



Exploration & Production

GENERAL SPECIFICATION

PIPING VALVES VESSELS

GS PVV 811

Diatom earth pre-coat filters

01	10/03	Change of Group name and logo
00	03/01	First issue
Rev.	Date	Notes



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1. Scope

This document describes the minimum requirements to be observed in the design, construction, inspection and testing of pre-coat filters comprising vertical plates for seawater use.

This type of filter is also called a diatom earth pre-coat filter.

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
ASTM B 633	Standard specification for electro deposited coatings of zinc on iron and steel
ASTM F 871	Standard specification for electro deposited coatings on threaded components (metric)
CEI	International Electrotechnical Commission
ISO 4042	Fasteners. Electroplated coatings

Professional Documents

Reference	Title
API 675	Positive displacement pump - controlled volume

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
AISC	Specification for the design, fabrication and erection of structural steel for building
ASME VIII div. 1	Boiler and pressure vessel code
ASME B 31. 3	Process piping
AWS D 1.1	Welder performance and welding procedure qualification

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS COR 101	Design of internal cathodic protection of equipment and storage tanks
GS COR 201	Supply of sacrificial anodes
GS COR 350	External protection of offshore and related structures and equipment by painting
GS COR 352	Internal protection of equipment by painting
GS ELE 111	Induction motors
GS INS 101	Instrument engineering, supply and construction general requirements
GS PVV 112	Piping material classes
GS PVV 211	Pressure vessels according to ASME VIII div. 1 or div. 2
GS PVV 212	Pressure vessels according to PD 5500
GS PVV 813	Skids mounted units for static equipment

3. Quality

Before the start of construction, the Manufacturer shall draw up a quality plan detailing all the construction and inspection operations. These shall be the subject of detailed procedures. The quality plan shall be submitted to the COMPANY who shall specify the points at which the inspections are required.

The Manufacturer shall also submit his construction drawings and welding documentation to the COMPANY for approval prior to the start of construction. Construction cannot begin until the COMPANY has approved the documents submitted.

4. Materials

They shall withstand all forms of corrosion by the fluid handled (aerated seawater + 3 ppm max. free chlorine), both in service and during shutdown period, at a maximum temperature of 25°C in service and 45°C when shut down, either by intrinsic resistance or by the addition of appropriate means of protection (coating, cathodic protection).

- The following materials shall be acceptable with no cathodic protection:
 - Titanium alloys

- Super austenitic stainless steels with a PREN ≥ 50
- Organic materials (FRP, nylon (or equivalent) mesh, etc.).
- The following materials shall be acceptable only with cathodic protection:
 - AISI 316 L stainless steel
 - 22% and 25% duplex stainless steels
 - Coated carbon steel.
- Coated carbon steel is recommended for the tank and doors, not including mechanical friction surfaces and mechanical sealing surfaces which may be of a different material (including weld clad stainless steels).

5. Design - Calculations

Operation of the filters shall satisfy the specifications set out in the job specification and the data sheets.

6. Design of the equipment

6.1 Assembly

The filtration assembly shall be constructed in the form of two packages, as compact as possible and comprising one or more:

- Diatom filters with their surrounding environment (piping accessories, valves, inspection and safety instrumentation)
- Ancillary equipment (tank and pump) for forming the pre-coats either manually or automatically.

6.2 Pressure vessels

6.2.1 Tank

Refer to the pressure vessel design and construction specification for the applicable points, supplemented as follows:

- As a general rule, tanks shall be of bi-conical form resting on two cradles
- The front pivoting door shall be mounted on hinges (opening to 180°).

6.2.1.1 Door seal

O-ring type, this shall be fitted in a standardised swallow-tail groove.

6.2.1.2 Filtering frames

Designed to be as rigid as possible, the frames shall be constructed in accordance with the following information:

- Frame diameter
- Thickness and type of central core

- Ease of installation/removal of fabric
- Guaranteed seal-tightness.

In each case, the filtering mesh shall have an aperture size of 60 mm.

Fixing of the filtering medium: The Manufacturer's attention is drawn to the fixing of the support fabric which should be such that there is no tendency to tear, particularly at the hubs.

The Manufacturer shall propose the type of fixing recommended with reasons for the choice (outer profile with tangential clamping, self-clamping profile or laser welding).

Spacers: The space between frames shall be maintained by the use of six or more spacers arranged around the periphery of the frames.

6.2.1.3 Collector shaft

The support shaft shall have a minimum thickness of 8 mm ensuring that there is no risk of ovalization or buckling. It shall be supported at three points resting on bearings.

The hoops (span of bearings in the outlet box) shall be fitted so they just slide onto the shaft and are secured by screws so they can easily be replaced. They shall be ground but not chromated.

At the end, the shaft shall be threaded so the frames can be fastened by a nut.

6.2.1.4 Vent

The vent shall be arranged in such a way that no air pockets can remain within the part of the filter containing the frames.

6.2.1.5 Outlet box

The seal tightness of the boxes shall be assured by lip seals.

6.2.1.6 Frame drive assembly

Drive shall be provided by:

- Direct transmission, or
- Gear with chain and reducers (in stainless housing).

The motor shall be rated to overcome the starting torque (drive difficulties).

The reducer shall have a minimum service factor at least equal to 2. It shall include an oil sight gauge and the gear wheels shall be helical with nickel chrome plating.

6.2.2 Pre-coat equipment

6.2.2.1 Tank

The capacity of the tank shall be rated according to the filters to be constructed.

The removable top part shall be strengthened to accommodate a stirrer if necessary.

The hatch for introducing additives shall be protected by a door.

The internal design of the container shall be such as to avoid any air suction via the pre-coat pump.

- **The outlet nozzle shall be fitted with a vortex prevention device.**
- **Pre-coat pumps (number: two, including one standby).**

The centrifugal pumps shall be rated to recirculate the suspension for homogenisation with the preparation tank and to enable the pre-coat on the filter plates to be removed.

6.2.3 Replenishing equipment

6.2.3.1 Tank

The top part of the tank shall be removable and reinforced to accommodate the stirrer. The feed hatch shall be protected by a door.

- **It shall be fitted by a vortex prevention device.**
- **Dosing pump (variable flow rate).**

A diaphragm type dosing pump shall be installed for each filter.

The pump Supplier shall take into account the abrasive effect of the additive (risk of breakdown of diaphragms, erosion of non-return valves) and in-line obstruction due to the high density of diatom earths.

6.2.4 Skids

The general design of the skids shall enable the equipment they support to be operated easily and safely within as compact a space as possible, taking into account the static and dynamic stresses generated by the devices in the various situations that can be envisaged (service, transportation and handling).

In addition, the Manufacturer shall minimise the transmission of vibrations by isolating the devices and the supported equipment.

Means of access and handling (ladders, platforms, monorails, etc.) shall be designed to enable all operation and maintenance operations on the equipment and their environment (ease of assembly and disassembly). The skid shall be fitted with pad eyes for handling at four points.

6.2.5 Piping and appurtenances

All piping and appurtenances shall be compliant with the piping classes defined in the job specification, and constructed in accordance with the general piping installation specification.

The arrangement of the valves and of the measuring instruments shall be designed for ease of access for servicing and manoeuvring purposes.

The valves shall be positioned at chest height or floor level to facilitate maintenance.

Flanges for connection to adjacent installations shall be provided at the limit of the skid.

Bolting less than 13 mm in diameter shall be of AISI 316 stainless steel or higher.

External bolting of diameters greater than or equal to 13 mm shall be galvanised and bichromated according to [ASTM F 871](#) and [ASTM B 633](#) (class Fe/Zn 12SC3) and coated according to [GS COR 350](#). Bolting shall be specified according to [ISO 4042](#), classification Zn 12C/Fe.



6.2.6 Instrumentation

The instrumentation shall be implemented in accordance with the general technical documents, as listed in the job specification.

The instruments shall be supplied by Suppliers approved by the COMPANY.

Unless otherwise stipulated in the job specifications, instrumentation shall be of analogue type (4-20 mA, 24 VDC power supply) for measuring pressure, temperature level, flow rate.

Logic state measurements (thresholds) shall be avoided or shall be subject to the COMPANY's approval. Valve positions shall be indicated by two limit switches (open and closed positions).

For operation driven by programmable logic controller or any other Digital Control System (DCS), refer to the system's job specification.

Instrument cable runs shall be segregated from power cable runs.

Junction boxes shall be located at the skid limit, protection class EEx"e". Glands shall be of stainless steel or brass. Screw fastenings shall be of stainless steel grade AISI 316 or higher.

6.2.7 Electricity

Motors shall be in accordance with the data sheets attached to the call for bids.

Unless otherwise stipulated in the job specification, the Manufacturer shall take into account the following parameters:

- Service voltage: 380 V - 50 Hz
- Non-distributed isolated neutral
- Control voltage (specified in the job specification)
- Safety motors for hazardous areas with IP 55 protection
- Cable trays in corrosion resistant material (AISI 316, organic products) with lid
- Glands of bronze or brass rated EEx"d"
- Junction boxes rated EEx"e" with plastic glands
- Screw fastenings of stainless steel grade AISI 316 or higher.

6.2.8 Corrosion protection

6.2.8.1 Cathodic protection

Sacrificial anodes shall be positioned on the bottom part of the filter tank, and on the door.

Sizes shall take into account the total stainless steel area (uncoated) and the proportion of carbon steel area with a coating that is liable to be degraded, with time, according to reference documents.

A special device (brush type) shall provide electrical continuity between the fixed assembly (tank + doors) supporting the anodes and the rotating assembly (shaft + filters and supports).

This device shall offer an electrical resistance < 0.05 ohms.

6.2.8.2 Coating protection

All internal and external parts of carbon steel including feet and gusset mountings shall be protected by a complete coating system in accordance with reference documents.

6.2.9 Blast cleaning and passivation

Parts of devices of stainless steel shall be blast cleaned and passivated then rinsed (maximum chloride ion content: 25 ppm). Carbon steel incrustations in stainless steel due to grinding spatter shall not be permitted.

6.2.10 Earthing

Bonding between all exposed metallic parts shall be provided by 35 mm² insulated copper cable. Each skid shall be fitted with two diametrically opposed earthing tabs.

7. Inspection and testing

Inspections and tests shall be carried out in accordance with the applicable specifications and codes, with, in particular:

- **Factory tests:**
 - Hydraulic tests of vessels and piping (1.5 x DP)
 - Dimensional inspection of the mounted assembly
 - Inspection of protection coatings
 - Testing of valves and motors
 - Installation offload, functional testing and calibration of instrumentation
 - Pump tests
 - Verification of operation of the frame drive assembly
 - Sealing tests
 - Field tests
 - Operating tests and verification of performance.