



Contract for the Centralized Procurement and Preassembly of Piping Systems for ITER

ADDENDUM 3

Summary for the Vacuum System

Purpose

The purpose of this Contract is the Centralized Procurement and Preassembly of Piping Systems for ITER. Addendum 3 gives details on the Vacuum System pipework preassembly fabrication which will be included in the contract.

Background

ITER will have one of the world largest and most complex vacuum systems composed of the following subsystems:-

- The Torus Vacuum System
- The Neutral Beam Vacuum System
- The Cryostat Vacuum System
- The Warm Regeneration System
- The Service Vacuum System (SVS), also including
 - The Type 1 Diagnostics pumping
 - The ICH&CD pumping
 - The LH H&CD pumping
 - The ECH&CD pumping
- The Type 2 Diagnostic Vacuum Pumping System (T2DVPS)
- The Cryogenic Guard Vacuum System (CGVS)
- The Leak Detection and Localization System

A network of vacuum pipework of approximately 6Km length is designed to interconnect between vessels, vacuum pumps and vacuum services. The pipework is all stainless steel (304L) schedule 10 or 20 and of size DN25 to DN300. Due to the pipework servicing ultra high vacuum systems, confining radioactivity, transporting hydrogen isotopes, and being critical for the ITER machine operability high quality, cleanliness and integrity requirements are required in all stages of production.

Scope of work

The contractor shall execute the following activities, in compliance with the technical specification for Vacuum System Pipe work to be supplied with the tender documentation. Some of the pipe runs are classed as protection important equipment under the French Quality Order of 7 February 2012, the details of the requirements required to meet this order will be included in the specification.

1. Procure all materials required to manufacture pipe run sub-assemblies ensuring certification to specification of all materials.
2. Manufacture all pipe runs sub-assemblies to the detailed design provided by the IO.
3. Perform all welding in accordance with the ITER Vacuum Handbook ([ITER_D_2EZ9UM v2.3](#)) and in particular its Attachment 1 – Welding ([ITER_D_2FMM4B v1.2](#)) and cover all cost associated with 3rd party inspection to meet these requirements.
4. Supply two off 6 metre lengths of each diameter and schedule of pipe to be used for installation spare.
5. Ensure vacuum cleanliness requirements are maintained throughout the manufacturing process in compliance with those described in the ITER Vacuum Handbook (([ITER_D_2EZ9UM v2.3](#)) and its Appendix 13 *Cleaning and Cleanliness* of the ITER Vacuum Handbook ([ITER_D_2ELUQH v1.2](#)).
6. Procure all standard pipe hangers and fittings.
7. Label all pipe run sub-assemblies as specified in the technical specification.
8. Vacuum leak tested to procedures consistent with those described in Appendix 12 *Guide to Leak Testing of Components for the ITER Project* ([ITER_D_2EYZ5F v1.4](#)) of the ITER Vacuum Handbook ([ITER_D_2EZ9UM v2.3](#)) all pipe run subassemblies.
9. Perform any addition actions required to ensure final compliance of the installation with ASME B31.3-2010 Cat M.
10. Provide a manufacturing dossier contain all documentation generated.
11. Provide packaging, temporary storage and shipping of piping materials and preassembled spools from workshops to ITER site at Cadarache;
12. Provide the necessary certification of conformity.

Excluded from the scope are all specialist supports, all vacuum bellows, all demountable vacuum flanges.

Experience

The Supplier and its personnel shall have experience in manufacturing and testing similar components. This includes, but is not limited to:

- Fabrication and assembly in high technology fields such as for chemical, vacuum, semiconductor or process plant involving control of tolerances and accurate metrology.
- Manufacture of items for use in High Vacuum
- Extensive experience in the qualification and performance of coded welds.
- Welder qualification in accordance with the ITER Vacuum Handbook([ITER_D_2EZ9UM v2.3](#)).
- TIG or MIG welding for vacuum and/or to ASME coded applications.
- Examination of weld integrity (ultrasonic and radiography).

- Vacuum leak testing

Facilities

The Supplier shall have or have access to suitable facilities for carrying out stainless steel TIG and MIG welding.

The Supplier shall have or have access to the necessary facilities for cleaning and vacuum processing to the necessary standards.

The Supplier shall have or have access to facilities for carrying out sensitive helium leak testing and residual gas analysis. .

The Supplier shall have or have access to suitable facilities for NDT (e.g. ultrasonic and radiographic inspection).

Particular interest shall be paid to the Tenderers that have or plan to have workshop nearby or in close proximity (< 50 km) to IO site at Cadarache.

Candidature

Participation is open to all legal persons participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender. A consortium may be a permanent, legally-established grouping or a grouping, which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

The consortium groupings shall be presented at the pre-qualification stage. The tenderer's composition cannot be modified without the approval of the ITER Organization after the pre-qualification.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Candidates (individual or consortium) must comply with the selection criteria. The IO reserves the right to disregard duplicated reference projects and may exclude such legal entities from the pre-qualification procedure.

Annex -1

The vacuum pipework will be broken down into sub-assemblies designed to minimise the onsite welding whilst being of dimensions suitable for normal transportation and respecting the access available for installation. Details are given of the complete lengths below:-

System	Material	Pipe Schedule	OD	~length	~Installations wall penetrations
Torus cryo-pump regeneration fore-line	304L	20	DN300	200m	11
NB cryo-pump roughing and regeneration fore-line.	304L	20	DN250	200m	7
Torus roughing line.	304L	20	DN250	120m	4
Cryostat cryo-pump roughing and regeneration fore-line	304L	20	DN250	120m	4
NB ABS Valves roughing lines.	304L	10	DN100	190m	12
NB venting and purge lines	304L	10	DN65	190m	8
SVS (Service Vacuum System)	304L	10	3 X DN150 lines 4 X DN 25 lines	4.7Km Total	~70
Type 2 diagnostics roughing.	304L	10	DN100	190m	21
Cryostat vent/purge Line.	304L	10	DN250	40m	4

Table 1 - Estimated length and details of installed vacuum pipework

The approximate geometry of the different installed pipe runs are given below:-

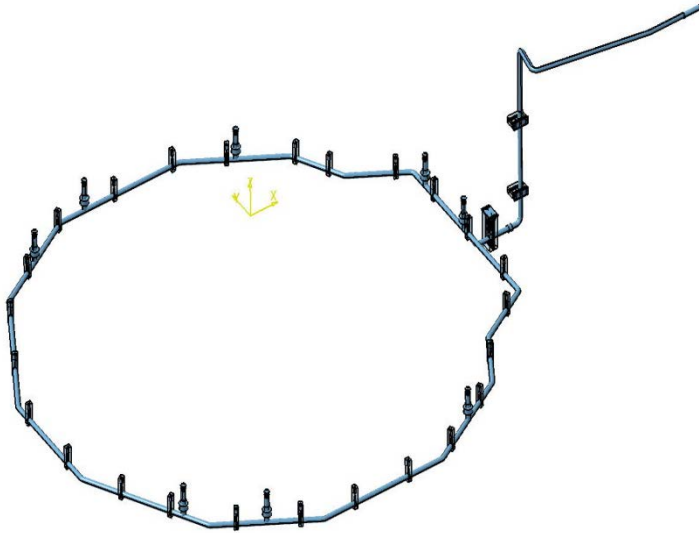


Fig: 1 Torus cryo-pump roughing and regeneration fore-line configuration model also showing conceptual pipe supports and hangers.



Fig: 2 NB Cryo-pump roughing and regeneration fore-lines configuration model showing conceptual hangers and supports.

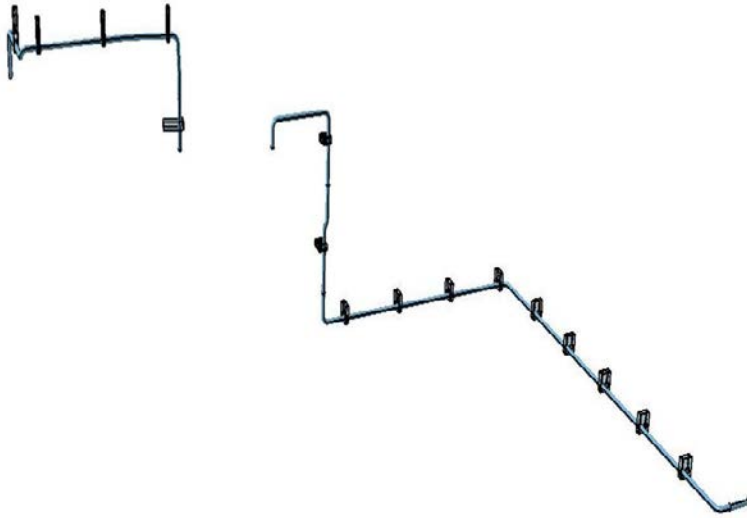


Fig: 3 Torus roughing fore-line configuration model showing conceptual hangers and supports.

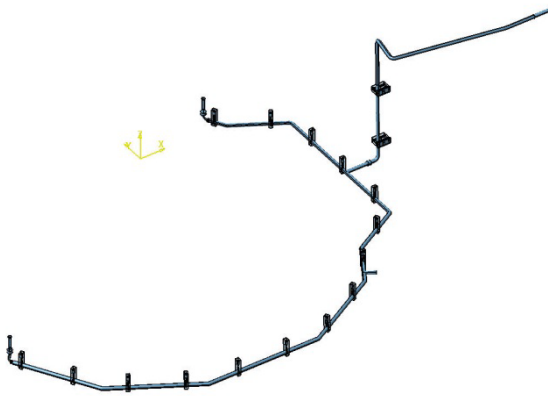


Fig: 4 Cryo-stat Cryo-pump roughing and regeneration fore-lines configuration model showing hangers and supports.

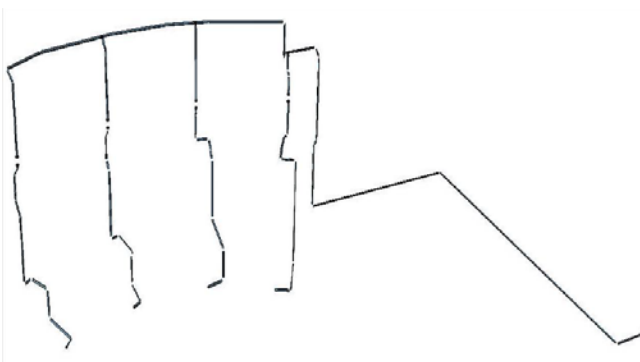


Fig: 5 NB ABS valve roughing lines configuration model

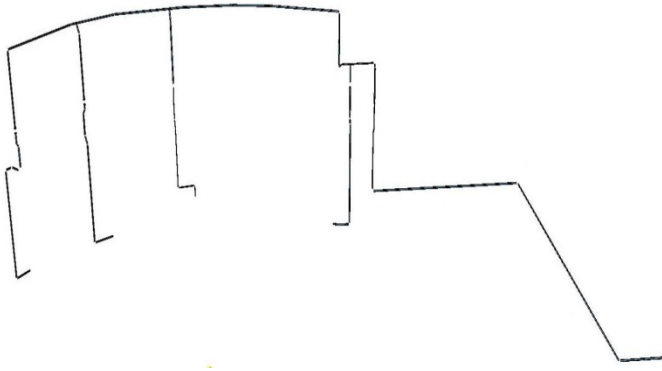


Fig: 6 NB Venting and purge line configuration model

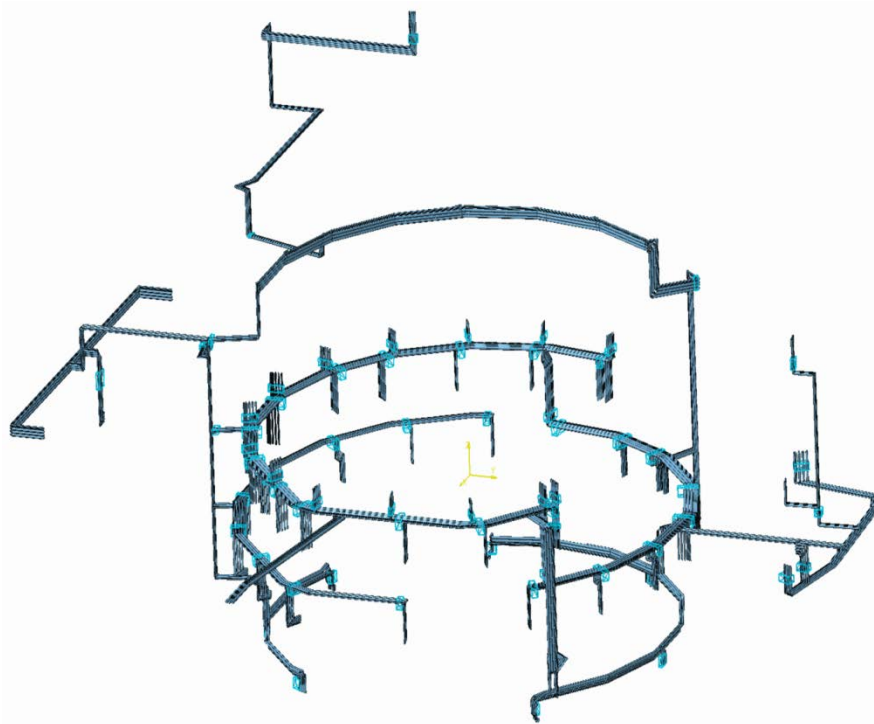


Fig: 7 SVS (service vacuum system) configuration model

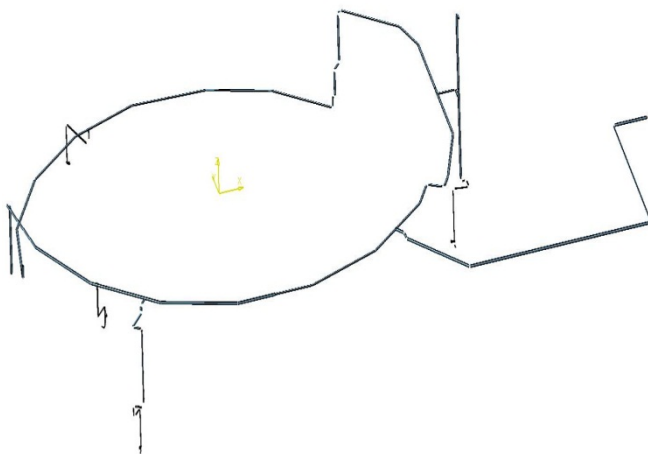


Fig: 8 Type 2 Diagnostic roughing lines configuration model

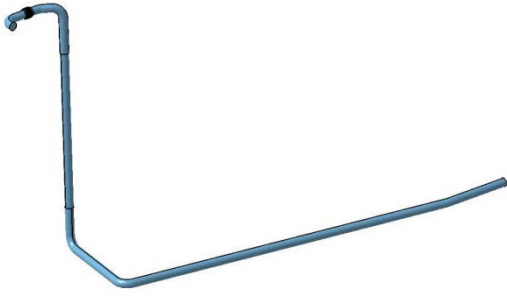


Fig 9 Cryostat vent / purge line configuration model