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Guidance on Industry Standard for Plate Heat Exchangers

GIS 26-104

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GIS 26-104. This Guidance on Industry Standard (GIS) is based on parts of heritage documents from the merged BP companies as follows:

BP (Pre-1999)

GS 26-2	Guidance for specification 126-5 Design of Plate-and-Frame Heat Exchangers for Offshore Use.
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Amoco

A FE-HE-P&F-P	Fabricated Equipment—Heat Exchangers—Plate and Frame— Procurement Specification.
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The document is divided into two parts:

- a. Part 1 covers gasketed, semi-welded and welded plate heat exchangers constrained within a frame. Part 1 sets out the BP additions to the current version of ISO 15547.
- b. Part 2 covers brazed aluminium plate fin heat exchangers. Part 2 is based on the draft of ISO 15547-2, but includes BP additions. When the ISO is published this part will be amended so that it contains only the BP additions.

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Part 1 Plate Heat Exchangers

- a. Guidance for plate heat exchangers is based on ISO 15547 Petroleum and Natural gas industries – Plate heat exchangers.
- b. Guidance statements of this GIS are modifications to ISO 15547.
- c. Modifications to ISO 15547 are identified as Add, Modify to Read, or Delete.
- d. Paragraph numbers in this specification correspond to ISO 15547.
- e. Paragraphs of ISO 15547 that are not revised remain applicable.



1. Scope

Add

This Engineering Technical Practice (ETP) provides guidance on industry standard for the design, materials, fabrication, inspection, testing, documentation, and preparation for shipment of plate heat exchangers based on ISO 15547.

3. Terms and definitions and abbreviated terms

3.2 Abbreviated terms

Add

HTFS	Heat Transfer and Fluid flow Service.
HTRI	Heat Transfer Research Incorporated.
MAWP	Maximum allowable working pressure.
MPI	Magnetic particle inspection.
NDT	Non destructive testing.
PQR	Procedure qualification records.
PWHT	Post weld heat treated.
UT	Ultrasonic testing.
WPS	Welding procedure specifications.

4. General

Add

- 4.4 A thermal guarantee shall be provided.

In most cases the Vendor shall supply the thermal guarantee, but in some circumstances another party, subject to BP approval, may supply the thermal guarantee.

- 4.5 Vendor's design software may be used, but in the event of a dispute BP may require a cross check with HTFS or HTRI software.

In general, Vendors have detailed in-house correlations, and such information is not usually available. So any crosscheck with HTFS/HTRI software can only be considered as a guide rather than a definitive answer.

5. Conflicting requirements

Add

In case of conflict between documents, the order of priority shall be:

1. The inquiry or purchase order.
2. The data sheet.
3. This GIS.
4. Pressure vessel code.



6. Proposal information requiredAdd

- 6.10 Alternate proposals can be submitted in addition to, not in lieu of, the basic proposal. All proposals shall clearly state all deviations from this standard and the Data Sheet.
- 6.11 Fabrication, inspection, and testing shall not be subcontracted without prior written approval from BP. Quotation shall clearly indicate intentions to subcontract any part of the work and the name and location of subcontractor.

7 Drawings and other data requirements**7.1 Drawings**

- 7.1.5 Delete the Phrase "if specified by the purchaser"
- 7.1.6 Delete the Phrase "if specified by the purchaser"

8. Design**8.1 General**Add

- 8.1.4 Plate and frame heat exchangers shall be of single pass counter-current flow design with the connections on the fixed cover. Approval for other designs shall be obtained from BP.
- 8.1.5 The maximum pressure drop through inlet and outlet ports and nozzles shall not exceed 10% of allowable plate heat exchanger pressure drop as specified on the process Data Sheet.

This is to ensure good distribution across the plate pack.

8.2 Design temperatureAdd

- 8.2.3 The design temperature for a gasketed plate and frame heat exchanger should not exceed 180°C (356°F).

8.3 Design pressureAdd

- 8.3.1 The design pressure for gasketed plate and frame heat exchangers should not exceed 25 bar g (375 psig).

8.4 Fouling marginModify to Read

A minimum fouling margin of 10% shall be used where...

8.6 Components

- 8.6.6 Delete the Phrase "If specified by the purchaser"

8.7 ConnectionsModify to Read

Connections shall be flanged unless agreed by BP.



8.7.2 Delete**11. Inspection and testing****11.1 Quality control**11.1.2 Modify to Read

As a minimum individual plates shall be visually inspected for defects prior to assembly.

Other inspection requirements that may be required (depending on criticality of the heat exchanger) include:

- *A random 10% of the plates shall be crack detected by applying fluorescent dye penetrant ink to one side of plate, soaking for at least six hours, then examining the opposite side under ultraviolet light. In the event of failures, 100% of the plates shall be dye inspected, at the discretion of BP.*
- *Welds shall be checked by Dye Penetrant Inspection (DPI) or Magnetic Particle Inspection (MPI). MPI shall be used for ferromagnetic materials and DPI for nonferrous materials and austenitic stainless steel.*
- *Cut edges, including cut-outs for nozzles, shall be visually checked, followed by DPI.*
- *Tie bars shall be subject to visual examination to check that no mechanical damage exists.*
- *Butt welds on nozzle necks shall be subject to 100% radiographic examination, if feasible.*

11.3 Nameplates and stampings11.3.1 Modify to Read

Nameplates shall be die stamped austenitic (300 series) stainless steel securely fastened to the fixed end and located so as to be clearly visible after installation.

11.3.2 Add

- Order placed by
- Any statutory markings (e.g. CE mark)
- BP works identification number
- Maximum design temperature

12. Preparation for shipmentAdd**12.5 General**

Plate heat exchangers should be shipped fully assembled. If not feasible, each component shall be clearly and permanently identified for proper assembly in accordance with detailed written assembly instructions.

12.6 Packing and shipping documents

12.6.1 Equipment or materials that contain or are coated with any regulated substances, such as the following, shall be prominently tagged at openings to indicate nature of contents and precautions for shipping, storage, and handling:

1. Insulating oils.



2. Corrosion inhibitors.
 3. Antifreeze solutions.
 4. Desiccants.
 5. Chemical substances.
 6. Hydrocarbon substances.
- 12.6.2 Regulated substances shall have a Material Safety Data Sheet (MSDS).
- 12.6.3 MSDSs shall fully comply with regulations for MSDS preparation specified by the entity that has jurisdiction and shall include a statement that the substance is considered hazardous by regulation.
- 12.6.4 If any substance is exempt from regulation, a statement to that effect shall be included.
- 12.6.5 Before shipment, MSDSs shall be forwarded to receiving facility.
- 12.6.6 At shipment, MSDSs in protective envelopes shall be affixed to the outside of the shipment.



Part 2: Brazed Aluminium Plate-Fin Heat Exchangers

1. Scope

This Engineering Technical Practice (ETP) provides guidance on industry standard for the design, materials, fabrication, inspection, testing, documentation, and preparation for shipment of brazed aluminium plate fin heat exchangers.

Part 2 of this GIS is based on a draft of ISO 15547-2 and will be updated when ISO 15547-2 is published.

2. Terms and definitions and abbreviated terms

For the purposes of Part 2 the following terms and definitions apply.

2.1. Terms and definitions

2.1.1.

heat transfer area

sum of the primary and secondary heat transfer surface areas of all heat-transfer passages in contact with a stream. See Figure 2.

2.1.2.

item number

BP's identification number for a plate-fin heat exchanger.

2.1.3.

minimum design metal temperature

lowest metal temperature at which pressure containing elements can be subjected to design pressure

EXAMPLE Ambient or process condition.

2.1.4.

plate-fin heat exchanger

a brazed aluminium plate-fin heat exchanger consists of a block (core) of alternating layers (passages) of corrugated fins. The layers are separated from each other by parting sheets and sealed along the edges by means of side bars, and are provided with inlet and outlet ports for the streams. The block is bounded by cap sheets at the top and bottom.

Note: All the layers carrying the same stream are connected together by headers (inlet, outlet, intermediate) directly attached by welding onto the brazed core. Figure 1 shows typical components of a plate-fin heat exchanger.

