening shall be designed according to Specification **GS STR 401**.

One month before sea fastening operations detailed calculation notes and drawing shall be submitted to the COMPANY by CONTRACTOR to define:

- The stability of the assembly formed by the cargo barge and the transported structures and/or cargoes
- The fastening procedure for the transported structures and/or cargoes
- The calculation of the behaviour of the assembly during transportation.

The applicable loading assumptions are given in GS STR 401.

3.4 Requirements for sea transportation

- Detailed data on the sea zones to be crossed and also the installation site and its environment shall be collated by CONTRACTOR
- A transportation procedure shall be submitted to COMPANY giving the list of actions to be carried out in view of a safe sea voyage:
 - Trim/List adjustment
 - Break water installation
 - Access ladders
 - Navigation light and shapes
 - Manhole
 - Pumping/bilge pump arrangement
 - Emergency equipment
- List of spare and emergency materials shall be prepared and submitted to COMPANY
- If manning is planned on the cargo barge, accommodation equipment shall be in accordance with applicable rules (National and International regulations).

Transportation calculations shall be performed according to Specification **GS STR 401**.

3.5 Requirements for installation operations

Installation calculations shall be performed according to Specification **GS STR 401** and the COMPANY approved installation procedure (launching, cranelifting, ballasting, etc.).

4. Tug

4.1 Tug selection

The tug shall be selected by CONTRACTOR taking into account:

- The selected towing method (displacement and overall dimensions)
- The planned towage route and total towage duration
- The climatic and oceanologic conditions to be encountered at the time of the scheduled towage.

The CONTRACTOR shall carry out the tug selection in accordance with the basic requirements indicated in para. 4.1.1.

The selected tug specifications shall be submitted to COMPANY for prior approval.

4.1.1 COMPANY basic requirements for tug selection

The tug shall be a "Ocean Going Tug" with raised foc'sles or a Tug/Anchor Handling/Supply Vessel (AHT) of such a design as to allow them to offer stability and sea keeping ability in accordance with "Guidelines for the Design and construction of Offshore Supply Vessels (Resolution A-469 XII). International Maritime Organisation".

- Tug (or AHT) shall be of such a design as to allow them to operate safely and effectively in their designated area (in towing configuration)
- Tug (or AHT) must be purpose built for towing operations or be a multi purpose design having towing capability
- Tug (or AHT) must be assigned an appropriate classification by a recognised Classification Society
- Tug shall be equipped with towing winch. Deep sea towage shall be carried out using the towing winch.

4.1.2 Navigation equipments

Selected vessels shall be fitted to an acceptable standard with navigation equipment and navigation aids relevant to the area of operations.

The basic equipment shall include:

- Compasses - magnetic and gyroscopic
- Rudder telemoteur
- Remote control of engine
- Radar
- Radio communication HF.SSB and VHF
- Echo-sounder



- Weather facsimile and SATNAV
- Updated charts.

4.1.3 Manning

Vessels in all categories shall be manned to meet the minimum requirements laid down by Statutory Regulations.

Manning levels will be adjusted to the specific requirements of the said towage.

A minimum number of certified officers shall be required according to the type of towing (normally 3 to 4 certificated officers is the minimum acceptable level).

When vessels are required to undertake long duration towages, difficult towages or where the towed cargo barge is unmanned, they shall have adequate certified accommodation to enable manning levels to be increased.

Any increase in manning levels will be subject to the limitations of the regulations relating to life saving appliances.

In general, certified accommodation and lifesaving appliances shall be provided for a minimum of eight men.4.2.5 of this Specification.

4.1.4 Documentation

Prior to tug survey being carried out, copies of the following documents shall be submitted to COMPANY (and reviewed by the Marine Surveyor).

- General specifications
- General arrangement plans
- Stability booklet
- Towing/anchor handling winches specification
- Towing wires and connections specifications
- Certificates:
 - Certificate of Registry
 - International Load Line Certificate
 - Tonnage certificate
 - Certificates of class (hull and machinery)
 - Cargo ship safety certificates
 - Certificates for life saving appliances
 - Radio certificates
 - Certificates for all tow wires, pennants stretchers (spring) and shackles
 - Bollard Pull Certificate.

In particular, the International Load Line Certificate, the Certificates of Class and the Cargo Ship Safety Construction Certificate will be taken into account when assessing the suitability and seakeeping characteristics of the Tug.



4.1.5 Fuel/Range

The tug shall have a reserve of fuel and other consumables of a least 20 % supply. If refuelling en route is proposed then suitable arrangements must be made before the tow starts.

4.1.6 Salvage equipment

4.1.6.1 Basic equipment

The tug shall be equipped with:

- Burning and welding gear suitable for use by crew members
- At least two portable submersible pumps with own power supply, and hose
- Suitable boat for transfer of equipment and personnel from Tug to barge
- Portable radio transmitter/receivers (walkie talkie)
- Search light to aid night operation and for use in illuminating the tow during periods of emergency, or malfunction of the prescribed navigation lights
- Shermuley gun/messenger lines.

The tug shall be supplied with at least:

- 1 spare towline
- 1 spare pennant line
- 1 spring (pennant)
- Spare shackles of sufficient size, including split pins, seizing wire and lead for securing shackle pins, etc.

4.1.6.2 Additional equipment

The following equipment may be required according to towing arrangement:

- Anti chafe gear shall be fitted as necessary. In particular the tow line shall be protected at towing pods, tow bars and stern rail
- Fenders and necessary hawsers to be capable to undertake a side tow in shelter area without damaging the tow.

4.2 Requirements for towing operations

4.2.1 Weather forecasts

Arrangements shall be made by the CONTRACTOR for a recognised International Weather forecasting COMPANY to provide daily weather forecasts for all towages.

Daily forecasts shall be updated as necessary in the event of gale/storm/typhoon warnings being in force which might affect the towage.

Daily forecasts shall start 48 hours before the expected time of departure for each towage.

4.2.2 Weather routeing

In case of towage in adverse weather condition it is recommended to contract weather routeing service of a weather forecasting service.



4.2.3 Towage routes

The CONTRACTOR shall prepare the general towage route prior to barge unit departure. This will include selection of potential ports of refuge during sea voyage.

Consideration shall also be given to water depths and towline catenary requirement along the voyage route.

The tug captain shall be fully responsible for the conduct of the voyage including deviations from the agreed general routeing which may be indicated by weather conditions encountered during the voyage.

4.2.4 Progress report

The CONTRACTOR shall keep COMPANY advised of towage progress and general weather conditions encountered during the voyage, on a daily basis.

Progress reports shall be forwarded to COMPANY by telex and include:

- Tow position
- Distance made good
- Average speed
- Course
- Distance to go
- ETA (Estimated Time of Arrival)
- Wind speed/direction
- Sea/swell conditions
- Brief description of any problems encountered.

4.2.5 COMPANY representative

CONTRACTOR shall plan to have accommodation and life saving appliances available on board the tug for one COMPANY representative all along the tow.

5. Towing equipment

The CONTRACTOR shall submit the complete list of equipment and materials allowing the towing operation to COMPANY approval.

The CONTRACTOR shall adhere in general with the basic following requirements.

5.1 Tug equipment

5.1.1 Towing winch

Only tug fitted with towing winch will be accepted (see para. 4.1.1).

- If only one drum is used for towing wire, the spare wire shall be stowed on a reel or other spooling device, and be readily accessible even in heavy weather and in such a position that transfer to the main towing drum can be easily and quickly effected.

- If multi drum winch is used then each winch drum shall be capable of independent operation.
- The towing winch and its connection to the vessel shall be strong enough to withstand a force equal to the breaking load of the tow wire acting at its maximum height above deck, without over stressing.
- The towing winch drum shall have sufficient capacity to stow the towing wire.
- The towing winch brake shall be capable of preventing the towing wire from paying out when the Tug is towing at its maximum continuous static Bollard Pull and shall not be released automatically in case of power failure.
- The winch shall be able to be operated from the bridge station.

5.1.2 Main towing line

The minimum length of tow lines (1 main + 1 spare) shall be not less than 750 metres.

The Breaking Strength (BS) shall be not less than $3.0 \times BP$ (Bollard Pull).

5.1.3 Wire pennant cable

At least two wire towing pennants shall be supplied (1 installed + 1 spare) approximately 25-35 metres in length.

The Breaking Strength to be equal to that of the main towing line.

5.1.4 Synthetic pennant (stretcher or spring)

When a synthetic spring is used, its breaking strength shall be at least 1.5 that required for the main towing line.

The synthetic pennant shall be in good condition and protected from wear, solvents and sunlight.

5.1.5 Towing bridle

Barge units shall be equipped with chain or composite chain/wire towing bridles. If composite, the chain shall be of sufficient length to extend beyond the deck edge and prevent chafing of the wire rope.

Leg lengths of the bridle parts shall be sufficient to form an angle of 45° to 60° at the bridle apex.

Breaking strength of bridle components shall be at least three times the tug rated Bollard Pull.

The bridle apex connection shall be a towing ring or a triangular shaped plate (Delta Plate).

5.1.6 Shackles - End of towing ropes

Towing shackles shall be bolted pin or delta pin type supplied with certificate and shall be secured by genuine split pin.

The safe working load (SWL) shall be equal to the nominated Tug's rated bollard pull.

All tow lines and pennants shall have hard eyes or sockets.



5.2 Cargo barge equipment

5.2.1 Cargo barge connection points

Cargo barge shall be fitted with heavy duty connections at the bow.

These should be of a SMIT clench-plate, quick release design.

Towing connection shall be mounted on doubler-plates welded over reinforced points on the barge deck.

Sufficient under-deck strength must be provided for all towline connection points. They shall be sited at the intersection of transverse and longitudinal bulkhead.

A NDT check shall be carried out at the junction between pad eye and deck structure.

The towing connections shall be strong enough to withstand forces equal to at least three times the tug BP.

5.2.2 Fair leads

Where fitted, fairlead shall be of an approved type, fitted with capping bars and sited close to the deck edge, in line with the tow connections.

5.2.3 Bridle recovery gear

Arrangements shall be made to enable recovery of the bridle on board the barge deck.

5.2.4 Emergency towing line

Emergency towing line shall be provided. It shall be a separate bridle and pennant of the same strength as the main bridle.

Emergency towing line shall be connected at the bow of the barge.

The emergency line specification shall comply with the minimum following requirements:

- Towing connection at barge bow centerline - BS = 3 x BP
- Capped fairlead
- Emergency wire pennant, with hard eyes - BS = BS of Main Line
- Emergency synthetic floating pennant with hard eyes - BS = 1.5 x BS of main line
- Float line to extend 75-90 metres aft of stern
- High visibility mark buoy.

5.2.5 Emergency anchor system

Cargo barge shall be fitted with an emergency anchor system always capable of holding the barge and cargo in gale conditions.

- Anchor cable length

The normal minimum effective length of anchor cable required is 120 metres mounted on a winch.



- Anchor cable strength
 - Cable on a winch: minimum BS of cable shall be 15 times the weight of anchor
 - Cable flaked out: minimum BS of cable shall be 20 times the weight of anchor.
- Anchor mounting and release

If there is no suitable permanent anchor housing the anchor shall be mounted on a bill board at about 60° to the horizontal.

The anchor shall be secured on the bill board in order to prevent lateral and upwards movement. The securing device shall be easily released manually.

6. Particular towing

Case of particular adverse towing conditions (heavy module, important draft - or/and difficult climatic/oceanologic conditions) are not covered by the present specification.

CONTRACTOR shall refer to the Particular Specification.

6.1 Tandem/double tows

Case of Tandem/double tows are also subject to the Particular Specification.

6.2 Manning requirements

If cargo barge manning is proposed by CONTRACTOR the conditions shall be in accordance with the following minimum requirements:

- Suitable accommodation shall be provided with facilities for watch keeping, communications, cooking, sleeping and sanitary requirements. These may be in accordance with national and local regulations.
- Life saving and fire fighting equipment shall be carried in accordance with International and National regulations for the safety of the number of people carried.
- For manned tows the following documentation shall be obtained:
 - Life Saving Apparatus and Fire Fighting Apparatus Certificates
 - Crew List
 - Radio Licences (as required)
 - Permission from Certifying Authority to man barge.
- At least two portable VHF radios should be supplied on board the barge to communicate with the Tug.
- Safety lines shall be fitted for the use of riding crew.
- Inclinometers shall be fitted for the monitoring of barge list and trim.