

GENERAL SPECIFICATION

PIPING VALVES VESSELS

GS EP PVV 415

Design and fabrication of air cooler

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1. Scope

This standard specification covers the engineering, design, fabrication and inspection of air cooled heat exchangers according to [API 661-ISO 13706](#).

[API 661-ISO 13706](#) shall be used in conjunction with the ASME or [CODAP](#) code. The code shall be defined in the job specification, and shall then become the reference to be applied to the word "code".

The term "air cooled heat exchanger" designates coolers and condensers in which the cooling agent is the ambient air, possibly associated with spraying.

The minimum rules and requirements to be fulfilled with respect to the choice of material, design, fabrication, Manufacturer quality control, inspection, as well as pressure relief devices, are those stated in the above documents. All these rules and requirements are applicable, only requirements in addition to these documents are detailed in this specification.

2. Reference documents

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

When national regulations exist, their recommendations shall always apply, together with the standards or codes to which they refer. Such national regulations shall therefore supplement or amend the provisions of the present document.

External Documents

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

Reference	Title
API STD 661/ISO 13706	Petroleum and Natural Gas Industries - Air-cooled Heat Exchangers
ASME B16.20	Metallic gaskets for pipe flanges. Ring joint, spiral wound, and jacketed
EN 10204	Metallic products - Type of inspection documents

Reference	Title
ISO 1940-1	Mechanical vibrations - Quality requirements for the balancing of rigid rotors - Part 1: Determination of acceptable residual unbalance
ISO 10816-1	Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts - Part 1: General guidelines
WRC 107	Bulletin No. 107: Local stresses in spherical and cylindrical shells due to external loading
WRC 297	Bulletin No. 297: Local stresses in cylindrical shells due to external loadings on nozzles, supplement to WRC Bulletin No. 107
PD 5500	Specification for unfired fusion welded pressure vessels
CODAP	French code governing the construction of unfired pressure vessels

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP COR 356	Corrosion Protection of Fasteners for Subsea and Topside Applications
GS EP COR 560	Physical and chemical treatment of hydrostatic test water
GS EP PVV 175	Cleaning of piping and vessels
GS EP PVV 612	Piping and equipment subject to severe sour service. Metallurgical and welding requirements
GS EP PVV 622	Piping and equipment subject to mild and intermediate sour service. Metallurgical and welding requirements

3. Materials

3.1 General

The materials used shall be selected from those allowed by the code, under the responsibility of the Manufacturer on the basis of the exchanger operating conditions supplied by the Company. However, in certain cases of special service (corrosive environment for instance), supplementary requirements may be added by the Company.

Material certificates shall be provided for all pressure containing parts and parts welded onto a wall subject to pressure (certificate 3.1.b as per, [EN 10204](#)).

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Fins made of aluminium alloy can be used depending on the fin attachment method used and within the temperature limits.

The Manufacturer shall also engineer the compatibility of the materials used for the tubes (including tubes and fins) and tube sheet when there is a risk of galvanic or interstitial corrosion.

For air cooled heat exchangers installed in a marine environment, the fins, if they are made of aluminium, shall be of an alloy adapted to that environment (preferably series 6000 alloy). The composition of this alloy shall be subject to the Company's approval.

3.2 Sour service

The requirements of [GS EP PVV 612](#) or [GS EP PVV 622](#) shall apply for exchangers with sour service conditions.

3.3 Bolting

Carbon steel bolting shall be protected against corrosion as stated in [GS EP COR 356](#).

4. Design

4.1 Design conditions

The design calculations shall take into account the various mechanical and thermal loadings (and their combination) to which the exchanger may be submitted.

4.2 Corrosion allowance

The corrosion allowance shall be as per [API STD 661 / ISO 13706](#).

4.3 Nozzles

4.3.1 Reinforcements for openings

Reinforcements shall be prohibited and the Manufacturer shall increase locally the shell and/or nozzle thicknesses.

4.3.2 Calculation of nozzles subjected to external forces

When external forces can be induced on the exchanger by the piping (in cases of hot service for example), the nozzles shall be calculated to withstand these forces. The calculations can be made according to [WRC 107](#), [WRC 297](#) or [PD 5500](#).

For air coolers installed on floating facilities, piping loads onto the nozzles have to be factored from [API STD 661](#) loads as to take into account imposed loads induced by the floating units. The applied factors shall be subject to Company approval.

Loadings and combinations of loads shall include static and dynamic loadings

4.4 Lifting and transportation

The calculation of exchangers during the lifting and transportation phases shall be carried out.