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Title	Design, Fabrication and Supply of Torus Cryo Pump Housing (TCPH) with Bellows and Other Loose items
Sub-title	MANDATORY APPENDIX : II-TCPH-APB3_03_WELDING REQUIREMENTS

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1. SCOPE

This mandatory appendix covers the requirement for welding for TCPH manufacturing.

2. REFERENCE

2.1. ASME Sec-IX

2.2. ASME section-VIII Div.2

2.3. ITER Vacuum Handbook v2.3 (RDB3_07)

3. SPECIFIC REQUIREMENTS

In addition to the requirements specified in ASME Section-VIII Div.2 and ASME Section IX, following supplementary requirements shall be applicable as mandatory.

3.1. Weld geometry of Vacuum Boundary Welds

Weld geometry of vacuum boundary joints (Weld Edge preparation) shall be selected from ASME Sec-VIII Div. 2 part 4. All welds are vacuum boundary joints in TCPH. Only full-penetration joint weld types with no backing strip are allowed for vacuum boundary welds.

3.2. Welding Process Selection

Welding processes for the TCPH components shall be as per Table 6.5 of ASME Section VIII Division 2 Part 6.

Preference is given to automatic or mechanized welding processes as to limit human error. Manual welding process may be used if necessary but its extent shall be minimized.


3.3. Weld Surface Preparation

The weld edge shall be prepared by machining, grinding or thermal cutting in accordance with the requirements of ASME Section VII Division 2, Part 6.

In case of surface preparation made by grinding or wire brushing, it shall only be carried out with stainless steel compatible grinding wheels and wire brushes. In any case grinding wheels used in other materials (CS, LAS, etc.) shall not be in contact with Stainless steel material. Additional requirements specified in APB3_06 for weld surface preparation shall be applicable.

In case of defect observed in base material which requires repair by welding, the NCR shall be issued which shall be subjected to approval of I-I prior to implementation.

Prior to welding, WEP surface shall be clean and free from paint, oil, rust, scale, slag, grease, marking materials, or other foreign materials that are detrimental during welding cycle.

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3.4. Welding qualifications:

- 3.4.1. All welding procedure specification (WPS), procedure qualification records (PQR) and Welder performance qualification (WPQ) shall be in accordance with requirements of ASME Sec-IX. For some specific welds (closed adjacent welds or restricted space), I-I may ask for special qualification and testing.
- 3.4.2. All Welder performance qualification (WPQ) shall be in accordance with requirements of ASME Sec-IX. The qualification and technical skill of welder is the responsibility of Bidder and shall be reviewed by independent inspection authority. Inspection and tests for new qualifications shall be witnessed by independent inspection authority; existing qualification shall be submitted to I-I and I-O for approval at least four weeks before start of production weld to verify original qualification.
- 3.4.3. Temporary Attachment welds including tack welding shall be welded using qualified welding procedures and welders. Welded attachments of jigs shall not cross or cover pressure retaining welds and shall be such that required NDEs of such pressure retaining welds are not compromised by any means.

3.5. Filler materials:

3.5.1. Filler Material Procurement

Filler material for welding shall be procured as per requirements provided in ASME Section II Part-C. Certification shall be as per EN 10204:2004 type 3.1. Each batch of filler material shall be tested for its chemical and mechanical properties.

3.5.2. Filler Material Compatibility

Filler material shall be chemically and mechanically compatible with base material and shall be listed in ASME Section-II C. In addition to the requirement of ASME Section-II C, following alloying elements shall also be measured and reported.


- Co (0.05% Max)
- Nb (0.1% Max)
- Ta (0.01% Max)

3.5.3. Ferrite Content

Ferrite content in Austenitic stainless steel welding materials shall be 3-10% FN.

3.5.4. Filler material Storage and Traceability

A process of electrode/wire issued to use or returned to stores shall be set up to ensure full traceability of material. For example, a welding material issue card may be used for traceability. The procedure shall be prepared and demonstrated to I-I and I-O during manufacturing

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Storage conditions and use of the welding materials shall be in accordance with manufacturer's recommendation or the recommendation of ASME BPVC Section II, Part C. The Bidder shall demonstrate the adequacy of material reception, storage, stock control, drying, and conservation.

3.6. Repair of welds:

ASME BPVC Section VIII, Division 2, Part 6, Par. 6.2.7 shall apply. Weld repair procedure shall be submitted to I-I for such repairs.

4. DOCUMENTS AND RESPONSIBILITY

- 4.1. The Bidder shall submit filler material technical specification for approval.
- 4.2. The Bidder shall submit CMTR (Certified material test reports) of each selected filler material batch to I-I for approval before start of production welds.
- 4.3. The Bidder shall submit filler material storage, handling and traceability procedure for I-I and IO approval.
- 4.4. Bidder shall submit WPS, PQR, and WPQ to I-I for approval before start of associated production weld activity.
- 4.5. Bidder shall submit weld map specifying planning of each weld seam (with sketch) along with applicable WPS, PQR and applicable NDEs to I-I for approval.
- 4.6. Bidder shall provide complete documents related to welding qualification, weld data sheet of production welds and details of mock-up welds if any.
- 4.7. Weld Repair Procedure shall be submitted to I-I for approval. In addition, Bidder shall notify I-I for each weld repair.