

INTERNATIONAL STANDARD

ISO 15547

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Petroleum and natural gas industries — Plate heat exchangers

*Industries du pétrole et du gaz naturel — Échangeurs thermiques à
plaques*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15547 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

Annexes A, B and C of this International Standard are for information only.

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Introduction

This International Standard is based on API standard 662, December 1995 edition.

Users of this International Standard should be aware that further or differing requirements may be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is an innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this International Standard and provide details.

This International Standard requires the purchaser to specify certain details and features.

A round bullet (●) at the beginning of a clause or subclause indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on the plate heat exchanger checklist (see annex B).

A triangular bullet (▲) at the beginning of a clause or subclause indicates an item appearing on the plate heat exchanger data sheet (see annex C).

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Petroleum and natural gas industries — Plate heat exchangers

1 Scope

This International Standard gives requirements and recommendations for the mechanical design, materials selection, fabrication, inspection, testing, and preparation for shipment of plate heat exchangers, sometimes referred to as plate-and-frame heat exchangers, for use in petroleum and natural gas industries.

This International Standard covers gasketed, semi-welded and welded plate heat exchangers constrained within a frame.

As used in this International Standard, the term heat exchangers, or exchangers, includes coolers, heaters, condensers, evaporators and reboilers.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1.1

connector plate

plate used to separate two or more services in one plate heat exchanger

3.1.2

drip tray

tray that is able to collect droplets from an entire heat exchanger plate pack

3.1.3

end plates

two plates, one at each end, that prevent the fluids in a plate heat exchanger from contacting the frame

**3.1.4
exchanger service**

one or more plate heat exchangers for a total specified heat-transfer duty

**3.1.5
frame**

assembly that provides the structural support and pressure containment of a plate heat exchanger

**3.1.6
fully welded plate pack**

plate pack where all the gaskets have been replaced by welds

**3.1.7
heat transfer area**

sum of the surface areas of one side of all plates in contact with both heat-transfer fluids

NOTE Areas of end plates are not included.

**3.1.8
item number**

purchaser's identification number for a plate heat exchanger

**3.1.9
nominal plate gap**

forming depth of an individual plate

**3.1.10
pass plate**

plate used to change the direction of flow of a stream in a multi-pass plate heat exchanger

**3.1.11
plate**

sheet of material precision-pressed or -formed into a corrugated pattern

**3.1.12
plate chevron angle**

angle formed between the corrugated plate pattern and the horizontal

**3.1.13
plate heat exchanger
PHE**

assembly of a gasketed, semi-welded or welded plate pack and its supporting frame

NOTE Figure 1 shows typical components of a plate heat exchanger.

**3.1.14
plate pack**

grouping of all plates contained within a frame

**3.1.15
port**

inlet or outlet opening in the plate

**3.1.16
pressure design code**

recognized pressure vessel standard specified or agreed by the purchaser

EXAMPLE ASME VIII.

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3.1.17**semi-welded plate pair**

two adjacent plates welded together where the weld replaces the function of a gasket

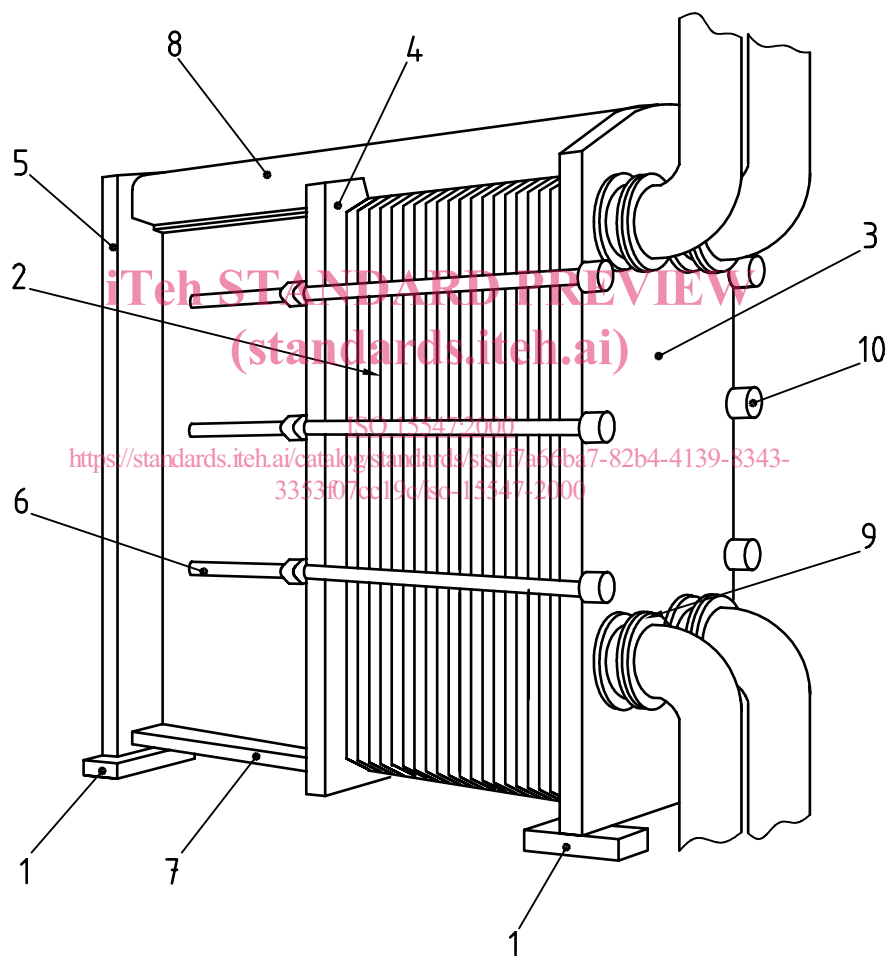
3.1.18**shroud**

removable covering for the top and sides of the plate pack of the plate heat exchanger, which provides protection in the event of a spray leak or fire

3.1.19**structural welding code**

recognized structural welding code specified or agreed by the purchaser

EXAMPLE AWS D1.1 for steel.

**Key**

- | | |
|------------------|-----------------------------------|
| 1 Mounting feet | 6 Tie bolts |
| 2 Plate pack | 7 Guide bar (bottom) |
| 3 Fixed cover | 8 Carrying bar (top) |
| 4 Movable cover | 9 Connections, studded or flanged |
| 5 Support column | 10 Tie nuts |

Figure 1 — Typical single-pass plate heat exchanger

3.2 Abbreviated terms

ASME	American Society of Mechanical Engineers
AWS	American Welding Society
IRHD	International rubber hardness degree
MDMT	Minimum design metal temperature
MRB	Manufacturing record book
NDE	Non-destructive examination
PHE	Plate heat exchanger

4 General

- ▲ 4.1 The pressure design code shall be specified or agreed by the purchaser. Pressure components shall comply with the pressure design code and the supplemental requirements in this International Standard.

The structural welding code shall be specified or agreed by the purchaser.

Annex A provides some recommended mechanical and design details for information. Annex A also includes some precautions for consideration when specifying fouling margin, fireproof shrouds and plate gaskets.

- ▲ 4.2 The vendor shall comply with the applicable local regulations specified by the purchaser.
- ▲ 4.3 If specified by the purchaser, or if required by national, state or local codes, the vendor shall register each exchanger.

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In this International Standard, where practical, US Customary units are included in parentheses for information.

5 Conflicting requirements

The vendor shall obtain written approval from the purchaser before proceeding with work affected by a conflict between the proposal and the purchase order.

6 Proposal information required

- 6.1 The vendor shall complete all information requested on the data sheet.
- 6.2 For components that are not fully identified by the terms and definitions in 3.1 of this International Standard, the vendor shall describe the details of construction and assembly.
- 6.3 The vendor shall include a detailed description of any exception to the specified requirements.
- 6.4 The first-time use of a PHE design, component or material by the vendor for the purchaser's intended service shall be clearly indicated by the vendor.
- 6.5 The vendor shall state anticipated life in the specified service and in storage of the gaskets proposed. Special requirements for gasket storage to maintain gasket shelf-life shall be specified.
- 6.6 The vendor shall state the method of support used for the movable cover.

6.7 The vendor shall supply a recommended spare parts list and unit spare-part prices for each plate heat exchanger.

6.8 The vendor shall state recommended plate-cleaning method(s).

- ▲ **6.9** If a fireproof shroud is specified, the PHE vendor shall submit proof that the proposed design has passed suitable type testing.

7 Drawings and other data requirements

7.1 Drawings

7.1.1 The vendor shall submit general configuration drawings for each PHE for review. The drawings shall include the following information:

- a) service, item number, project name and location, vendor's shop order number and purchaser's order number;
- b) maximum allowable working pressure, design pressure, test pressure, design temperature, minimum design metal temperature and any restrictions regarding testing or operation of the PHE;
- c) dimensions and location of supports;
- d) overall exchanger dimensions;
- e) maximum and minimum compressed plate pack length;
- f) side clearance required for plate removal;
- g) mass of the PHE, both empty and full of water;
- h) centre of gravity of the exchanger for empty and operating conditions;
- i) corrosion allowance;
- j) material specifications for all components;
- k) allowable forces and moments on connections;
- l) size, flange rating and facing, location, orientation, and flow identification of all connections;
- m) applicable design codes;
- n) number of plates installed and maximum number of plates for specified frame;
- o) gasket materials and adhesives required.

7.1.2 The vendor shall recommend the tools needed for the assembly and maintenance of the PHE. If torquing of bolts is required, the vendor shall provide torquing procedures.

7.1.3 The review of general configuration drawings by the purchaser shall not relieve the vendor of the responsibility of meeting the requirements of the purchase order.

7.1.4 After receipt of the purchaser's general configuration drawing review comments, the vendor shall furnish the certified general configuration drawings and the detail drawings.

- **7.1.5** If specified by the purchaser, the vendor shall furnish copies of applicable welding procedure specifications and weld maps for review or record.
- **7.1.6** If specified by the purchaser, the vendor shall furnish copies of applicable calculations for review or record.

7.2 Final records

7.2.1 The vendor shall furnish the purchaser with a user's manual which shall contain the following:

- a) technical description,
- b) assembly instructions,
- c) operating instructions,
- d) maintenance instructions,
- e) spare parts list,
- f) data sheets and drawings (as-built).

7.2.2 The vendor shall maintain records to confirm compliance of the material and fabrication with the requirements of this International Standard for at least five years.

8 Design

8.1 General

8.1.1 The frame and tie bolts of the gasketed or semi-welded PHE shall be designed to permit future installation of a minimum of 20 % additional plates.

8.1.2 Gasketed plates shall be replaceable individually, and semi-welded plates in pairs, without having to remove any other plate.

8.1.3 The plate pack shall incorporate means for positive alignment of the plates and gaskets.

8.2 Design temperature

▲ 8.2.1 All PHEs shall have two design temperatures, a maximum design temperature and a minimum design metal temperature (MDMT), specified by the purchaser.

8.2.2 The design temperatures shall be used for the design of all pressure-retaining components.

8.3 Design pressure

The plate heat exchanger design shall not be based on differential pressure.

8.4 Fouling margin

● The purchaser shall specify a percentage fouling margin where:

$$\text{Fouling margin} = (U_{\text{clean}}/U_{\text{service}} - 1) \times 100 \quad (1)$$

where

U is the thermal transmittance (overall heat transfer coefficient).

8.5 Corrosion allowance

▲ 8.5.1 Corrosion allowance, if specified, shall apply to connections only.

8.5.2 Plate material shall be selected based on an assumed zero corrosion allowance.