

GENERAL SPECIFICATION

PIPING VALVES VESSELS

GS EP PVV 412

Plate heat exchangers

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1. Scope

This General Specification covers the Company practices and minimum requirements for the mechanical design, materials, fabrication, inspection and testing of Plate Heat Exchangers subject to internal pressure. It covers several types of Plate Heat Exchangers:

- The plate-and-frame heat exchangers according to the [API STD 662 Part 1 / ISO 15547-1](#)
- The welded plate-block heat exchangers (in Annex D)
- The shell and plate heat exchangers (in Annex E)
- The printed circuit heat exchangers (in Annex F).

This specification does not address the selection of the Plate Heat Exchanger type.

The scope is limited to heat exchangers for surface applications in offshore or onshore environment. This specification shall be complemented by a dedicated particular project specification for the purchase of equipment and supported by the relevant process and mechanical data sheets.

Such equipment may contain liquid or gaseous petroleum or chemical products, air, water or steam. Specific use for H₂S or amine service is subject to Company prior acceptance.

This specification does not address local regulation, nor specific requirements imposed by Classification Society (for floating units).

The design, material selection, inspection, testing and preparation for shipment shall be performed according to the [API STD 662 Part 1 / ISO 15547-1](#) with the amendments defined in the present General Specification.

The sections 3 to 11 below follow the plan of the [API STD 662 Part 1 / ISO 15547-1](#) and the section 12 states additional requirements.

The process design is governed by the [GS EP ECP 103](#).

Protective devices such as safety valve or rupture disc are not part of this General Specification.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

Any divergence between any of the contractual reference documents, or between this specification and any other contractual reference document, shall be reported to the Company for decision. In such a case, and unless otherwise agreed or decided by the Company, it is understood that the more stringent requirement shall apply.

Exceptions to, or deviations from this specification are not permitted unless previously accepted in writing by the managing entity named on the front page. For this purpose, vendor's requests for substitution or change of any kind shall be completed with all pertinent information required for the Company assessment.

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External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published at the effective date of this document.

Reference	Title
API STD 662 Part 1	Plate Heat Exchangers for General Refinery Services - Part 1: Plate-and-Frame Heat Exchangers
ISO 15547-1	Petroleum, petrochemical and natural gas industries - Plate-type heat exchangers - Part 1: Plate-and-frame heat exchangers
ASCE 7	Minimum Design Loads for buildings and other Structures
ASME B1.1	Unified inch screw threads
ASME B16.5	Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard
ASME BPVC Section IX	ASME Boiler & Pressure Vessel Code - Section 9: Welding and Brazing Qualifications
ASME BPVC Section V	ASME Boiler & Pressure Vessel Code - Section 5: Nondestructive Examination
ASME BPVC Section VIII Div 1	ASME Boiler & Pressure Vessel Code - Section 8: Rules for Construction of Pressure Vessels - Division 1: Pressure Vessels
ASME BPVC Section VIII Div 2	ASME Boiler & Pressure Vessel Code - Section 8: Rules for Construction of Pressure Vessels - Division 2: Alternative Rules
ASTM A264	Standard Specification for Stainless Chromium-Nickel Steel-Clad Plate
ASTM A265	Standard Specification for Nickel and Nickel-Base Alloy-Clad Steel Plate
ASTM A578	Standard Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications
NACE MR 0175 / ISO 15156	Petroleum and natural gas industries - Materials for use in H ₂ S-containing environments in oil and gas production

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP COR 771	Thermal insulation (hot and dual service)

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Reference	Title
GS EP COR 772	Thermal insulation (cold service)
GS EP ECP 103	Process design criteria
GS EP PVV 211	Design and fabrication of pressure vessels according to ASME VIII
GS EP PVV 402	Standards for exchanger accessories and equipment
GS EP PVV 611	Welding of pressure containing piping and equipment
GS EP PVV 612	Piping and equipment subject to severe sour service. Metallurgical and welding requirements
GS EP PVV 614	Welding of duplex and super-duplex stainless steel
GS EP PVV 615	Welding of UNS 31254 alloy
GS EP PVV 616	Welding of titanium pipe and fittings
GS EP PVV 617	Welding of 3 ½ % nickel steel
GS EP PVV 622	Piping and equipment subject to mild and intermediate sour service. Metallurgical and welding requirements

3. Terms and definitions

The terms and definitions used in this specification are in accordance with the [API STD 662 Part 1 / ISO 15547-1](#) section 3 with the following amendment:

CRA	Corrosion Resistant Alloy
General Specification	Total General Specification as referenced in the section 2.
Inspection body	Organization independent from the vendor, designated by the purchaser and responsible for monitoring the equipment manufacture from the reception of the raw materials to the delivery of the equipment. The inspection body can be also Company's or purchaser's representative.
Managing Entity	Entity named on the front page of the document.
Low Temperature Service	Whatever the environmental conditions an exchanger is considered as "low temperature service" when the design temperature is equal or lower than -30°C, or for a exchanger with a design temperature in operation greater than -30°C when the impact tests are required at -30°C and lower.
Plate and Shell Heat Exchangers (PSHE)	Assembly of a welded plate pack of circular plates and its components (shell, flange, supports...).

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Printed Circuit Heat Exchanger (PCHE)

The PCHE is a plate type heat exchanger made of chemically etched plates. It consists in a core of diffusion-bounded plates and headers welded to the core.

Welded Plate-Block Heat Exchanger

Assembly of a welded plate pack and its components (heads, panels, supports, columns...).

4. General

The section 4 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following amendments:

4.1 Pressure design code

The pressure design code considered for this General Specification is [ASME BPVC Section VIII Div 1](#).

The selection of the degree of radiographic examination is defined as follow:

- “Full radiographic” examination is required in any case for the following applications:
 - Heat exchangers with a design pressure greater than 60 barg
 - Heat exchangers which contain lethal substances
 - Heat exchangers to operate at Low Temperature Service
 - Heat exchangers in vacuum service (when vacuum occurs during start-up or in other conditions than normal service, it is not necessary considered as "vacuum service")
 - Heat exchangers which are to be heat treated for any reason
 - Heat exchangers in cyclic service
 - Heat exchangers made in Titanium.
- “Spot radiographic” examination may be selected for other applications
- “No radiographic” examination option is not allowed.

The Annexes A, B and C of the [API STD 662 Part 1 / ISO 15547-1](#) shall be considered as mandatory.

The structural welding code shall be a recognized international code such as [ASME BPVC Section IX](#).

4.2 Local regulations

The applicable local regulations shall be specified in the project documentation.

For countries where the exchangers is used have their own regulations, such regulations shall be applied even if they are more severe than the applicable codes and standards. Consequently, the more severe requirements are applicable.

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5. Proposal information required

The section 5 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following amendments:

5.1 Data Sheet

The plate-and-frame heat exchangers data sheets shall comply with the form provided in by the [API STD 662 Part 1 / ISO 15547-1](#) Annex C (SI units).

The service, duty and other design parameters as well as proposed type, position, arrangement and materials, shall be specified on the Heat Exchanger data sheets.

5.2 Components whose terms and definition are not identified by Clause 3

The section 5.2 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

5.3 Exception to the specified requirements

The section 5.3 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

5.4 First-time use of a plate-and-frame heat exchanger design

The section 5.4 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following additional amendment:

A performance test is required on the first-time use heat exchanger; the performance test shall be done on the first unit.

5.5 Anticipated life of the proposed gaskets

The section 5.5 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

5.6 Method of support of the movable cover

The section 5.6 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

5.7 Recommended spare parts

The section 5.7 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following additional amendment.

Minimum spare parts are defined as follow, for each heat-exchanger unit:

- 10% of each gasket type, and four (4) as a minimum
- One (1) set of nuts for clamping the plates.

The accessories which may be listed in the particular specification shall be furnished with the main equipment.

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5.8 Fireproof shroud

The section 5.8 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

6. Drawings and other required data

The section 6 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following amendments:

6.1 Drawings

6.1.1 The section 6.1.1 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following additional amendments:

- p) Details of connections including any lining, cladding and method of attachment to the covers
- q) Details of lifting lugs, location of nameplate and other attachments
- r) Requirements for Non Destructive Examination.

6.1.2 The section 6.1.2 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following additional amendment:

Vendor shall specify the required distance dimension between fixed cover and movable cover to avoid the damage of plates and gaskets at bolted up condition.

6.1.3 The section 6.1.3 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

6.1.4 The section 6.1.4 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

6.1.5 The weld maps, the qualified welding procedure specifications and procedure qualification records as required by the pressure design code and the applicable General Specifications shall be submitted for review and record.

6.1.6 Both the thermal and the mechanical calculation notes shall be submitted for review and record.

The design calculations for supports, lifting and pulling devices shall be submitted for review, with the description of the lifting and handling operations.

6.2 Final records

6.2.1 The section 6.2.1 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

6.2.2 The section 6.2.2 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

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7. Design

The section 7 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following amendments.

7.1 General

7.1.1 The section 7.1.1 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

7.1.2 The section 7.1.2 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

7.1.3 The section 7.1.3 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.

7.2 Design temperatures

7.2.1 The section 7.2.1 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following additional amendment:

The maximum and minimum design temperatures shall be defined following the rules of the [GS EP ECP 103](#). The minimum design metal temperature shall be defined in accordance with the pressure design code.

7.2.2 The section 7.2.2 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following additional amendment:

The design temperature of a component influenced by both the hot and cold sides shall be the more severe one (including for external bolts).

7.3 Design pressure

The section 7.3 of the [API STD 662 Part 1 / ISO 15547-1](#) applies with the following additional amendment:

The maximum and minimum design pressures shall be defined following the rules of the [GS EP ECP 103](#).

7.4 Fouling margin

The fouling margin is not considered for the plate-and-frame heat exchangers; it is replaced by an extra surface of 15% as per specified in the [GS EP ECP 103](#).

7.5 Corrosion allowance

7.5.1 The corrosion allowance applies to unlined connections and unlined parts only. It shall be specified on the data sheet.

7.5.2 The section 7.5.2 of the [API STD 662 Part 1 / ISO 15547-1](#) applies without any additional amendment.