外部委託業者の募集

References: IO/26/OT/10034832/ENA

“Design and Manufacturing of the ICRH Antenna PHTS (Primary Heat Transfer System) Distribution Piping, 51ANW3"

（ICRH アンテナの主要熱伝達システムの配管、51ANW3 の設計と製造)）

IO 締め切り 2026 年 8 月 5 日(水)

〇はじめに

本事前情報通知（PIN）は、作業契約の入札授与および実行につながる公開入札調達プロセスの最初のステップです。

〇背景

ITER は平和利用の核融合発電の科学的および技術的な実現可能性の実証を目的とした、国際共同研究開発プロジェクトです。ITER 機構の 7 つのメンバーは、;欧州連合（EURATOM が代表）、日本、中華人民共和国、インド、大韓民国、ロシア連邦、および米国です。

ITER の敷地はフランス南東部のブーシュデュローヌ地区にあり、ITER 本社（HQ）もあるフランス CEA サン・ポール・レ・デュランス に近いところに位置しています。詳細については、ITER のウェブサイト http://www.iter.org を参照して下さい。

〇作業範囲

本業務の範囲は、詳細設計の実施、最終設計審査（Final Design Review）に必要な入力文書の作成、製造設計の開発、製造準備審査の準備および資材調達、ならびに製作および納入を含みます。

ITER機構内では、加熱・電流駆動プログラムにおける配管担当部門が本契約の実施責任を負います。

本契約の受注者は、設計および製造活動を遂行するための技術要件を満たし、これらの活動を所定の期限内に、高い品質水準で完了することを確実にしなければなりません。

〇調達プロセスと目的

目的は、競争入札プロセスを通じて供給契約を落札することです。

この入札のために選択された調達手続きは公開入札手続きと呼ばれます。

オープン入札手順は、次の 4 つの主要なステップで構成されています。

- ステップ1-事前情報通知（PIN）
  事前情報通知は公開入札プロセスの第一段階です。IO は、企業、研究機関その他の主体に対して当該入札機会を事前に周知するため、今後予定されている入札に関する情報を公表するよう、各 DA に正式に要請します。

関心を有する入札参加者は、以下の調達スケジュールに示された期限までに、関心表明書（附属書Ⅰ）を電子メールにて提出するようお願いいたします。

- ステップ2-入札への招待
  PINの発行から14作業日以内に、関心を示した入札者に対して入札への招待（IIT）が送付されます。この段階では、PINを確認した関心のある入札者が入札書類を入手し、入札指示に従って提案書を準備・提出することができます。

- ステップ3-入札評価プロセス
  入札者の提案は、ITER機構の公正で専門的な技術評価委員会によって評価されます。入札者は、技術範囲に従い、入札への招待（IIT）に記載された特定の評価基準に基づいて作業を実施できることを示す技術的な適合性の詳細を提供する必要があります。

- ステップ4–落札
  認定は、入札への招待（IIT）に記載されている、コストに見合った最適な価格または技術的に準拠した最低価格に基づいて行われます。

〇概略日程

概略日程は以下の通りです：

マイルストーン	暫定日程
事前指示書（PIN）の発行	2026 年 7 月 21 日
関心表明フォームの提出	2026 年 8 月 5 日
入札への招待（IIT）の発行	2026 年 8 月 10 日
iProc で入札提出	2026 年 9 月 15 日
入札評価及び契約授与	2026 年 9 月 30 日
契約調印	2026 年 10 月 14 日

〇契約期間と実行

予想される契約期間は、26か月の見込みです。契約の最終調印日の前にはいかなる作業も実施されません。

〇経験・専門性・知識

望ましくは、契約者は以下の経験、専門知識および知見を有していることが期待されます。

- 圧力機器（NPE）の設計・製作実績を有し、ホスト国の規制における法的な「製造者」としての責任を担った経験を有すること。
- EN 13480（または同等規格）に準拠した加圧水配管の設計および製作（溶接を含む）の実績を有すること。
- ステンレス鋼製機器・部品に対する溶接部非破壊検査（VT、PT、UT、RT）、漏えい試験お

よび耐圧試験（水圧試験）の実績を有すること。

- 原子力用途の機器・部品の設計、調達および製作に関する品質保証（QA）および品質管理（QC）の実績を有すること。
- 原子力安全用途向け機器・部品の認定に関する実績を有すること。

〇候補

参加は、個人またはグループ/コンソーシアムに参加するすべての法人に開放されます。法人とは、法的権利及び義務を有し、ITER 加盟国内に設立された個人、企業又は機構をいいます。

法人は、単独で、またはコンソーシアムパートナーとして、同じ契約の複数の申請または入札に参加することはできません。共同事業体は、恒久的な、法的に確立されたグループ又は特定の入札手続のために非公式に構成されたグループとすることができます。コンソーシアムのすべての構成員(すなわち、リーダーと他のすべてのメンバー)は、ITER 機構に対して連帯して責任を負います。

コンソーシアムとして許可されるために、その点で含まれる法人はコンソーシアムの各メンバーをまとめる権限をもつリーダーをもたなければなりません。このリーダーはコンソーシアムの各目メンバーのために責任を負わなければなりません。

指名されたコンソーシアムのリーダーは、入札段階で、コンソーシアムのメンバーの構成を説明する予定です。その後、候補者の構成は、いかなる変更も ITER 機構に通知することなく変更してはなりません。かかる認可の証拠は、すべてのコンソーシアムメンバーの法的に授権された署名者が署名した委任状の形式で、しかるべき時期に IO に提出しなければなりません。

【※　詳しくは添付の英語版技術仕様書「**Design and Manufacturing of the ICRH Antenna PHTS (Primary Heat Transfer System) Distribution Piping, 51ANW3**」をご参照ください。】

ITER 公式ウェブ　http://www.iter.org/org/team/adm/proc/overview からもアクセスが可能です。

「核融合エネルギー研究開発部門」の HP：　http://www.fusion.qst.go.jp/ITER/index.html
では ITER 機構からの各募集（IO 職員募集、IO 外部委託、IO エキスパート募集）を逐次更新しています。ぜひご確認ください。

イーター国際核融合エネルギー機構からの外部委託
に関心ある企業及び研究機関の募集について

＜ITER 機構から参加極へのレター＞

以下に、外部委託の概要と要求事項が示されています。参加極には、提案された業務に要求される能力を有し、入札すべきと考える企業及び研究機関の連絡先の情報を ITER 機構へ伝えることが求められています。このため、本研究・業務に関心を持たれる企業及び研究機関におかれましては、応募書類の提出要領にしたがって連絡先情報をご提出下さい。

china eu india japan korea russia usa
Route de Vinon-sur-Verdon - CS 90 046 - 13067 St Paul Lez Durance Cedex - France

PRIOR INDICATIVE NOTICE (PIN)

OPEN TENDER SUMMARY

IO/26/OT/10034832/ENA

For

Design and Manufacturing of the ICRH Antenna PHTS (Primary Heat Transfer System) Distribution Piping, 51ANW3

Abstract

The purpose of this summary is to provide prior notification of the IO intention to launch a competitive Open Tender process in the coming weeks. This summary provides some basic information about the ITER Organisation, the technical scope for this tender, and details of the tender process for the award of a Contract to perform Design and Manufacturing of the 51ANW3 PHTS (Primary Heat Transfer System) Distribution Piping for Heating & Current Drive Program.

Reference documents

- Annex 1 – Technical Specifications ref FDQQXH, v 1.3 dated 02 July 2026.

1 Introduction

This Prior Indicative Notice (PIN) is the first step of an Open Tender Procurement Process leading to the award and execution of a Service and Supply Contract.
The purpose of this document is to provide a basic summary of the technical content in terms of the scope of work, and the tendering process.

The Domestic Agencies are invited to publish this information in advance of the forthcoming tender giving companies, institutions or other entities that are capable of providing these supplies prior notice of the tender details.

Your contact persons for this PIN are: nadezda.eremina@iter.org and andrew.brown@iter.org

2 Background

The ITER project is an international research and development project jointly funded by its seven Members being, the European Union (represented by EURATOM), Japan, the People's Republic of China, India, the Republic of Korea, the Russian Federation and the USA. ITER is being constructed in Europe at Saint-Paul-lez-Durance in southern France, which is also the location of the headquarters (HQ) of the ITER Organization (IO).

For a complete description of the ITER Project, covering both organizational and technical aspects of the Project, visit www.iter.org.

3 Scope of Work

The scope of work covers the detailed design development, preparation of input documentation for final design review, manufacturing design development, manufacturing readiness review preparation and material procurement, fabrication and delivery.Within the ITER Organization, Distribution Piping for Heating & Current Drive Program will be in charge of implementing this Contract.

The Contractor, who will be selected for this Contract, shall meet the technical requirements for the execution of design and manufacturing activities and ensure the activities are completed on time and to high levels of quality.

4 Procurement Process & Objective

The objective is to award a Service and Supply Contract through a competitive bidding process.

The Procurement Procedure selected for this tender is called the Open Tender procedure.

The Open Tender procedure is comprised of the following four main steps:

- Step 1- Prior Indicative Notice (PIN) :
  The Prior Indicative Notice is the first stage of the Open Tender process. The IO formally invites the Domestic Agencies to publish information about the forthcoming tender in order to alert companies, institutions or other entities about the tender opportunity in advance. **Interested tenderers are kindly requested to return the expression of interest form (Annex I) by e-mail by the date indicated in the procurement timetable below.**

- Step 2 - Invitation to Tender (ITT) :
  Within 14 days of publishing the Prior Indicative Notice (PIN), the Invitation to Tender (ITT) will be advertised. This stage allows interested bidders who have seen the PIN to obtain the tender documents and prepare and submit their proposals per the tender instructions.

- Step 3 – Tender Evaluation Process :
  Tenderers' proposals will be evaluated by an impartial, professionally competent technical evaluation committee of the ITER Organization. Tenderers must provide details demonstrating their technical compliance to perform the work in line with the technical scope and per the criteria listed in the invitation to tender (ITT).

- Step 4 – Contract award :
  A Service and Supply Contract will be awarded based on best value for money according to the evaluation criteria and methodology described in the Invitation to Tender (ITT).

5 Procurement Timetable

The tentative timetable is as follows:

Milestone	Expected Date
Publication of the Prior Indicative Notice (PIN)	21 July 2026
Deadline for Submission of Expression of Interest Form	5 August 2026
Invitation to Tender (ITT) Launch	10 August 2026
Tender Submission in IPROC	15 September 2026
Tender Evaluation Completion & Contract Award	30 September 2026
Contract Signature	14 October 2026

6 Quality Assurance Requirements

Prior to the commencement of any work under this Contract, the selected Contractor shall produce a “Quality Plan” and submit it to the IO for approval, describing how they will implement the ITER Procurement Quality Requirements.

7 Contract Duration and Execution

The duration shall be for 26 months. No work shall commence before the date of final signature of the Contract.

8 Experience/Expertise/Knowledge

Preferably, the Contractor is expected to own the following experience/expertise/knowledge:

- Design and manufacturing NPE(s) and acting as legal “Manufacturer” in the meaning of the host state regulations
- Design and manufacturing, including welding, of pressurized water piping according to EN 13480 or equlivent.
- Performing welds NDT (VT, PT, UT, RT), leak tests and hydrostatics tests of stainless steel components
- Quality assurance and quality control for design, procurement and fabrication of equipment and components for nuclear applications
- Qualification of equipment and components for nuclear safety applications

9 Candidature

Participation is open to all legal entities participating either individually or in a grouping/consortium. A legal entity is an individual, company, or organization with legal rights and obligations established within an ITER Member State.

Legal entities cannot participate individually or as a consortium partner in more than one application or tender of the same contract. A consortium may be a permanent, legally-established grouping, or a grouping constituted informally for a specific tender procedure. All consortium members (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

In order for a consortium to be acceptable, the individual legal entities included therein shall have nominated a leader with authority to bind each member of the consortium, and this leader shall be authorised to incur liabilities and receive instructions for and on behalf of each member of the consortium.

It is expected that the designated consortium lead will explain the composition of the consortium members in a covering letter at the tendering stage. Following this, the Candidate's composition must not be modified without notifying the ITER Organization of any changes. Evidence of any such authorisation shall be submitted to the IO in due course in the form of a power of attorney signed by legally authorised signatories of all the consortium members.

10 Sub-contracting Rules

All sub-contractors who will be taken on by the Contractor shall be declared with the tender submission in IPROC. Each sub-contractor will be required to complete and sign forms including technical and administrative information, which shall be submitted to the IO by the tenderer as part of its tender.
The IO reserves the right to approve (or disapprove) any sub-contractor which was not notified in the tender and request a copy of the sub-contracting agreement between the tenderer and its subcontractor(s). Rules on sub-contracting are indicated in the RFP itself.

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02 Jul 2026 / 1.3 / Approved
EXTERNAL REFERENCE / VERSION

Technical Specifications (In-Cash Procurement)

PBS-51 - Technical Specification for Design and Manufacturing of the 51ANW3 PHTS Distribution Piping

Document concerns 51ANW3 PHTS ex-vessel distribution piping classified as nuclear pressure equipment, associated supports and thermal insulation.
It covers the following steps:
- Detailed design development, preparation of input documentation for Final Design Review
- Manufacturing Design development, Manufacturing Readiness Review preparation
- Material procurement, fabrication and delivery

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1 Preamble

This Technical Specification is to be read in combination with the General Management Specification for Service and Supply (GM3S) Ref.[1] that constitutes a full part of the technical requirements.

In case of conflict, the content of the Technical Specification supersedes the content of GM3S Ref.[1].

2 Purpose

The present Technical Specification is issued for the needs of ITER Ion Cyclotron Resonance Heating (ICRH) System (PBS-51) and gathers the requirements for:

- Detailed design of the ICRH Port Plug primary cooling pipes, supports and thermal insulation (PBS-51 sub-system 51ANW3):
  - Current design optimization, starting from the preliminary design of the system
  - Detailed design documentation preparation, as part of ICRH Antenna Final Design Review package
  - 51ANW3 Manufacturing Readiness Review (MRR) preparation
  - Nuclear Pressure Equipment (NPE) full aspect management
- Fabrication of the piping
- Manufacturing of the related supporting structures and of the thermal insulation
- Delivery of the piping, the related supporting structures and thermal insulation to the IO site

The piping is classified Nuclear Pressure Equipment (NPE) of level N2, pressure Category II. In all above listed steps, Contractor acts as “Manufacturer” in the meaning of the French host state regulations for the NPE.

3 Acronyms & Definitions

3.1 Acronyms

The following acronyms are the main one relevant to this document.

Abbreviation	Description
ANB	Authorized Notified Body
CRO	Contract Responsible Officer
DRR	Delivery Readiness Review
FDR	Final Design Review
FVE	Final Visual Examination (as part of the Final Assessment of (nuclear) pressure equipment)
GM3S	General Management Specification for Service and Supply
ICRH	Ion Cyclotron Resonance Heating
IO	ITER Organization

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Abbreviation	Description
KOM	Kick-Off-Meeting
MRR	Manufacturing Readiness Review
NPE	Nuclear Pressure Equipment
NPMA	Nuclear Particular Material Appraisal
PED	Pressure Equipment Directive (DIRECTIVE 2014/68/EU of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment")
PIC	Protection Important Component
PHTS	Primary Heat Transfer System (PBS-26 sub-system)
RF	Radio Frequency
SRD	System Requirement Document

3.2 Definitions

Terminology	Definition in this document
Contractor	Shall mean an economic operator who have signed the Contract in which this document is referenced.
Manufacturer	General definition: Any natural or legal person who manufactures a pressure equipment or assembly or has such equipment or assembly designed or manufactured, and markets that equipment or assembly under his name or trademark or uses it for his own purposes …
Operator	Is the person holding the permission of creation of the nuclear basic installation in which the nuclear pressure equipment is installed or intended to be installed.

4 Applicable Documents, Regulations, Codes and Standards

4.1 Applicable Documents

This is the responsibility of the Contractor to identify and request for any documents that would not have been transmitted by IO, including the below list of reference documents.

This Technical Specification takes precedence over the referenced documents. In case of conflicting information, this is the responsibility of the Contractor to seek for clarification from IO.

At the contract Kick Off Meeting (KOM), IO will provide latest approved version of reference documents are given to the Contractor.

Upon notification of any revision of the applicable document transmitted officially to the Contractor, the Contractor shall advise within 4 weeks of any impact on the execution of the contract. Without any response after this period, no impact will be considered.

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4.1.1 General IO Documents

[1] General Management Specification for Service and Supply (ITER_D_82MXQK v1.4)
[2] Protection Important Functions and Components Classification Criteria and Methodology (ITER_D_347SF3 v1.8)
[3] Tritium Handbook (ITER_D_2LAJTW v1.4)
[4] ITER Vacuum Handbook (ITER_D_2EZ9UM v2.5)
[5] ITER Seismic Nuclear Safety Approach (ITER_D_2DRVPE v1.6)
[6] Propagation of the Defined Requirements for Protection Important Components Through the Chain of External Interveners (ITER_D_BG2GYB v3.3)
[7] Quality Requirements for IO Performers (ITER_D_22MFG4 v6.4)
[8] Quality Classification Determination (ITER_D_24VQES v6.0)
[9] Procedure for the management of Deviation Request (ITER_D_2LZJHB v9.1)
[10] Procedure for Management of Nonconformities (ITER_D_22F53X v10.3)
[11] Procedure for Inspection and Testing (ITER_D_TVL3Y5 v2.0)
[12] Quality Management System Audits (ITER_D_2DQTA8 v6.0)
[13] Specification for CAD data Production in ITER direct contracts (ITER_D_P7Q3J7 v2.0)
[14] ITER Coordinate Systems (ITER_D_2A9PXZ v3.7)
[15] ITER Materials Properties Handbook, Introduction, baseline 2009 (ITER_D_2NRCSB v1.3)
[16] Static and Transient Magnetic Field Maps in Tokamak Building (ITER_D_3BQBVY v3.1)
[17] MQP L3 Working Instruction for Manufacturing Readiness Review (ITER_D_44SZYP v5.1)
[18] Working Instruction for the Delivery Readiness Review (DRR) (ITER_D_X3NEGB v3.0)
[19] Chemical composition and impurity requirements for materials (ITER_D_REYV5V v3.1)
[20] Safety requirement Roombook (ITER_D_KF63PB v2.17)
[21] Radiation environment for equipment during operations (ITER_D_3FM52L v1.1)
[22] Radioprotection guide for ESPN application (ITER_D_2LTQ96 v2.5)
[23] Radiation Protection Requirements for the ITER Vacuum Vessel and Ports Components (ITER_D_2M2F8H v2.2)
[24] List of manufacturing documents to be prepared and stored for PE and NPE (ITER_D_WDBC7H v2.7)
[25] Design Review Procedure (ITER_D_2832CF v7.0)
[26] ITER System Design Process (SDP) Working Instruction (ITER_D_4CK4MT v4.1)
[27] Template for SDR Input Data Package (ITER_D_TWW7AY v4.2)
[28] Procedure for Analyses and Calculations (ITER_D_22MAL7 v6.8)
[29] Codes and Standards for ITER Mechanical Components (ITER_D_25EW4K v5.0)
[30] Procedure for Identification and Controls of Items (ITER_D_U344WG v2.2)
[31] ITER Numbering System for Components and Parts (ITER_D_28QDBS v5.1)
[32] System Component labelling procedure ITER Project (ITER_D_TL25DK v3.3)
[33] ITER Site Signage & Graphics Standards (ITER_D_4ALJEU v2.5)
[34] Tokamak Seismic Analysis - PIM 432 - Design FRS Input (ITER_D_8FZSG9 v2.0)

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[35] Provisions for Implementation of the Generic Safety Requirements by the External Actors/Interveners (ITER_D_SBSTBM v2.3)
[36] ITER Policy on Safety Security and Environment Protection Management (ITER_D_43UJN7 v4.0)
[37] Reviewer Checklist for Structural and Seismic Analyses (ITER_D_7XDM2N v2.0)
[38] Technical Checker Checklist for Structural and Seismic Analyses (ITER_D_7XDDMP v2.0)
[39] Independent Peer Reviewer Checklist for Structural and Seismic Analyses (ITER_D_7XDHTT v2.0)
[40] Instructions for Structural analyses (ITER_D_35BVV3_v4.1)
[41] Instructions for Seismic Analyses (ITER_D_VT29D6 v2.1)
[42] IEA reviewer checklist for Structural Integrity Reports (ITER_D_7TZ3NJ v1.0)
[43] Software Qualification Policy (ITER_D_KTU8HH v2.0)
[44] Instructions for the Storage of Analysis Models (ITER_D_U34WF3 v2.0)
[45] Guidelines for Qualification by Analysis (ITER_D_AKFUMQ v1.2)
[46] MQP L3 Procedure for Qualification of Protection Important Components (PIC) (ITER_D_XB5ABP v2.1)
[47] Diagrams and Drawings Management System Working Instruction (ITER_D_KFMK2B v2.2)
[48] Guidelines for ALARA Implementation (ITER_D_W6655F v2.3)

4.1.2 PBS-51 Specific Documents

[49] SRD-51 (ICH&CD) from DOORS (ITER_D_28B33K v7.2)
[50] Load Specification for the IC H&CD Antenna (ITER_D_33CETP v6.1)
[51] ICRH Antenna components classification (ITER_D_Q4MQRL v2.5)
[52] IC H&CD Antenna Functional Analysis (ITER_D_XQ5SZ7 v1.4)
[53] Surveillance Plan for PBS 51 – Ion Cyclotron H&CD System (ITER_D_U44GYC v1.1)
[54] Surveillance Plan for PBS 51 – Annex 2 – Detailed List of PIAs (ITER_D_TXAC52 v1.2)

4.1.3 PBS-51 Diagrams, Drawings, BoMs

[55] ITER_51ANW3_PID_002 (ITER_D_CE4YMT v1.0) *(not approved but can be used as starting point)*
[56] 51.AN.W3/W5 – 51.AN.13/15 PFD – PHTS & Antenna Cooling water (ITER_D_X7RVF3 v1.5)

4.1.4 Configuration Management Models (CMM)

The most up to date 3D model of the piping and environment will be shared officially by IO to the contractor through Data Exchange Task (DET) at the Kick off Meeting (KOM).

4.1.5 Interface Documentation

[57] IS-15-51-001 Interface between Vacuum Vessel and IC H&CD (ITER_D_2EAQDT v3.2)
[58] 15.VV.00-PID Diagram (ITER_D_QEZQDK v2.1)
[59] Structural Analysis of the ITER Vacuum Vessel Regular Equatorial Port (ITER_D_YWMHRB v1.0)
[60] IS-23-51-001 Cask and Plug Remote Handling System and IC Antenna Plug (ITER_D_46EE6U v4.4)
[61] Interface sheet Tokamak Cooling Water System (PBS26-PH, -CV, -DR, -DY) – IC H&CD system (PBS 51) (ITER_D_4C3AZH v3.5)
[62] TCWS IBED PHTS System Process Loading Conditions (ITER_D_YQCUY5 v3.0)
[63] WP4.16&4.18.Update of IBED PHTS & DYS water hammer analyses (ITER_D_3S3YGB v7.0)
[64] Piping and Instrumentation Diagram (P&ID) IBED Primary Heat Transfer System (PHTS) - EXPORT CONTROL (ITER_D_SNJ3LL v5.0)

4.2 Applicable Regulations, Codes and Standards

4.2.1 Host State Regulations

The applicable Host State regulation is wide-public available. It is the responsibility of the Contractor to apply the relevant regulation applicable to its scope of work. English translations are given only for guidance, French version prevails in any case of conflict.

[65] “Arrêté du 7 février 2012 fixant les règles générales relatives aux installations nucléaires de base” (ITER_D_7GJHSE v1.2 in French and its English translation for guidance ITER_D_7M2YKF v1.7)
[66] "Code de L’environnement, Articles L557 & R557 » https://www.legifrance.gouv.fr
[67] “DIRECTIVE 2014/68/EU of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment” (English version for guidance ITER_D_RZ6PAK_v1.0)
[68] Arrêté du 30 décembre 2015 relatif aux équipements sous pression nucléaires (ITER_D_SFMMMB v1.4 in French and its English translation for guidance ITER_D_SMP384 v2.3)

4.2.2 Codes and Standards

[69] EN 13480 Metallic Industrial Piping
- EN 13480-1: Metallic industrial piping - Part 1: General
- EN 13480-2: Metallic industrial piping - Part 2: Materials
- EN 13480-3: Metallic industrial piping - Part 3: Design and calculation
- EN 13480-4: Metallic industrial piping - Part 4: Fabrication and installation
- EN 13480-5: Metallic industrial piping - Part 5: Inspection and testing

It is recommended to select relevant edition and addenda identical to the ones having currently the PED presumption of conformity.

[70] EN 1993-1: Eurocode 3 - Design of Steel Structures
- EN 1993-1-1 (2005): Part 1-1: General Rules and General Rules for Buildings
- EN 1993-1-4 (2006): Part 1-4: Supplementary rules for stainless steels
- EN 1993-1-8 (2005): Part 1-8 : Design of joints.

[71] ISO 20485 (2017): Non-destructive testing - Leak testing - Tracer gas method

[72] EN 1779 (1999): Non-destructive testing - Leak testing - Criteria for method and technique selection

[73] ISO 9712 (2022): Non-destructive testing — Qualification and certification of NDT personnel

[74] ASTM A380 -25 Standard Practice for Cleaning, Descaling, Pickling, and Passivation of Stainless Steel Parts, Equipment, and Systems

This is the responsibility of the Contractor to procure the relevant Codes and Standards applicable to that scope of work (not limited to the ones listed in this section), with respect to the "Codes and Standards for ITER Mechanical Components" Ref. [29].

5 Scope of Work

This section defines the specific scope of work, in addition to the contract execution requirement as defined in the GM3S Ref. [1].

5.1 Scope Overview

The scope of this technical specification is summarized below and further detailed in the document.

- Detailed design of the ICRH Port Plug primary cooling pipes and supports, part of PBS-51 sub-system 51ANW3 located in the port interspace of the equatorial port cell #13 (11-L1-C13):
  - Final Design Review (FDR) documentation preparation
  - Manufacturing Readiness Review preparation (documentation and meeting)
- Material Procurement
- Fabrication of the piping, fabrication of the related supporting structures and of the thermal insulation
- Delivery Readiness Review
- Packing and delivery to IO site

All activities above to be realized in full compliance with:
- Host state regulations for Nuclear Pressure Equipment (NPE)
- Applicable Codes and Standards
- ITER and PBS-51 system particular requirements

The piping is classified Nuclear Pressure Equipment (NPE) of level N2, Category II.
It is expected to have two NPEs, one for inlet manifold and one for outlet manifold.

In all above listed steps, Contractor acts as legal "Manufacturer" of the NPE(s) in the meaning of the host state regulations.

The 51ANW3 PHTS distribution manifolds main features are as follows:

- Stainless steel pipes ~28 m, (DN65, DN50, DN25) as per current configuration on Figure 1
- Insulation: thickness 30 mm of high-performance insulation material, removable
- Stainless steel supports (primary and secondary)
- Pipe whip restrains

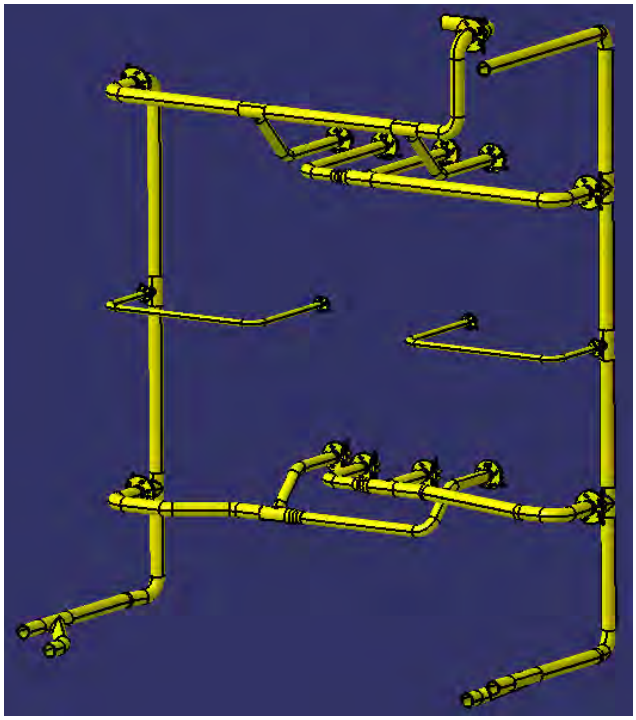

Figure 1: 51ANW3 PHTS distribution manifolds – piping only, without insulation.

5.2 Work Phases Definition

The scope of work is broken down into three (3) phases, which will allow a stepwise progression towards the delivery of the manufacturing design and shipment of certified pressure equipment to ITER.

The phase breakdown is specified hereafter:

- Phase 1: FDR documentation preparation
- Phase 2: [CONDITIONAL]: 51ANW3 PHTS distribution MRR preparation
- Phase 3: [CONDITIONAL]: Material procurement, fabrication, delivery

Phases shall be executed sequentially, which means that Phase 1 shall be completed before starting the Phase 2, and subsequently the Phase 2 shall be completed before starting the Phase 3.

The Phase 2 and 3 are conditional.
Successful completion of the Phase 1 is the condition to start the Phase 2.
Successful completion of the Phase 2 is the condition to start the Phase 3.

The phases general description is given in Table 1.

Table 1: Contractual phases general description	
Phase n°	**Short Description**
Phase 1 **FDR documentation preparation**	**<u>Final Design Review (FDR) documentation preparation</u>** A. Optimization and improvement of the current design, starting from the Preliminary Design configuration of the system: - Propose optimization and improvement of current design and verify the compliance with all requirements applicable to the system (requirements in terms of design, manufacturing, on-site installation, interface, host state regulations, code and standards, operational and maintenance, integration, and others further detailed in the technical specification) - Summarize optimization and improvements proposal(s) to a report to IO for review B. Final Design development (based on above listed): - Update piping and supports layout and related 3D model(s) and 2D diagram(s) - Piping design (sizing, pressure drop, heat release estimation, insulation material selection, structural validation, determination of loads on interfacing piping, isometric drawings preparation, Bills of Material, etc..) - Supports design (structural validation, determination of loads at attachments, pipe whip restrains implementation, detailed primary and secondary support drawings preparation, bills of material, etc..) - System general arrangement drawings and interface drawings preparation - Nuclear Pressure Equipment (NPE) specific documentation, ensuring the compliance with Host State regulations (HRA, NPMAs, etc), considering the contractor acts as “Manufacturer” of the NPE - Structural Integrity Report, Qualification Synthesis Report, Maintenance and Inspection Plan - Demonstration of on-site installation feasibility (preliminary on-site installation plan, definition of temporary supports if needed, realization of mock-ups of the critical areas, such as VV connections) - Endorsement of the design by the ANB selected by the Contractor, acting as NPE Manufacturer C. Participation to the FDR meeting (support in potential needs of clarifications) *Detailed description in Section 5.8 and list of deliverables in the Section 8.*

Table 1: Contractual phases general description	
Phase n°	**Short Description**
Phase 2 **[CONDITIONAL]** **51ANW3 PHTS distribution MRR preparation**	**<u>51ANW3 PHTS distribution Manufacturing Readiness Review (MRR) preparation</u>** A. Manufacturing Design development (based on Phase 1) - Implement the outcomes from the FDR to the Manufacturing Design - Detailed manufacturing drawings for whole system (piping and supports) - Material procurement documentation - Estimation of the spare quantities - Manufacturing documentation (MIP,WPS ,WPQR , etc..) - Nuclear Pressure Equipment (NPE) specific documentation, ensuring the compliance with Host State regulations, considering the contractor acts as "Manufacturer" of the NPE - Involvement of the ANB in all steps required by the NPE regulation, ANB selected and managed by the Contractor (Contractor is acting as NPE Manufacturer) - On-site assembly plan/instruction (for pipes, supports and insulation) - All documents expected to be available prior the 51ANW3 PHTS MRR, following Ref. [17] B. 51ANW3 PHTS distribution Manufacturing Readiness Review (MRR) preparation and active contribution to the 51ANW3 PHTS MRR meeting, following Ref. [17]: - 51ANW3 PHTS MRR agenda preparation - 51ANW3 PHTS MRR presentations preparation - Attendance at 51ANW3 PHTS MRR meeting *Detailed description in Section 5.8 and list of deliverables in the Section 8.*

Table 1: Contractual phases general description	
Phase n°	**Short Description**
Phase 3 **[CONDITIONAL]** **Material Procurement, Fabrication, Delivery**	**<u>Material procurement, fabrication, delivery</u>** Based on the Phase 1 and Phase 2, Contractor acting as NPE Manufacturer: A. Material procurement: - Procure the material (including spare) in line with procurement specifications from Phase 2 B. Fabrication, inspection, testing, certification: - Fabrication of the piping where contractor acts as “Manufacturer” - Fabrication and installation of the regulatory NPE name-plates - Fabrication of the related supporting structures (or pre-fabrication for supports which cannot be fabricated as one piece) - Compilation of the manufacturing dossier and all related documentation - Final assessment including all mandatory steps, such as Final visual Examination (FVE), Pressure test, documentation control - Factory Acceptance Tests (FAT) - NPE Instruction manual delivery - Delivery Readiness Review (DRR), to be organized before the delivery of the equipment to ITER site, following Ref.[18]. C. Preservation, Packing and Delivery to ITER site (DDP as per Incoterms) in line with Ref.[18] - Delivery of the certified NPEs to ITER site - Delivery of the insulation to ITER site (prefabricated) - Delivery of the supports to ITER site (or pre-fabricated supports) - Delivery of the spares to ITER site (quantity in line with the on-site installation plan and maintenance and inspection plan) - Delivery of related documentation package for all items *Detailed description in Section 5.9 and list of deliverables in the Section 8.*

5.3 Background - PBS-51 System overview

In its baseline configuration the ITER Ion Cyclotron Heating and Current Drive (IC H&CD – PBS-51) system has to couple 20MW of radio-frequency (RF) power in quasi-Continuous Wave operation (pulses up to 3600s) for a variety of ITER plasma scenarios, in a frequency range of 40-55MHz. The ICH&CD system includes one ICRH antenna port plug, also called "ICRH Antenna", is an in-vessel component located in the equatorial port nb 13. Figure 2 is showing the IC Antenna overview.

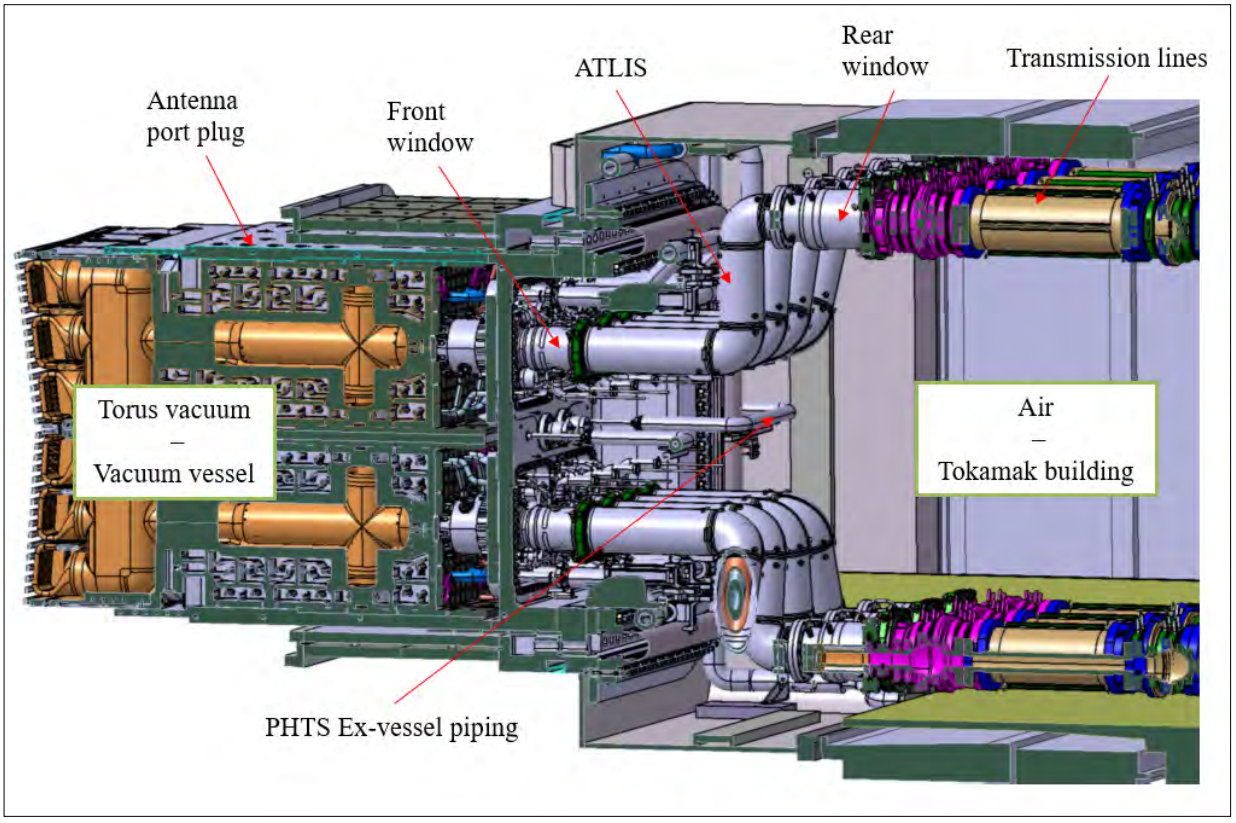

Figure 2: ICRH Antenna overview plus main connected equipment

ICRH Antenna is cooled by the ITER Primary Heat Transfer System (PHTS), part of Tokamak Cooling Water System (PBS-26). The 51ANW3 piping is distributing the PHTS water to different sub-assemblies of the Antenna port plug (in particular – to the four RF modules and to the port plug body 51ANW3 piping is supported on the Vacuum Vessel (VV) Connecting Duct, part of PBS-15.

The piping needs to be covered by thermal insulation to avoid heat releases to the port cell during operation and baking phases.

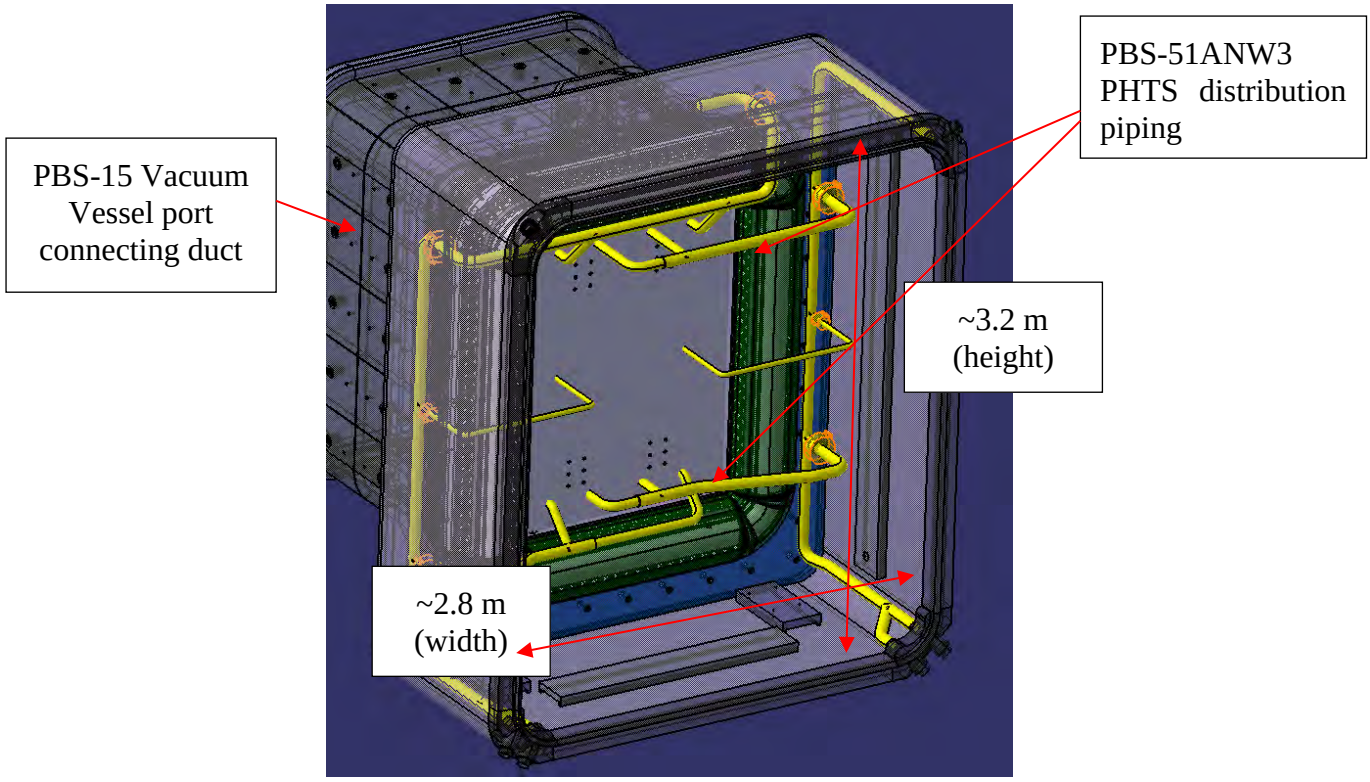

Figure 3: PHTS Distribution Piping current layout (in yellow colour) without insulation and without supports, rough dimensions of the PBS-15 VV port connecting duct are indicated for information

5.4 Equipment Classification

The Table 2 is recalling the 51ANW3 ex-Vessel PHTS distribution piping classification extracted from the Ref. [51].

Contractor shall design and manufacture two Nuclear Pressure Equipment (NPEs):

- 51ANW3 piping inlet (51ANW3-PHTS NPE-1)
- 51ANW3 piping outlet (51ANW3-PHTS NPE-2)

Item	Safety Class Ref.[2]	Quality Class Ref.[8]	Seismic Class Ref.[5]	Vacuum Class Ref.[4]	Tritium Class Ref.[3]	RH Class	PED Category Ref.[67]	NPE Level Ref.[68]
51ANW3 piping inlet (51ANW3-PHTS NPE-1)	PIC (SIC-1)	QC1	SC1(S)	N.A.	TC 2A	N.A.	Cat.II	N2
51ANW3 piping outlet (51ANW3-PHTS NPE-2)							Cat.II	N2
51ANW3 supports	SR	QC3	SC2	N.A.	N.A.	N.A.	N.A.	N.A.
51ANW3 insulation	Non-PIC	QC3	NSC	N.A.	N.A.	N.A.	N.A.	N.A.
N.A. Non Applicable								

Table 2: 51ANW3 PHTS Components classification (extracted from the Ref. [51])

5.5 Division of Responsibilities concerning Nuclear Pressure Equipment

IO as the Operator specifies all the requirements including those for adequate maintenance, oversight and inspection, in accordance with Articles 1.2 and 1.3 of INB Order Ref. [65].

The Contractor is the legal Manufacturer of the Nuclear Pressure Equipment (NPE) in the scope of this technical specification. As Manufacturer, the Contractor shall design, manufacture and get the NPE(s) certified in respect of the host state regulations in Section 4.2.1. Contractor is responsible for ANB involvement at any stage, when required by the host state regulations in Section 4.2.1. Main principles of the division of responsibilities between Operator and Manufacturer are recalled in Table 3:

	Contractor as NPE Manufacturer	IO as Nuclear Operator
Load Specifications	-	R
Equipment Specifications	-	R
Hazard Analysis	R	A
Design	R	A
Material Procurement, including NPMA	R	A
Manufacturing	R	A
Testing and Examination	R	A
ANB contracting	R	A
User Manual	R	A
Declaration of conformity	R	A
R = Responsible for organizing, performing *A = Review/Comment/Accept/Approve*		

Table 3: Scope of responsibilities between the IO and the Contractor

5.6 Requirements Applicable to all Phases

The requirements presented in this section are applicable to all phases.

Piping is the pressure equipment conveying tritiated water, at high temperature and pressurized.

Contractor shall make sure that all requirements are met during all phases of the Contract.

5.6.1 Requirements from Host State Regulations for NPE

Host state regulations in Section 4.2.1, and in particular the Essential Safety Requirements (ESR) applicable to N2 Cat. II fully apply.

Requirements related to the radioprotection are expressed in the ITER Radioprotection guide Ref. [22] and specific document for the VV ports in Ref.[23].

In addition to the typical design and manufacturing documentation, Contractor shall issue all specific documentation (in each phase) necessary to build and get certified the 51ANW3 NPEs.

This corresponds to [DL1-6], [DL1-12], [DL1-13] and [DL1-14] in Phase 1, part of the MRR package in [DL2-2] in Phase 2 and part of the LTR in [DL3-2] in Phase3.

5.6.2 Requirements from Applicable Design and Manufacturing Standards

Contractor shall apply EN 13480 Ref.[69] and EUROCODE 3 Ref.[70] for the design of the 51ANW3 piping and supports. Other code/standards compliant with the requirements from the PBS-51 SRD, can be used upon provided justifications. In particular, the NPE design and manufacturing aspect shall be carefully taken into account at the code/standard selection.

Whatever would be the selected standards, Contractor shall demonstrate the compliance with Essential Safety Requirements (ESRs). When needed, requirements from standards shall be complemented by additional requirements to reach full compliance with host state regulation (part of [DL1-6]).

5.6.3 Requirements Specific to ITER Project and to PBS-51

5.6.3.1 Requirements from PBS-51 SRD applicable to the 51ANW3

The requirements from the SRD-51 Ref.[49] applicable to this Contract have been extracted from the SRD-51 Ref.[49] to a the table in the Appendix 1, to help Contractor in identifying requirements applicable to the 51ANW3 PHTS distribution.

In general, by complete execution of the contract in accordance with this Technical Specification, the applicable requirements from Appendix 1 are fully covered. Appendix 1 is to be used by the Contractor for justification of compliance of performed work with the SRD-51 Ref.[49].

5.6.3.2 Requirements related to ITER classifications of components

Requirements related to ITER classifications of components are gathered in below listed documents and fully apply to the of 51ANW3 PHTS distribution, as appropriate to the classifications shown in section 5.4.

- QC1 (as highest in 5.4): Quality Classification Determination, Ref. [8]

- SIC-1 (as highest in 5.4):
  - Protection Important Functions and Components Classification Criteria and Methodology, Ref. [2]
  - Propagation of the Defined Requirements for Protection Important Components Through the Chain of External Interveners, Ref [6]
  - Surveillance Plan for PBS 51 - Annex 2 - Detailed List of PIAs, Ref. [54]
  - Surveillance Plan for PBS 51 – Ion Cyclotron H&CD System (ITER_D_U44GYC v1.1), Ref.[53]

- SC1(S) (as highest in 5.4) → ITER Seismic Nuclear Safety Approach, Ref. [5]

- TC2A (as highest in 5.4):→ Tritium Handbook, Ref. [3]
  - Leak tightness acceptance criteria:
    - Leak tightness criteria for TC2A system (operating at ΔP=1bar):

$$10^{-5}\frac{Pam^3}{s}(air\ equivalent)$$

    - Derived leak tightness criteria for 51ANW3 (operating at ΔP=49bar):

$$2.04 \times 10^{-7}\frac{Pam^3}{s}(air\ equivalent) = 5.49 \times 10^{-7}\frac{Pam^3}{s}(He\ equivalent)$$

- Limitations in material composition, refer to section 5.7.2.3

5.7 Scope of Supply for the Phase 1

5.7.1 Objectives of the Phase 1

Contractor shall develop the Final Design of 51ANW3 PHTS distribution piping, supports and thermal insulation. The contractor shall demonstrate 51ANW3 manufacturing and installation feasibility using engineering analysis or mock-ups.

Piping 51ANW3 is NPE level N2 Cat. II, and contractor acts as Manufacturer of the NPE(s).

Contractor involves and manages an ANB, to get verification and endorsement of the produced NPE design.

Contractor produces the set of deliverables (from [DL1-1] to [DL1-19]) listed in Table 8 at Final Design (FD) maturity. Those deliverables will be used by IO as part of the ICRH Antenna FDR input document package.

Current 51ANW3 PHTS distribution piping layout corresponds to a preliminary design and shall be used as starting point for Contractor further design work. At the contract Kick Off Meeting (KOM) the most recent CAD data will be provided to the Contractor. Contractor has the freedom for piping and supports development inside the free space available.

5.7.2 Design Requirements

5.7.2.1 Equipment Functions

The functions breakdown is described in Ref. [52] up to the component level.

The Ex-Vessel PHTS piping (51AN13) is participating to the following functions:

- A13.02.01.03 - To ensure water / air joints integrity *(= SIC function)*
- A13.01.05.01 - To ensure connection with PHTS pipes (VV)
- A13.01.05.03 - To provide thermal shield in the Cryostat interspace
- A13.04.02.03 - To ensure compatibility with Port cell extension PHTS pipes

In addition, the Ex-Vessel PHTS piping (51AN13) is also participating to the following design driver:

- Not preclude the PBS-51 Antenna Port Plug removal from the Vacuum Vessel (VV) port (permanent part does not interfere with PBS-23 space reserved for remote handling transport cask trajectory). Refer to section 5.7.2.5 for description of requirements related to assembly/disassembly.
- To be dismountable in minimized lead time, ALARA principle to be applied since piping is located in the hostile environmental conditions in the equatorial Port Cell #13 (11-L1-C13) and port interspace (see Safety Requirement Roombook Ref. [20])
- Ex-Vessel PHTS piping (51AN13) is lifetime equipment and shall be able to operate up to 30 years.

5.7.2.2 Load Specifications

The PBS-51 Load Specification for the IC H&CD Antenna Ref.[50] applies, Contractor shall extract the information relevant to the 51ANW3 equipment.

List of normal situations and main design parameters of the pressure equipment is given in the Table 4.

Additional to the load specification Ref.[50], the following complementary aspects shall be considered:

- Set-up of the acceptance criteria to adapt the EN 13480-3 Ref.[69] to provide equivalent to the various service levels in the Ref.[50].

  Contractor shall propose the set of acceptance criteria for various service levels to IO for acceptance prior starting any work on analysis.

- Loads defined in the Interface Sheet PBS-26.PH-51-001 (Ref. [61])
  - PBS-26.PH connected branch design parameters from Ref. [62] and Ref.[63].
  - Maximum Expected Operating Temperature “MEOT” = 250°C
  - Maximum allowable temperature, the regulatory “TS” = 270°C
  - Maximum allowable pressure, the regulatory “PS” = 49 bar(g)

  o 51ANW3 piping has not its own safety devices to limit the pressure or temperature, the “PS” and “TS” are set up to the same level as PHTS connected manifold, and Pd and Td also:
  - 51ANW3 Maximum allowable temperature , the regulatory “TS” = 270°C
  - 51ANW3 Maximum allowable pressure, the regulatory “PS” = 49 bar(g)
  - 51ANW3 Design temperature “Td” = 270°C
  - 51ANW3 Design pressure “Pd” = 49 bar(g)

  Parameters above have been integrated to the Table 4.

  o The water hammer coming from PBS-26.PH loop to 51ANW3 piping is described in the Ref. [63]. The event category to be considered for those loads on the piping shall be the same as the category of the water hammer event in the report Ref. [63]. (Note: for lecture of the Ref. [63], PBS-51 port is located in the center of the PHTS IBED manifold.)
  o Water slugs coming from PBS-26.PH loop to 51AMW3 during blow-out shall be considered as normal situation, see PBS-26 reports Ref.[62] and Ref.[63].

- Thermal relative displacements between VV flange and VV Connecting Duct Ref.[59]

- New Floor Response Spectra from FRS VV- Tokamak Seismic Analysis - PIM 432 - Design FRS Input (8FZSG9 v2.0) Ref.[34] shall be used instead of the ones provided in the load specification Ref.[50]. As there is a refinement still ongoing on IO side on this topic, the FRS will be confirmed at KoM of the Phase 1.

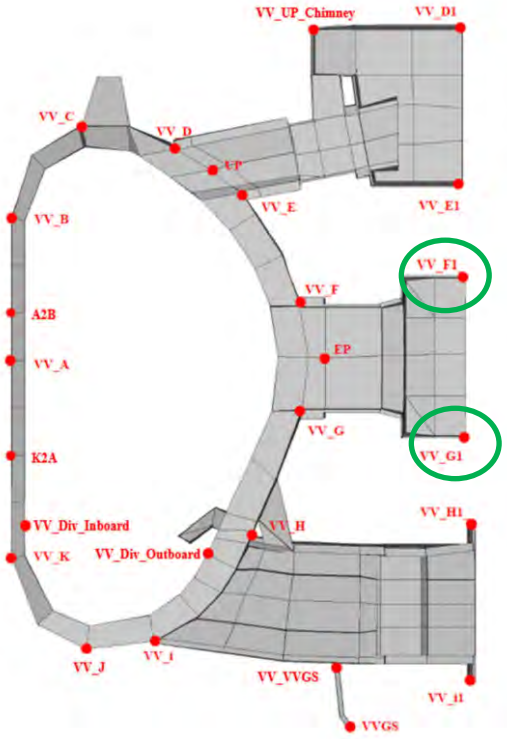

Figure 4: Identification of relevant points on the VV in Ref. [34]

The compliance with load specification and additional inputs from this chapter will be reflected as part of the [DL1-4] and [DL1-5].

Table 4: 51ANW3 PHTS Distributions – List of normal situations and main design parameters

Index	Sub-system	Situation of the equipment	Fluid nature Fluid state Group along PED Ref.[67]	Maximum total flowrate from the interfacing manifold	Normal operating temperature (T_{op}) [°C] and pressure (P_{op}) [bar(g)]	Minimum/Maximum allowable temperature (TS) [°C] and pressure (PS) [bar(g)]	Minimum/Maximum Design temperature (T_d) [°C] and pressure (P_d) [bar(g)]	Maximum Pressure drop [bar]	Nuclear Level along NPE regulation Ref.[68]	Pressure category along PED Ref.[67]	Material grade	Proof Pressure Test in line with PED Ref.[67] and EN 13480-5 Temperature (T_{Test}) and Minimum Test Pressure (P_{Test})
1	51ANW3	Antenna Cooling	Demineralized Water Liquid (but gas for PED classification) Group-2	44kg/s (total) 14.6kg/s for each DN65	T_{op} = [75°C; 136°C] P_{op} = 45bar(g) max	TS = 270°C PS = 49 bar(g) See Ref.[61][62]	T_d = 270°C P_d = 49 bar(g)	11.9 (for whole antenna)	N2	Cat.II	grade 1.4404 (EN 10216-5)	T_{test} = 20°C P_{test} = 92 bar(g) (P_{test} value based on the EN grade 1.4404)
2		Baking	Demineralized Water Liquid (but gas for PED classification) Group-2	4.4kg/s (total) 2.3kg/s for each DN65	T_{bk} = 250°C max P_{bk} = 47bar(g) max							
3		Drying	Nitrogen Gas Group-2	4.4kg/s (total) 2.3kg/s for each DN65	T_{dy} = [40°C:240°C] P_{dy} = 39bar(g) max							
4		Blow-out	Compressed Air or Nitrogen Gas Group-2	6.9kg/s (total) 2.3kg/s for each DN65	T_{bw} = [30°C; 40°C] P_{bw} = 39bar(g) max							
5		Helium Leak Tightness Test	Helium Gas Group-2	*not applicable*	T_{LT} = [5°C, 35°C] P_{LT} = [-1bar(g); +1bar(g)]							
6		Antenna Filling	Air Gas Group-2	*Not applicable*	T_{fil} = [5°C, 35°C] P_{fil} = [-1bar(g); +1bar(g)]							

5.7.2.3 Material Requirements

In addition to the requirements from the host state regulations and from the applicable standards, several requirements specific to the system are provided in this section.

5.7.2.3.1 Impurities limitation for radioprotection purposes (Ref. [19])

For radiation protection purposes, material impurities levels shall be limited for all 51ANW3 material, in line with Ref. [19], with criteria of "Cat 1" proper to the items located in port interspace.

For convenience, impurities limitations from Ref. [19] are extracted to Table 5 for main materials. If material not reported in the Table 5, Contractor shall refer directly to Ref. [19].

Table 5: Additional impurities limitations for 51ANW3 materials

Austenitic Stainless Steel EN grade 1.4404 (pipes and fittings)	Austenitic Stainless Steel EN grade 1.4404, 1.4301, 1.4307 or similar (supports)	Austenitic Stainless Steel fillers
Co (%wt) < 0.05 % Ta (%wt) < 0.01% Nb (%wt) < 0.1%		Co (%wt) < 0.2%

5.7.2.3.2 Tritium Handbook limitations for TC2A Ref. [3]

- "Halogenated materials, sulphur and phosphorus, and processes involving the use of these materials, shall be avoided when possible for all components having a Tritium Classification. These materials lead to potential for oxidation catalyst poisoning and to metallic corrosion due to acid formation. If use of these materials cannot be avoided, the content of these materials in Tritium Classification 1 and 2 systems shall be limited to 0.025% of each."

5.7.2.3.3 EN 13480-2 Ref. [56] general requirement for materials for pressure piping

- Maximum carbon, phosphorus and sulphur content for steel intended for welding or forming – see limitations in Table 4.1-1 of EN 13480-2 Ref. [56]

5.7.2.3.4 Maximum magnetic permeability of 1.03 as per PBS-51 SRD Ref. [49]

- Only non-magnetic materials to be used in the port interspace, with magnetic permeability of 1.03 maximum.

5.7.2.3.5 Suitability for the operation in the equatorial Port Cell #13 environmental conditions

- 30 years of operation (SRO, DT-1, DT-2)
- Environmental conditions in the equatorial Port Cell #13 (11-L1-C13) and port interspace (see Safety Requirement Roombook Ref. [20])
- Radiation levels during operation Ref.[21]

5.7.2.3.6 Material Certificates

Certificates of level 3.1 according to EN 10204 (edition 2004) to be provided for all materials.

5.7.2.4 ITER Material Identification and Equipment Tagging

Currently, the pipes and supports are bearing preliminary or partial tagging (refer to P&ID Ref. [55]), and some items are not tagged yet. Contractor shall finalize and complement the tagging and identification following ITER identification rules Ref.[30], Ref.[31], Ref. [32], and Ref. [33].

5.7.2.5 Assembly/Disassembly

The piping located in the area of the PBS-23 transport cask trajectory shall be removable. For this purpose, piping and supports can be split in two parts:

- Permanent part – after on-site installation stays permanently attached to the VV (parts not interfering with PBS-23.03 Cask transfer system, refer to chapter 5.7.3.2)
- Removable part – can be disconnected from the antenna and VV and removed and further re-installed back (See permanent and removable part of piping on the Figure 5.)
- Figure 10 shows the volume available for permanent parts of the 51ANW3
- Following the ALARA principle (guideline in Ref.[48]), Contractor shall select a technical solution, where the worker time exposure is limited as much as possible during connection and disconnection of the piping during nuclear phase. The technical solution selected for connection and disconnection shall be part of the supply scope. In case clamps or flanges are selected, both sides, together with the gasket shall be part of the Contractors supply.
- Contractor shall estimate the time necessary to the assembly and disassembly of the removable parts.

Assembly and disassembly aspects are part of the Maintenance and Inspection plan [DL1-18].

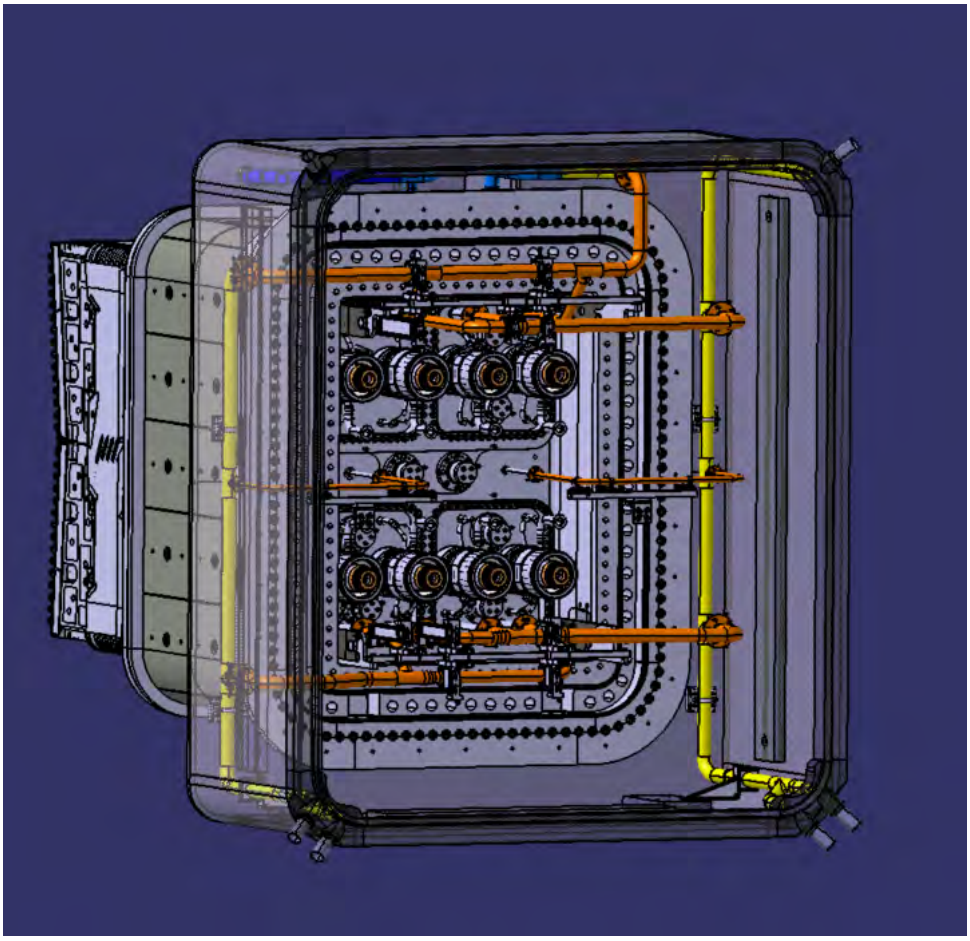

Figure 5: 51ANW3 PHTS distribution piping permanent part in yellow and removable part in orange

5.7.2.6 Thermal Insulation Definition and Heat Releases Estimation

Thermal insulation shall be foreseen on all piping to minimize heat releases to the port interspace.

- Current assumption is 30mm of high performance mineral wool such as Microtherm® MPS. Lower thickness can be locally accepted, is case of limited space.
- Contractor shall select appropriate thermal insulation and its thickness, to provide the same heat conservation function and to stay within the space available for the piping. Insulation to be represented in the 3D and 2D (as part of [DL1-2] and [DL1-3])
- Thermal insulation shall be removable, in order to be able to perform periodic inspections of the piping.
- Contractor shall provide the heat releases to the equatorial port #13 interspace in all normal situations, taking into account environmental conditions and submit to IO for acceptance (as part of the [DL1-4])

5.7.2.7 High Energy Line Break (HELB) Aspects

To prevent damages on surrounding PIC components in case of pipe break, Contractor shall select and implement the features to prevent pipe whips (such as pipe whip restrains, or others), to exclude damage on surrounding PIC components in the event of 51ANW3 pipe break. All items around the PHTS piping are PIC, as follows:

- PBS-31.SV.IC: High vacuum pumping system for ICH&CD private vacuum
- PBS-51.AN: ICRH Antenna sub-systems
- PBS-15: Vacuum Vessel port connecting duct, VV port extension, VV flange and VV pipes

Refer to the Figure 6.

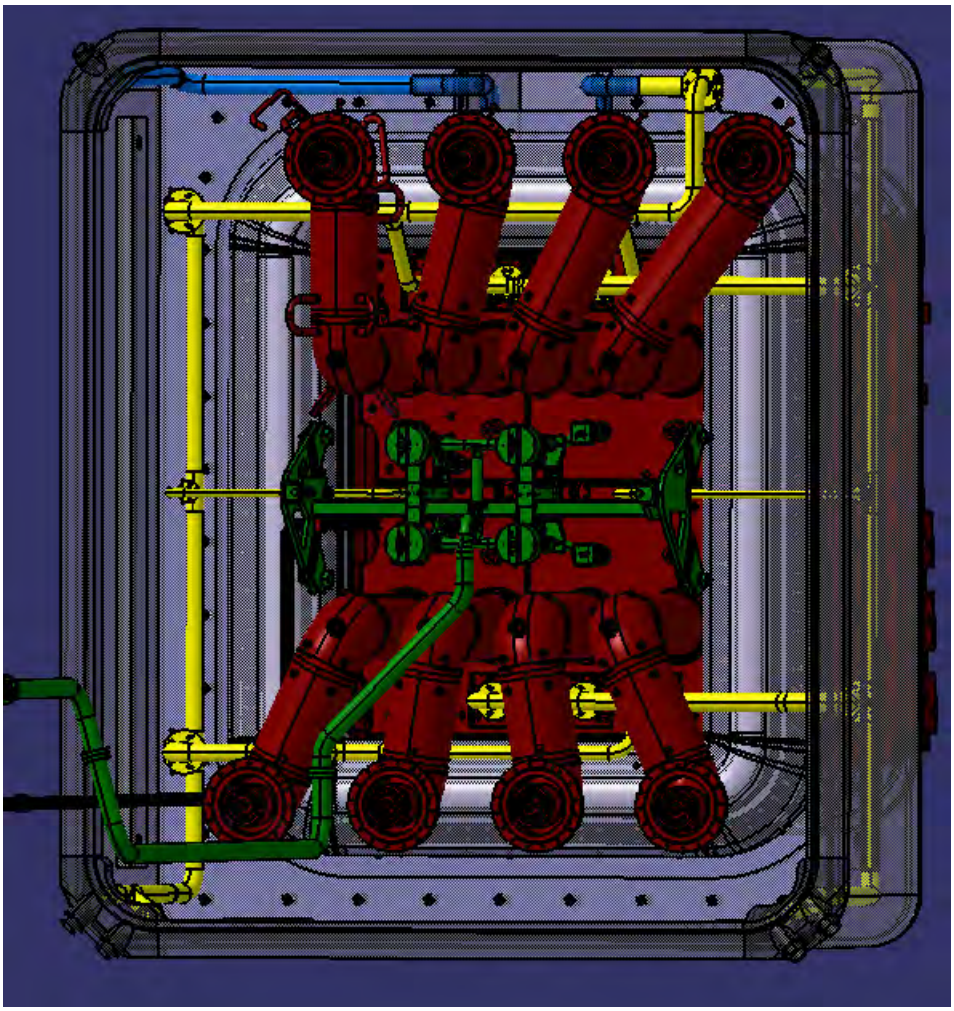

Figure 6: Arrangement in the equatorial port #13 port interspace, PIC components highlighted in green for PBS-31, brown for PBS-51.AN, in grey for PBS-15 VV and in blue PBS-15 pipes

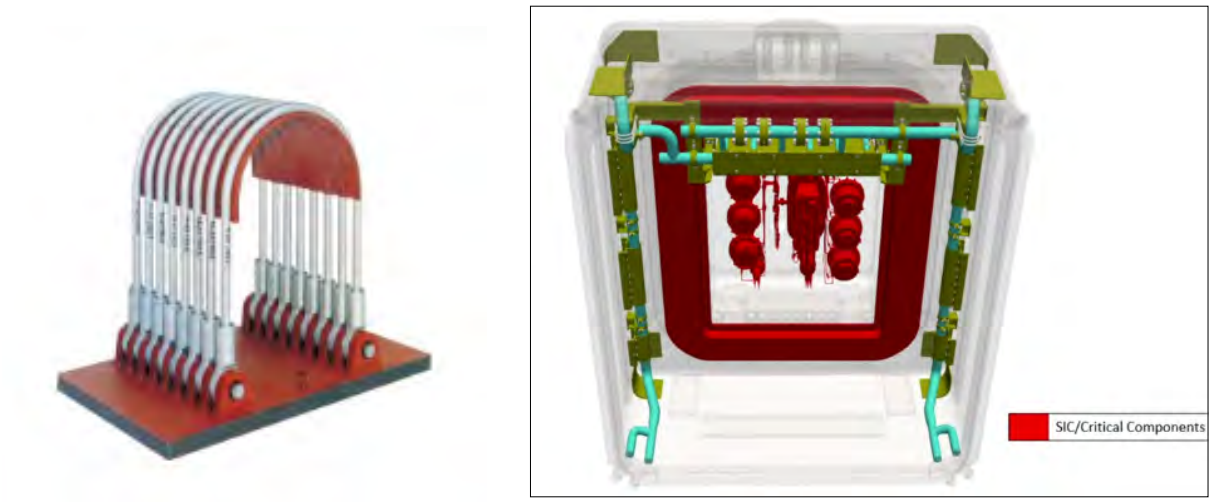

Figure 7: Examples of technical solutions with pipe whip restrains adopted in other ports

5.7.2.8 Maintenance and Inspection Plan

As requested by the host state regulations, the maintainability and inspect ability of the NPE shall be foreseen in the NPE design. Design shall allow to perform periodic in-service inspections required by regulation.

Contractor shall design the system keeping in mind the regulatory periodical inspections and maintenance tasks if stemming from the Hazard and Risk Analysis (HRA) ([DL1-12]).

Regarding the restricted access to the manifolds (dose rate and limited space, no access during operation), Contractor shall target robust design, with minimized maintenance and inspection needs. Maintenance tasks (if any) shall be synchronized with the intervals of regulatory periodical in service inspections.

Contractor shall demonstrate that the in-service inspections tasks and planned maintenance tasks are feasible.

Any special tools and/or test equipment, if needed, for maintenance or periodical inspection shall be provided by the Contractor together with the NPE.

Maintenance and Inspection aspects are part of [DL1-18].

5.7.2.9 List of Spares

List of spares shall be based on the following:

- Maintenance and Inspection Plan [DL1-18]
    - Spares needed for Regulatory periodic in-service inspections (insulation and its attachment features, ..)
    - Spares needed for one (1) ICRH antenna removal and re-insertion (insulation, gaskets, ..)
- On-site installation plan [DL1-17]
    - Spares needed for on-site adjustments or as back-up for challenging/critical steps
    - Spare gaskets for leak tests repetition (in case of unsuccessful on site test)

List shall be submitted to IO for acceptance as [DL1-19]. Spares are part of the Contract material procurement and shall follow the same chain of manufacturing and testing as all other materials.

5.7.2.10 Units

Only SI units, SI derived units, and units used in the applicable standards and host state regulations shall be used.

5.7.3 Interface Requirements

Following interfaces and related interface requirements presented in this chapter shall be considered in the design.

5.7.3.1 Interfaces between PBS-15 (ITER Vacuum Vessel) and 51ANW3

Applicable Interface Sheet IS-15-51-001, Ref.[57]:

- Connections to the VV stubs and to VV pipe (3x inlet DN65, 3x outlet DN65), Figure 8 and Figure 9.
- Attachment of the piping supports to the PBS-15 VV connecting duct (surfaces where attachment is allowed are shown at Figure 10. Only welded attachment expected as per the IS-15-51-001, Ref.[57], schematic representation of the principle is on Figure 11.
- Thermal relative displacement between VV and connecting duct Ref. [59] shall be considered in the design (see also chapter 5.7.2.2)
- Loads on attachment points of the supports and piping shall be provided to PBS-15 for acceptance (as part of [DL1-4] and [DL1-5])
- Feasibility of the welding and NDT at the level on the to the PBS-15 VV stubs is critical operation – mock-up and demonstration expected (as part of [DL1-17]).

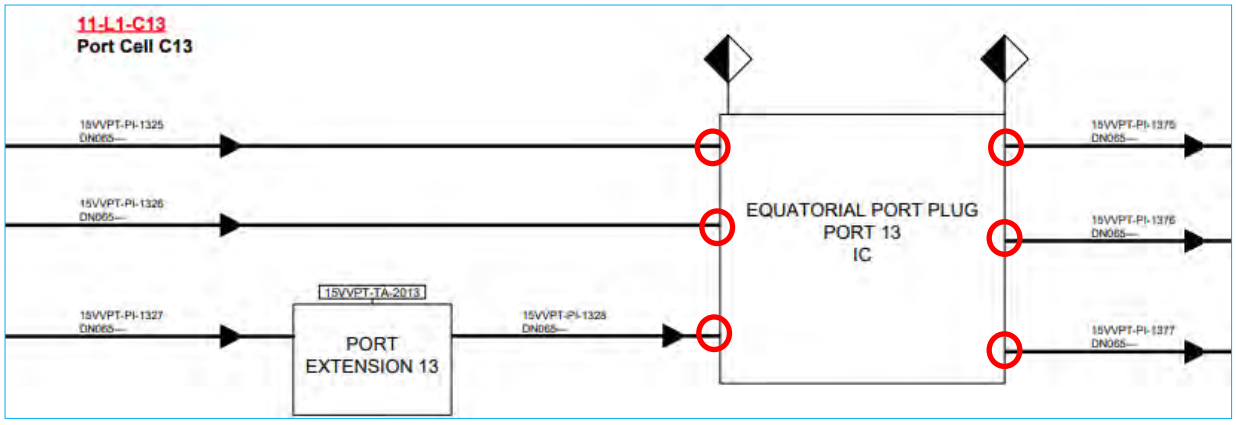

Figure 8: Schematic connections of PBS-51 to PBS-15 stubs and pipes - Interfaces highlighted by red circles – extract from P&ID of PBS-15.VV.PT Ref. [58]

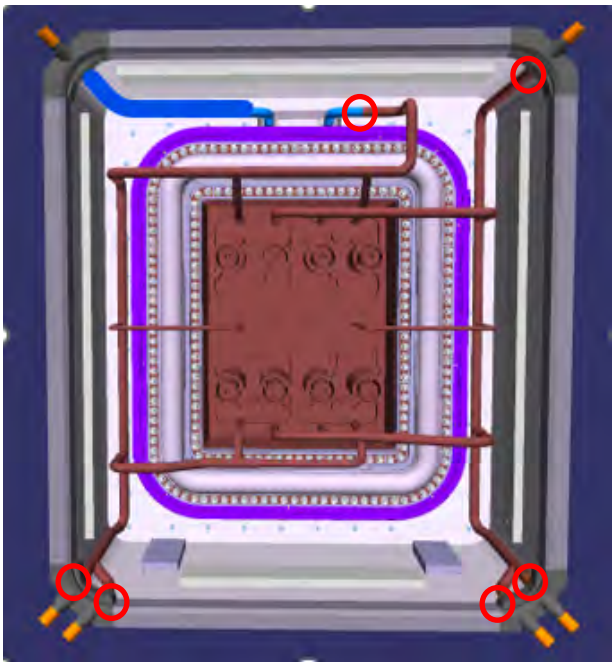

Figure 9: Physical interfaces /connections of PBS-51 pipes (brown) to PBS-15 stubs (grey) and PBS-15 pipe(blue) Interfaces highlighted by red circles – view from 3D

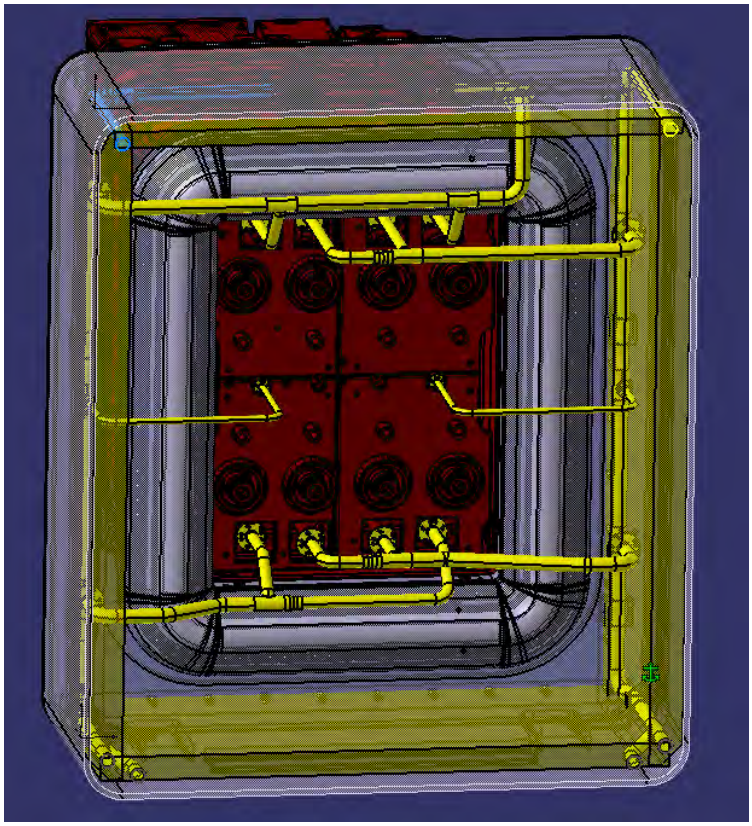

Figure 10: Yellow volumes correspond to the areas of the possible attachment of the 51ANW3 supports the PBS-15 VV Port Connecting Duct. Yellow volume shows also the space delimitation for permanent part of the system

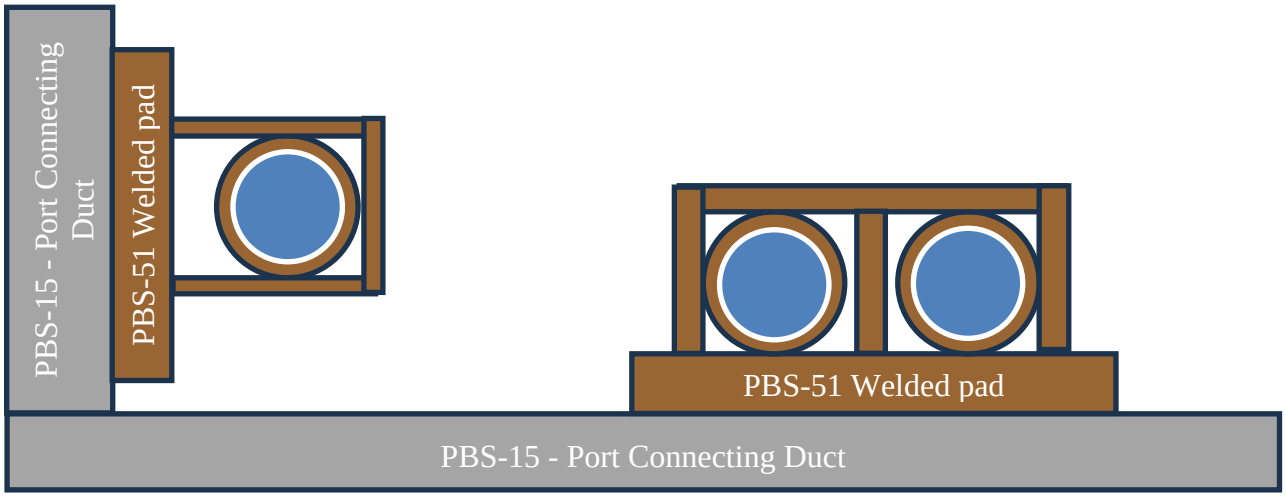

Figure 11: Attachment of the PBS-51 supports to the VV Port Connecting Duct - agreed scheme, as per the Interface Sheet IS-15-51-001 Ref.[57]

5.7.3.2 Interfaces between PBS-23.03 (ITER Cask and Plug Remote Handling System) and 51ANW3

Applicable Interface Sheet IS-23-51-001, Ref [60]:

No 51ANW3 permanent part shall interfere with PBS-23.03 Cask and Plug Remote Handling System trajectory. See Figure 12.

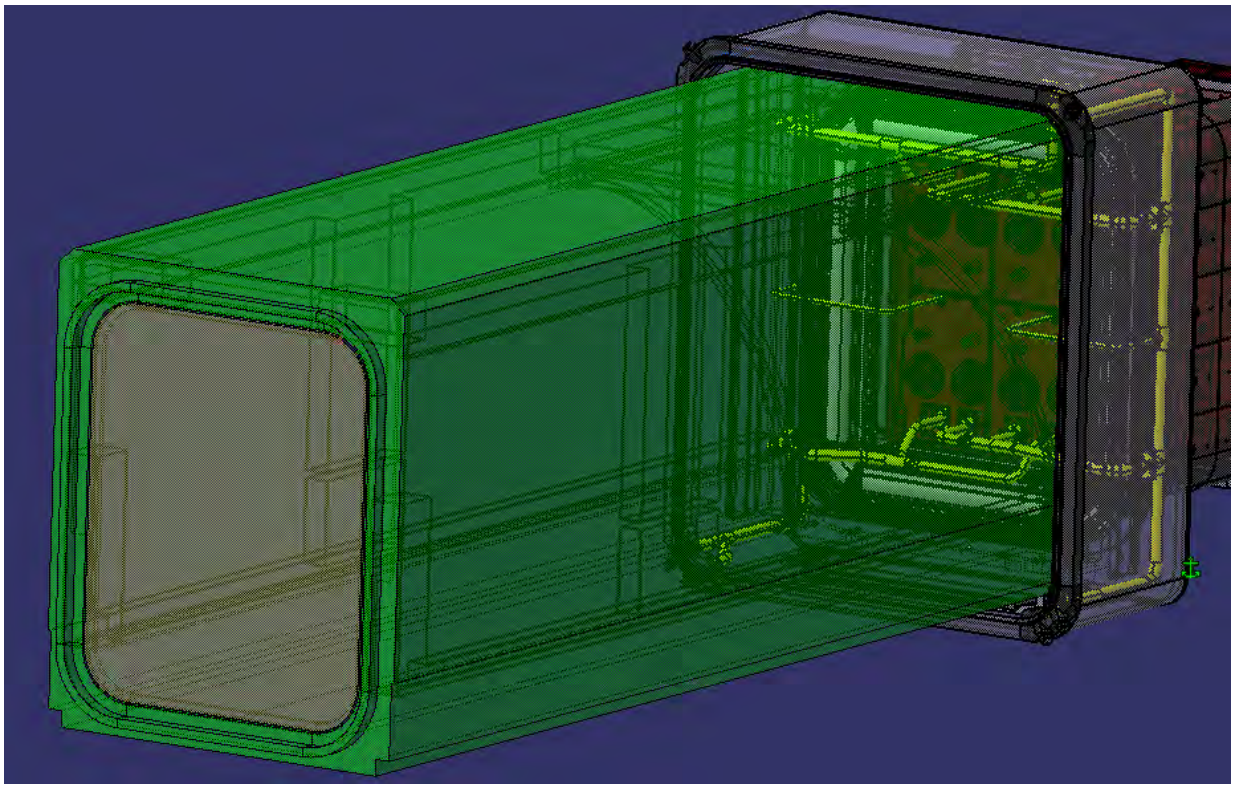

Figure 12: PBS-23.03 Cask and Plug Remote Handling System trajectory (in green)

5.7.3.3 Interfaces between PBS-26.PH (Tokamak Cooling Water System) and 51.AN.W3

Applicable Interface Sheet: IS-26.PH-51-001, Ref [61] and related reports Ref.[62] and Ref.[63]. There is no direct physical interface connection between PBS-51 and PBS-26, piping connection goes though PBS-15 intermediate (see Figure 13).

51ANW3 is concerned by the following functional interfaces:

- Loads related to the temperature, pressure, flow rate, (information extracted from the IS and reflected to the Table 4. Refer to section 5.7.2.2
- Loads induced by water hammer and water slugs – refer to section 5.7.2.2
- Minimizing the pressure drop, criteria given for whole 51.AN system, as maximum pressure drop of 1.19 MPa. (see Table 4).

Compliance with the loads induced by PBS-26.PH and resulting pressure drop to be submitted to IO for validation (as part of the [DL1-4]).

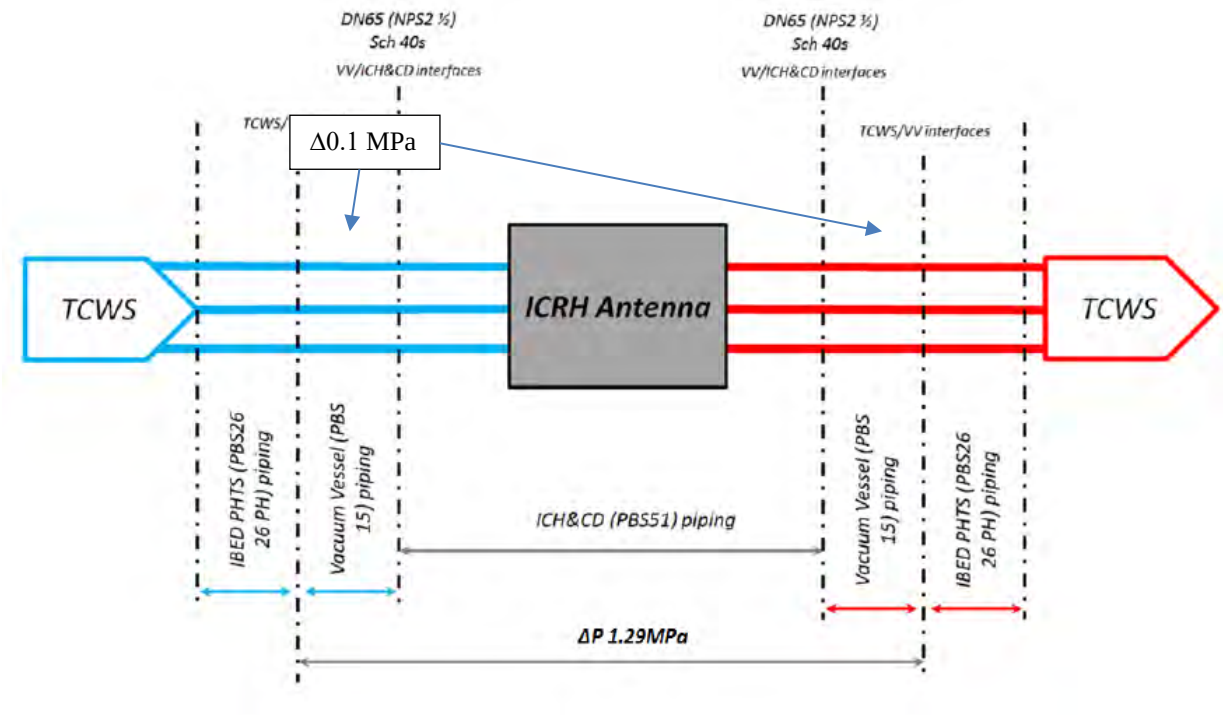

Figure 13*: Schematic PBS-51 connection to PBS-26.PH though PBS-15 intermediate, extract from IS-15-51-001 Ref. [57]*

5.7.3.4 PBS-51 Internal Interfaces - Connection of the 51ANW3 to ICRH Antenna Port Plug 51AN13

The 51ANW3 piping is connected to the ICRH Antenna Port Plug at 10 locations, see P&ID Ref. [55] and PFD Ref.[56]:

- Connection to ICRH Antena Port Plug body inlet/outlet (1x inlet DN25, 1x outlet DN25) – flanges with clamps – "Quick Disconnection System" (QDS)
- Connections to 4 RF modules inlet/outlet (4x inlet DN50, 4x outlet DN50) - –

Current attachment solution is the "Quick Disconnection System" (QDS). Specific product, the remote handling (RH) compatible connections QDS 500RH75 and QDS 500RH40, have been proposed by Technetics, see Figure 14

For Final Design development, the RH compatibility is no more required. The clamp can be hands-on removed/reinstalled. RH clamp can be dropped and simple hands-on clamps can be used.

Contractor shall select the products already qualified. In case selected connectors are not qualified yet, the qualification process for PIC to be followed Ref.[46].

Contractor is in charge of supplying both sides of all connections:

- 51ANW3 side
- Gasket
- 51AN13 side

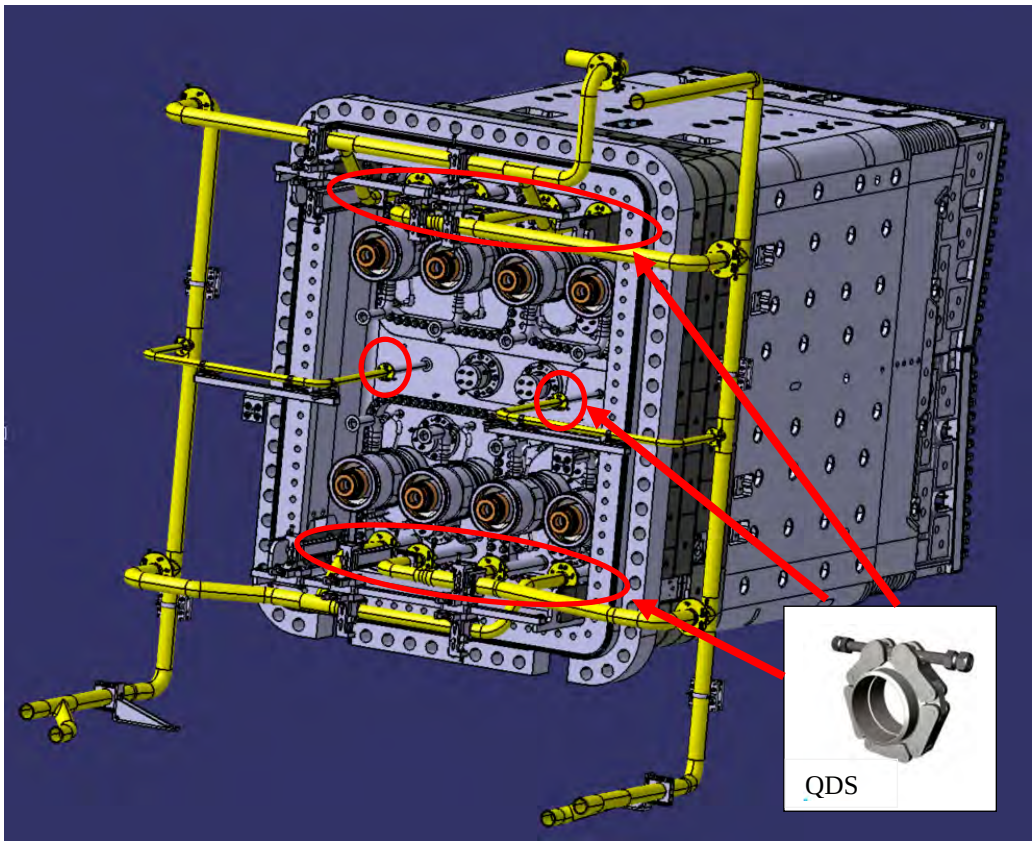

Figure 14: Physical Interfaces between 51ANW3 and 51AN.13 - 2 connections to ICRH Antenna Port Plug body and 8 connection to RF modules

In terms of supports, as a backup solution, the direct attachment to ICRH Antenna Port Plug may be possible upon agreement with IO. Potential attachment is displayed on the Figure 15. Supports potentially attached to the ICRH Antenna port plug shall be removable.

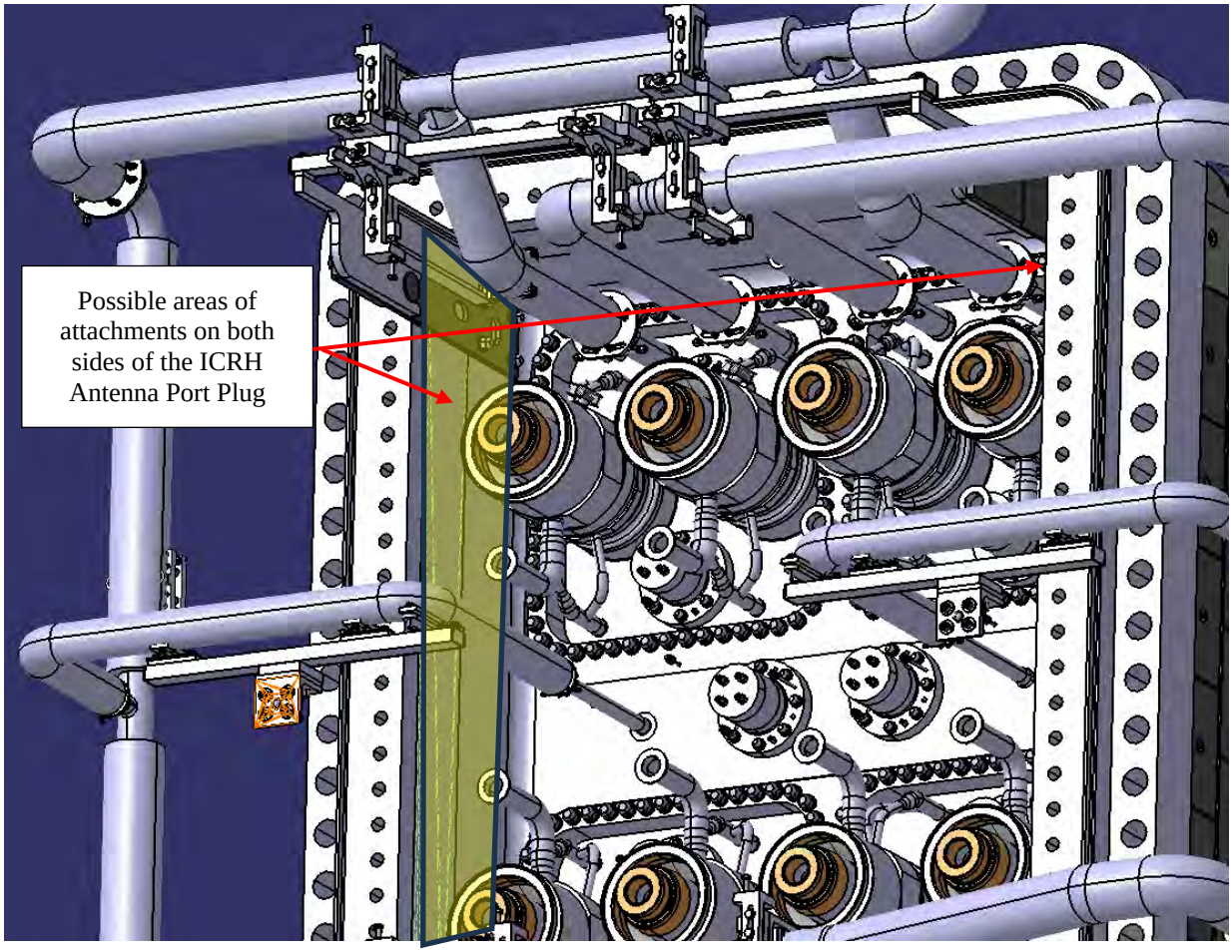

Figure 15: Possible attachment to ICRH Antenna Port Plug (upon agreement)

5.7.3.5 Pipe Stress Analysis Boundary Conditions at Physical Interfaces

The piping is to be analyzed from anchor point at the PBS-15 VV port extension and connecting duct till the anchor point on the 51AN13 ICRH Antenna Port Plug and RF modules (see Figure 16 and Figure 17). Forces and moments to be given at those locations. Short portion of piping between the PBS-51 internal interfaces and ICRH Antenna Port Plug and RF modules (out of procurement scope) is to be added for the purpose of pipe stress analysis only (see Figure 17). Same for the short portions of PBS-15 piping (see Figure 16). Piping supply limit stays at the physical interfaces.

- Loads at PBS-15 VV stubs and pipes to be provided, for IO validation
- Loads at supports attachment to PBS-15 to be provided, for IO validation
- Loads at the level of PBS-51 Antenna Port Plug body and RF modules to be provided, for IO validation

Above listed resulting loads are going to be part of [DL1-4] and [DL1-5].

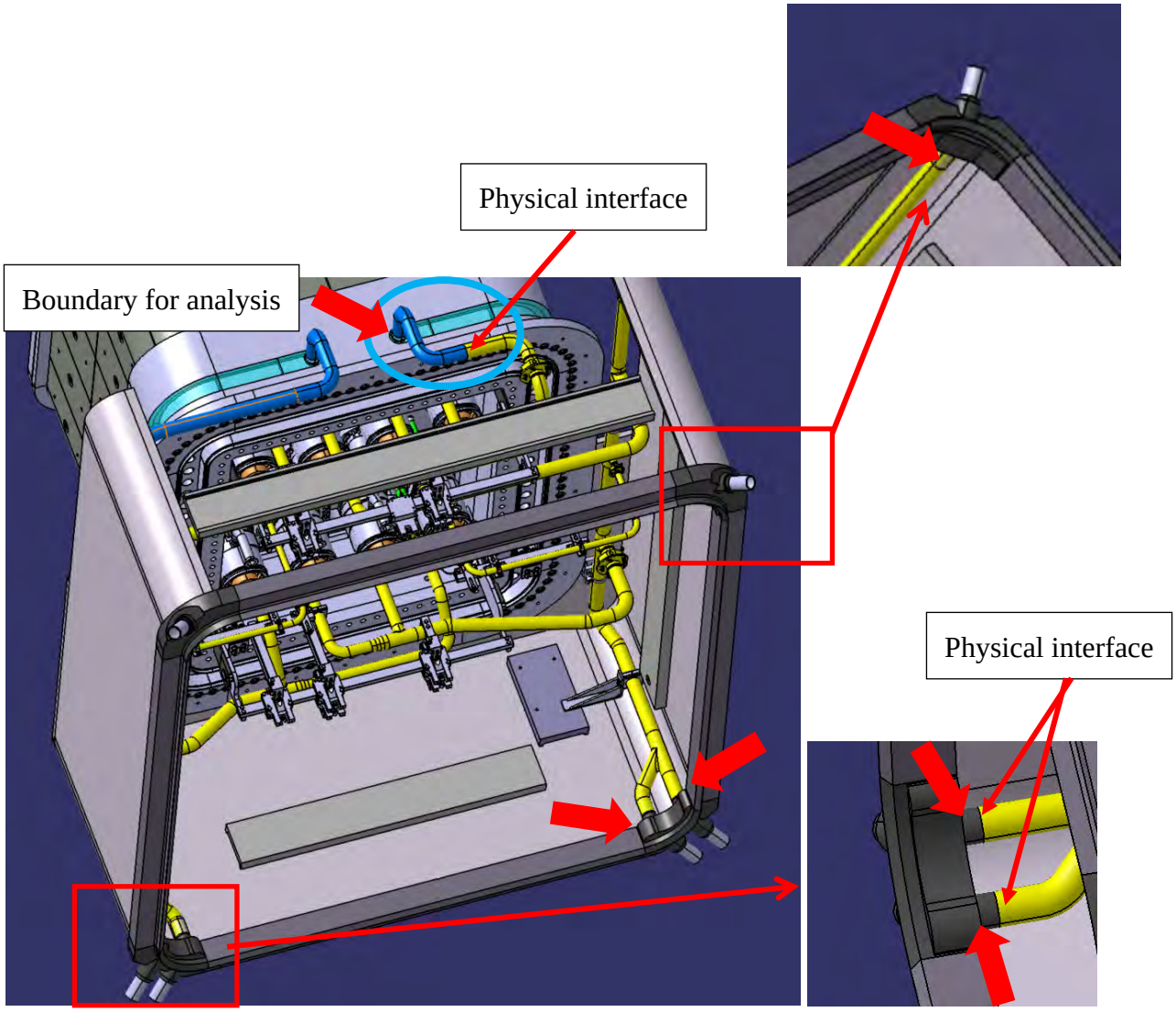

Figure 16: Boundary between PBS-15 and 51ANW3 piping for pipe stress analysis are at the anchor points pointed with red arrow. Surrounded blue part of PBS-15 pipe shall be included to the 51ANW3 analysis scope, loads to be provided at anchor point on VV.

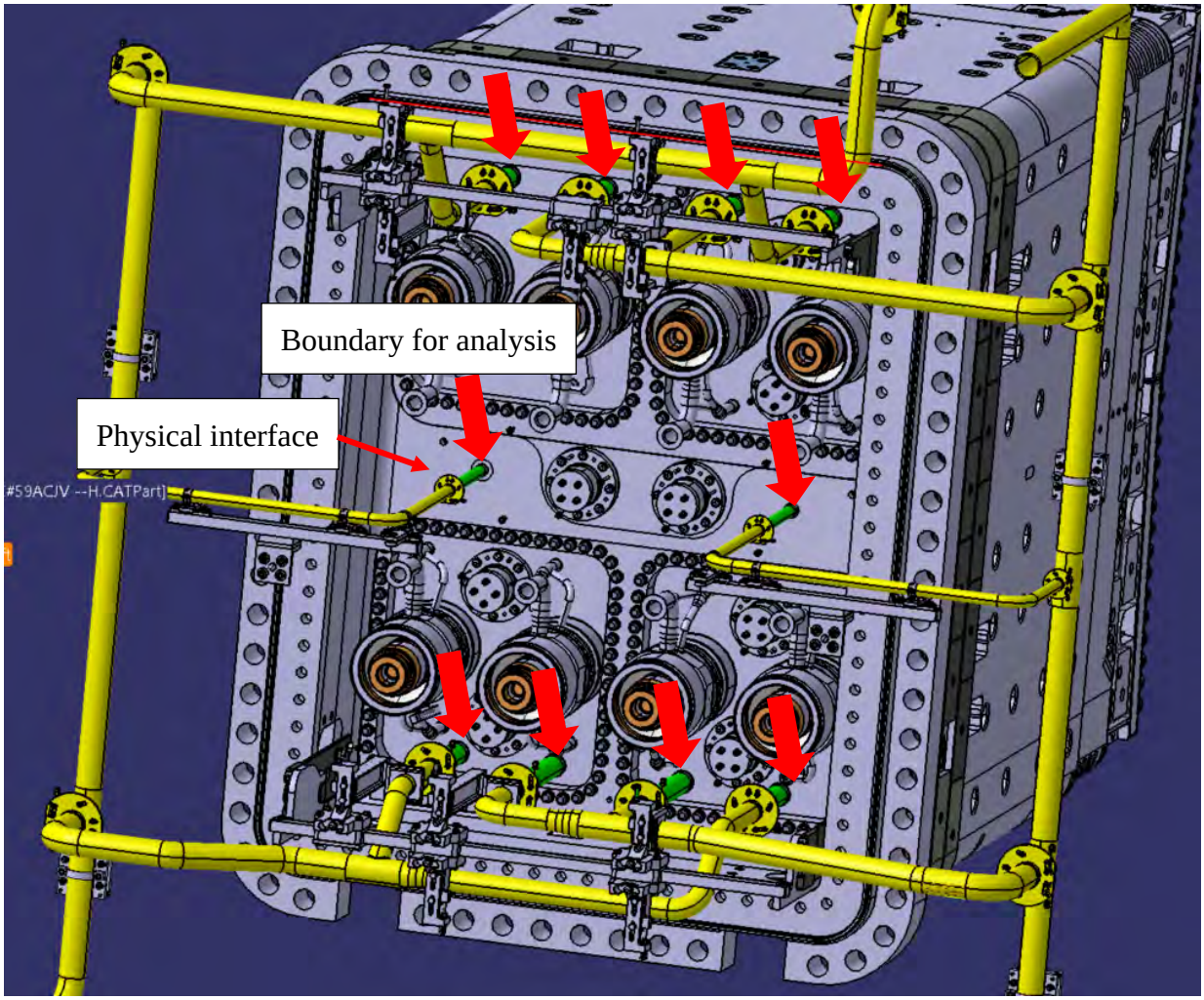

Figure 17: Boundary between ICRH Antenna and 51ANW3 piping for pipe stress analysis. Green pipe sections be included to the 51ANW3 analysis scope, loads to be provided at anchor point on the Antenna and RF modules.

5.7.3.6 Means for Adjustments at Interfaces during On-Site Installation

Contractor shall consider the as-design tolerances of the interfacing items in the 51ANW3 design and foresee the means of on-site adjustments to fit properly with interfacing pipes and supporting structures.

The design of the 51ANW3 piping and supports shall allow adaptation to the as-built, when inside the tolerances range, at least.

The nominal as-design positions and tolerances are provided in the CMM and interface documentation. Some of as-built positions will be known in later stage, at MRR, at release of the Phase 1 and prior starting the Phase 2.

Available as-built will be given at KOM of Phase 2. For majority of dimensions the work will continue with as-designed interfaces with need of on-site adjustment to as-designed tolerances.

Pipes and supports over lengths shall be foreseen to ease the installation works. Contractor shall estimate the quantity of spares for on-site installation as part of the [DL1-19], and based on [DL1-17]).

5.7.4 Integration Requirements

Contractor shall take into account the environment and neighbouring systems, when designing the 51ANW3 piping and supports lay-out in the 3D model.

When developing the detailed design, Contractor shall update simultaneously the 51ANW3 2D diagrams (PFD and PI&D) and 3D models and keep them consistent (as part of [DL1-2] and [DL1-3]).

3D environment can be shared for information (.3dxml, or .step file) upon request. The most up to date 3D model will be sent officially by IO to the contractor through Data Exchange Task (DET) at the Kick off Meeting (KOM).

Contractor shall not create clashes and shall keep adequate distance from surrounding systems to accommodate manufacturing tolerances and to consider space for 51AN3W equipment installation.

For illustration, Figure 18 and Figure 19 are showing the 51ANW3 PHTS distribution piping with environment in the equatorial port 13 interspace.

Updated and finalized piping and support 3D lay out shall be delivered and associated 2D diagrams, drawings and BOMs will be delivered by Contractor. As first step, the modification proposal [DL1-2] and diagrams [DL1-3] shall be approved, followed by 3D model, BOMs and drawings ([DL1-7], [DL1-8], [DL1-9], [DL1-10] and [DL1-11]).

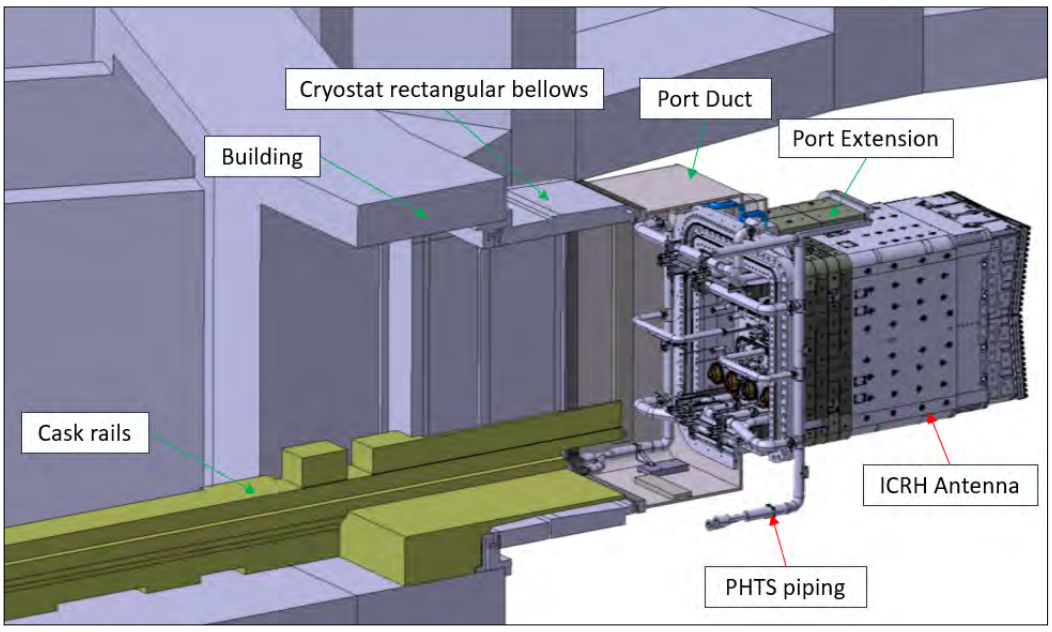

Figure 18: Interspace environment (cut view) and Antenna (with Antenna Transmission Lines Interspace Sections (ATLIS) and First Wall (FW) pumping assembly

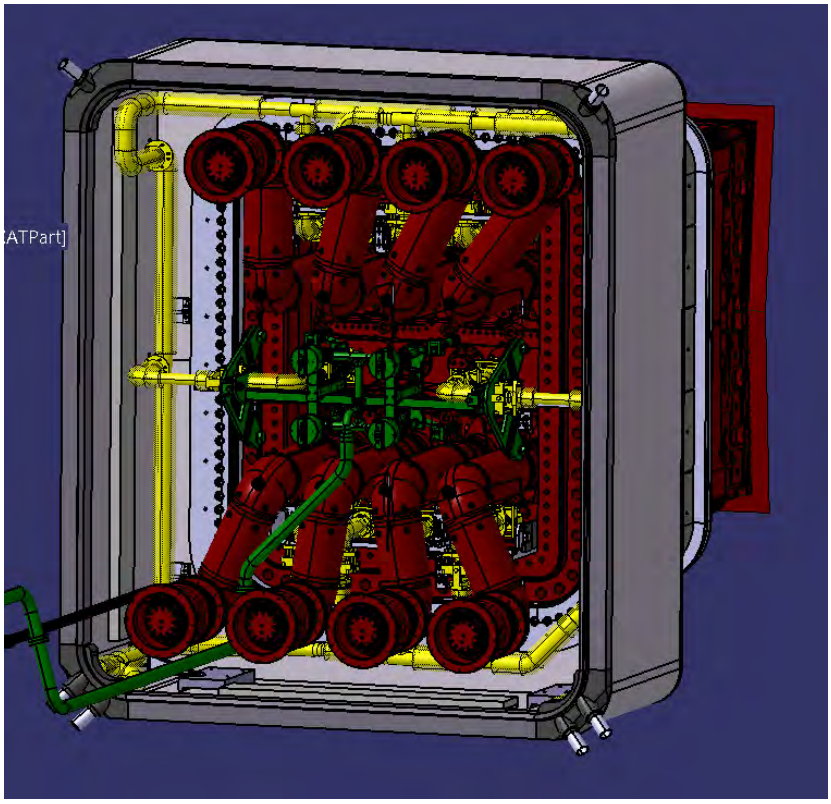

Figure 19: Port Interspace view (51AN3W piping in yellow colour, PBS-31 Service Vacuum System in green, PBS-15 VV Port Connecting Duct in grey)

5.7.5 Requirements for Structural and Seismic Analysis

The deliverables requesting analysis and calculations in the [DL1-4], [DL1-5] and [DL1-15] are comprising following main activities:

- Structural and seismic analysis
- FE analysis (if necessary to validate some specific locations or components)
- Hand calculation
- Detailed data post treatment according to EN 13480 Ref.[69] and EUROCODE Ref.[70]
- Report production in accordance with IO quality procedures
- Technical check from independent reviewers

All the analyses shown in the present document shall be conducted according to load specification Ref. [50] and complementary information in chapter 5.7.2.2

All the analysis produced shall be conducted in accordance with the Procedure for Analyses and Calculations Ref. [28] and with:

- EN 13480-3 Ref.[69]
- EUROCODE 3 Ref.[70]
- Instructions for Structural Analyses Ref.[40]
- Instructions for Seismic Analyses Ref.[41]
- The record of the model will be performed by the IO, the contractor shall ensure that the analysis output (i.e. models, results and spreadsheet / macros) are compliant with the Instructions for the Storage of Analysis Models Ref.[44]

- For all the PIC components (according to the classification Ref. [51] and section 5.4), the contractor shall follow the guidelines for qualification Ref.[46]. Overall qualification aspects related to the scope of work is part of the [DL1-16].

5.7.6 Final Design Review (FDR)

IO organizes Final Design Review (FDR) for whole ICRH Port Plug Antenna, including 51ANW3 piping in line with Ref.[25]. The deliverables from [DL1-2] to [DL1-18] will be part of the ICRH Antenna FDR documentation package.

The Contractor shall attend to the FDR and support the IO to answer the different questions. No presentation is expected from the Contractor.

5.7.7 Acceptance Criteria of the Phase 1

- On time production and approval of all deliverables listed in Table 8.
- NPE design endorsed by the ANB (proven by the ANB report)
- Approval of the “Phase 1 Compliance Matrix”. To demonstrate that the performed work is complying with all requirements of Phase 1 of this Technical Specification Contractor shall upload on IDM the “Phase 1 Compliance Matrix” for IO review and approval.

5.8 Scope of Supply for the Phase 2

5.8.1 Objectives of the Phase 2

Based on the completion of the Phase 1, FDR documentation and FDR outcome, Contractor develops the Manufacturing Design of 51ANW3 piping, thermal insulation and supports.

If available, IO will provide at KOM of the Phase 2 to the Contractor as built dimensions, to be taken into account during the manufacturing design development (VV Port Connecting Duct dimensions, position of interfacing pipes, etc..). Nevertheless, it is not expected to have all as-built information at the time of the KOM.

Piping 51ANW3 is NPE level N2 cat II, and Contractor acts as Manufacturer of the NPE(s).

Contractor involves and manages an ANB, to get verification and endorsement of the produced NPE manufacturing design.

Contractor produces the set of documents constituting the [DL2-2] and elaborates complete input package for 51ANW3 Manufacturing Readiness Review (MRR) in line with Ref. [17]. The minimum content of the [DL2-2] is detailed in Table 6.

Contractor contributes actively to the 51ANW3 MRR preparation and MRR meeting.

5.8.2 Manufacturing Readiness Review (MRR)

Prior starting any manufacturing or material procurement, IO will organize the 51ANW3 MRR according to IO procedure Ref. [17].
Once the 51ANW3 MRR is approved, IO will give the “Authorization To Proceed” (ATP).

The aim of the 51ANW3 MRR is to:

- Confirm that the manufacture of the concerned component is ready to start without incurring unacceptable risks.
- Give the ATP with manufacturing to the Contractor.

The MRR shall cover in particular:
- The material
- The personnel
- The machines and tools
- The manufacturing methods
- The transportation of components
- The requirements

For complete information, and MRR workflow, refer to IO procedure Ref. [17].

The Contractor shall:
- Produce all necessary documents of the MRR input package according to the Ref. [17], the main MRR input documents are listed in the Table 6 (corresponding to [DL2-2]).
- Keep up to date the list of MRR input documents and monitor the status of documents preparation following the IO template Ref.[27].
- Submit the MRR agenda proposal, for IO review and approval. MRR agenda shall be approved by the MRR panel Chair selected by IO.
- Prepare the necessary presentations (ppt files) to be used during the MRR and make them available on IDM prior the MRR meeting.
- Attend the MRR meeting at ITER site (remote or physical attendance)

All documents from the MRR input package shall be submitted in IDM to the IO for review and acceptance. Documents shall be approved and made available to the MRR panel prior the MRR meeting.

After the MRR has been held, the Chair will issue a formal report detailing the recommendations, if any, and the outcome of the MRR, as follow:
- Successful, in this case IO shall give the ATP
- Unsuccessful, in this case the Contractor shall resolve the issues identified, and a new MRR will take place.
- Conditionally successful, in this case the Contractor shall complete the activities (deemed minors) to comply with the MRR report recommendations. A new MRR is therefore not required in that case.

It should be noticed that a conditionally successful or unsuccessful MRR might have several contractual implications (financial, delay, unforeseen task) that will be discussed between IO and the Contractor.
In any case Phase 3 cannot start without successful completion of the MRR and ATP delivery.

Table 6: List of MRR documents

#doc	Title of document	Comments
Engineering		
[MRR-1]	List of Deviation Requests (DR) (if any)	pdf/word/excel

Table 6: List of MRR documents		
#doc	**Title of document**	**Comments**
[MRR-2]	List of Non-Conformity Reports (NCR), (if any)	pdf/word/excel , ITER NCR database
[MRR-3]	List of standards, codes and regulations	pdf/word/excel
[MRR-4]	Models (3D)	See section 11.4
[MRR-5]	Isometric drawings	pdf + native
[MRR-6]	Regulatory nameplates drawings	pdf/word
[MRR-7]	Supports Detailed Manufacturing 2D Drawings	pdf + native
[MRR-8]	Bill of Materials (BoMs) and List of minimum spare materials, according to templates: BOM Mechanical Discipline (ITER_D_YH3HJR v1.7) BOM Template-piping discipline (ITER_D_WKRHM5 v2.1)	excel
[MRR-9]	Equipment list (List Of Tagged Items) according to template Template for Construction Basic Tagged Item List (7) (ITER_D_B5RQUG v1.1)	excel
[MRR-10]	Verification Compliance Matrix (requirements and evidence) VCM is a compliance matrix that references the technical requirements and defined requirements that are specified in the present document, and is tracking their implementation.	excel
Manufacturing processes		
[MRR-11]	Manufacturing and Inspection Plan(s) for all items (pipes, fittings, insulation, filler, supports, etc) MIP template: Inspection Plan (IP) Template ITER_D_QV7GQF v1.3, as per Ref. [7].	docx/pdf and ITER Manufacturing Database “MDB”
[MRR-12]	Material procurement specifications for all materials (pipes, fittings, gaskets, , insulation, filler, materials for supports, etc)	docx/pdf
[MRR-13]	Nuclear Particular Material Appraisals (NPMAs) for nuclear pressure equipment	docx/pdf
[MRR-14]	Material management procedures (identification, traceability, storage, handling)	docx/pdf
[MRR-15]	Manufacturing procedures	docx/pdf
[MRR-16]	Welding data package for all works: - Welding procedures/welding Procedure Specification (WPS) - Welding procedure qualification record (WPQR) - Welding map	docx/pdf
Test methods		
[MRR-17]	Manufacturing quality control procedures (marking, dimensional)	docx/pdf
[MRR-18]	Non-Destructive Testing procedures (VT. PT, RT, UT, LT, ..)	docx/pdf
[MRR-19]	Hydrostatic Test procedure	docx/pdf
Quality acceptance		

Table 6: List of MRR documents		
#doc	**Title of document**	**Comments**
[MRR-20]	Quality Plan	docx/pdf
[MRR-21]	List of Suppliers/Sub-contractors and their scope	docx/pdf
[MRR-22]	Suppliers/Sub-contractors Quality Plans	docx/pdf
[MRR-23]	Agreed/Notified Bodies approvals (for NPE) or other third party (for other parts)	docx/pdf
[MRR-24]	Factory Acceptance Test	docx/pdf
[MRR-25]	MRR deliverables list (list of documents deliverables to be provided by the Manufacturer)	docx/pdf
List of qualified personnel		
[MRR-26]	List of qualified welders, and NDT personnel	docx/pdf /excel
Assembly		
[MRR-27]	51ANW3 On-site assembly procedure	docx/pdf
Transportation and preservation		
[MRR-28]	- Packing and preservation procedure - On-site storage and preservation procedure	docx/pdf

5.8.3 Acceptance Criteria of the Phase 2

- On time production and approval of all deliverables listed in Table 9.
- NPE documentations for procurement and manufacturing endorsed by the ANB.
- MRR successfully closed and ATP issued.
- Approval of the Phase 2 Compliance Matrix. To demonstrate that the performed work is complying with all requirements of Phase 2 of this Technical Specification, the Contractor shall upload on IDM the “Phase 2 Compliance Matrix” for IO review and approval.)

5.9 Scope of Supply of the Phase 3

5.9.1 Objectives of the Phase 3

The target of the Phase 3 is the fabrication and delivery of the piping 51ANW3.

Contractor acts as legal Manufacturer of the NPE(s).

Contractor involves and manages an ANB, to get validation of all procurement, manufacturing and control steps as required by NPE regulation and gets final NPE certification.

Contractor procures all row materials including spares for 51ANW3 piping, thermal insulation and supports.

Contractor fabricates 51ANW3 piping, thermal insulation and supports, and performs all required inspections and testing. Equipment shall be ready to be connected to the interfacing piping and structures on ITER site.

After final acceptance by IO, Contractor packs and ships all items to ITER site and delivers all full documentation package.

Execution of all material procurement, manufacturing and control phases leads to the completion of the LTR, which corresponds to [DL3-2]. LTR minimum content can be found in the Table 7.

5.9.2 Material Procurement

Contractor shall procure all the materials including spare quantities (defined during Phase 1, in [DL1-19]) in line with the MIPs and related documentation approved for MRR in Phase 2:

- Pipes, fittings (elbows, tees, reducers, flanges, gaskets, ...)
- Raw materials for supports (beams, plates, fasteners, clamps, ..)
- Raw material for the name plates
- Filler materials
- Thermal insulation and attachment features
- Any other materials identified in the design (Phases 1 and Phase 2), such as temporary plugs, temporary test connectors and temporary supports

Compliant with:

- NPMAs (when applicable)
- Standard EN 13480-2 and -4 (Ref.[69])
- Material Requirements in chapter 5.7.2.3

Material certificates 3.1 according to EN 10204, for temporary features certificate 2.2 as minimum.

5.9.3 Fabrication

5.9.3.1 Generalities for all fabrication and control steps

Contractor shall build the equipment in line with the MIPs and related documentation approved for MRR in Phase 2

All fabrication activities shall be performed in accordance with approved MIP, procedures and working instructions. Host state regulations (4.2.1), Design and manufacturing standards (4.2.2) and ITER particular requirements to 51ANW3 apply entirely. All welding shall be realized according to qualified procedures and by qualified welders as per EN 13480-4 Ref.[69]. All NDT shall be realised by qualified personnel EN 13480-4 Ref.[69].

ANB shall be involved each time when requested, to comply with the host state regulations.

Necessary tools, temporary supports or temporary test pieces are also in scope of the Contractor.

5.9.3.2 Fabrication of the piping, NPEs

- Piping to be fabricated per standard EN 13480-4 Ref.[69], host state regulations (section 4.2.1) and in line with the documentation produced in Phase 1 and Phase 2.
- Same applies to the name-plates fabrication and installation. Nameplates shall contain all mandatory information as requested by the host state regulations (section 4.2.1).

5.9.3.3 Fabrication of the supporting structures (or pre-fabrication for supports which cannot be installed on ITER site as one piece)

- Supports to be fabricated per standard EN 13480-4 Ref.[69] and EUROCODE 3 Ref.[70] and in line with the documentation produced in Phase 2.

5.9.3.4 Pre-fabrication/shaping of the removable thermal insulation

- Thermal insulation to be manufactured in line with the documentation produced in Phase 2 and following the recommendations of the insulation material supplier.
- Thermal insulation shall be installed at the last step, when all testing and examination have been performed.

5.9.3.5 Dimensional Control

- Verification and record of all dimensions according to applicable drawings the produced in Phase 2. Particular attention shall be given to the dimensions necessary to meet the requirements ("DNRE" French acronym "Dimension Nécessaire au Respect d'une Exigence").

5.9.3.6 Non-Destructive Testing – Visual, Surface, Volumetric

- NDT (VT, PT, UT, RT, as appropriate) shall be performed in line with the procedures developed in produced in Phase 2, and as per standard EN 13480-5 Ref.[69] (acceptance EN 5817 class B for all NDTs)

5.9.3.7 Non-Destructive Testing - Leak Testing with Tracer Gas (LT-TG)

- Helium Leak testing shall be realized at the end of the manufacturing, when hydrostatic test has been successfully performed and pipes drained and dried sufficiently, to allow helium leak testing.
- Leak test shall be carried out in line with the ISO 20485 Ref [71]. Appropriate method to be selected and proposed by the Contractor, in line with the targeted leak rate guided by the EN 1779 Ref [72]. Contractor can perform global leak testing of all the piping in the same time, or proceed with step-wise testing and make a summary of individual leak rates.
- Operators shall be qualified in accordance with ISO 9721 Ref.[73] and testing devices properly calibrated.
- Leak testing is performed at room temperature, and pipes shall not be pressurized above 0.5 bar(g) during the leak test.
- The appropriate temporary connectors shall be foreseen on both extremities of the process pipes to allow the realization of the test.
- Leak tightness acceptance criteria:
    - For 51ANW3 whole system (in line with Tritium Handbook [3] and chapter 5.6.3.2:

$$2.04 \times 10^{-7} \frac{Pa.m^3}{s} (air\ equivalent) = 5.49 \times 10^{-7} \frac{Pa.m^3}{s} (He\ equivalent)$$

5.9.3.8 Hydrostatic Pressure Tests

- Hydrostatic pressure test is carried out as part of the final assessment of the NPE in section 5.9.3.9.
- EN 13480-5 Ref.[69] shall be followed entirely.
- Pressure test minimum value: P_{test} = 92 bar(g) following the Table 4.
- Contractor shall foresee the appropriate temporary connectors or caps on all extremities of the pipes to allow the realization of the tests.

5.9.3.9 Final Assessment

NPE final assessment is composed of following main steps:

- Documentation verification
- Final Visual Examination (FVE)
- Hydrostatic pressure test (section 5.9.3.8)
- Installation of the regulatory NPE name-plates
- Edition of Certificate of Conformity(by ANB) and Declaration of Conformity (by Contractor)

5.9.3.10 Compilation of the Manufacturing Dossier and Related Documentation

- (Life Time Records, see details in 5.9.4)
- NPE Instruction manual (in line with Host State Regulations)
- Detailed instructions related to the on-site assembly of the supports and NPEs, including the on-site adjustment means, installation tolerances, instruction for connections to interfaces

5.9.3.11 Draining, Drying, Temporary Plugging

- After having completed successfully the on-site hydrostatic pressure tests, pipes shall be drained and dried.
- Hydro-tested pipes shall be drained by gravity as much as possible and after that shall be dried. The drying is considered satisfactory when the moisture of the air inside the pipe is below -20°C water dew point.
- Once the pipes are dried, tight temporary caps on extremities shall be put in place.
- Process to be repeated each time piping was opened.

5.9.3.12 Cleaning, Pickling, Passivation

- In view of the transportation and long term storage, cleaning, pickling and passivation shall be performed according to EN 13480-4 Ref.[69], and ASTM A380 Ref. [74]

5.9.4 Lifetime Records (LTR)

The Contractor shall compile the manufacturing completion dossier, so called “Lifetime Records” (LTR).

General LTR composition for NPEs is summarized in the Appendix I of Ref.[24] . Several documents already delivered in Phase 1 and Phase 2 are also part of the LTR, but they are not repeated in Table 7.

Table 7: Main contents of the LTR, based on the Ref.[24]

#doc	Title of document	Comments
[LTR-1]	Relevant documents from Phase 1 and Phase 2	
[LTR-2]	Completed and signed-off MIP(s)	
[LTR-3]	EN 10204 type 3.1 Material Test Certificates confirming compliance with this Technical Specification and meeting regulatory requirements for NPE – for all materials part of NPE	
[LTR-4]	Other relevant EN 10204 type 3.1 Material Test Certificates for non-pressure bearing parts (supports, insulation)	
[LTR-5]	Welding records	
[LTR-6]	Dimensional reports, As-built drawings	
[LTR-7]	Non Destructive Testing (NDT) reports and records	
[LTR-8]	Destructive testing reports	
[LTR-9]	Pickling, passivation and cleanliness reports	
[LTR-10]	Hydrostatic pressure test report	
[LTR-11]	Helium leak tightness test report	
[LTR-12]	Final inspection report	
[LTR-13]	All DRs and NCRs closed out	
[LTR-14]	Declaration of conformity by Manufacturer	
[LTR-15]	Certificate of Conformity by ANB	
[LTR-16]	Any other manufacturing record deemed by the IO to be relevant evidence of proper execution of this Technical Specification	

5.9.5 Factory Acceptance Test (FAT)

Several tests are part of the Factory Acceptance Tests (FAT) and cannot be all realized at once. As FAT are considered the steps from the Manufacturing and Inspection Plan (MIP) :

- All NDTs (5.9.3.6)
- Helium Leak test (5.9.3.7)

- Dimensional controls (5.9.3.5)
- Hydrostatic Pressure Test(s) (5.9.3.8)
- Documentation verification (5.9.4)

All of them shall be performed and found compliant with the acceptance criteria.

The Acceptance of the FAT corresponds to :

- MIP(s) for all equipment completely executed and all steps signed-off by all parties.
- Successful Final Assessment with ANB
- Delivery of the Certificate of conformity
- Delivery of the Declaration of conformity
- LTR hand-over

5.9.6 Packing, Shipment and Transportation to the ITER site

The contractor design and supply appropriate packaging, adequate to prevent damage during shipping lifting and handling operations. Where appropriate, accelerometers or other sensors shall be fitted to ensure that limits have not been exceeded. When accelerometers are used, they shall be fixed onto each box and shall be capable of recording the acceleration along three perpendicular directions.

Packaging shall allow storage during several months before the on-site installation.

Contractor manages the transportation to ITER site in line with the GM3S Ref [1]. Selected Incoterms delivery format shall be the DDP.

The shipment can occur only after having successfully performed the DRR (see section 5.9.7)

5.9.7 Delivery Readiness Review (DRR)

Before the shipping, a Delivery Readiness Review (DRR) shall be organized according to procedure Ref.[18]. IO will check the availability of the required documentation.

Contractor shall issue the documents in line with the procedure Ref. [18] as part of [DL3-3]. All IDM links to the templates are also provided in the procedure Ref. [18].

- Transportation Quality Plan for PIC
- Delivery Report
- Contractor Release Note (CRN)
- Packing List (PL)
- Equipment Storage & Preservation Requirements Form

All above listed documents shall be approved by IO prior the shipment.

5.9.8 Site Acceptance Tests (SAT)

Site Acceptance Tests (SAT) will be performed by IO representatives. The package will be opened, and following points shall be checked.

- Checking the integrity of the packaging and status of accelerometers
- Cleanliness and preservation check
- Visual check, quantities check
- Check of marking and NPE nameplates

- Documentation check

Successful SAT inspection is a condition for final acceptance of the items [DL3-4].

5.9.9 Acceptance Criteria of the Phase 3

- On time fabrication and delivery of 51ANW3 piping certified NPE, supports, and insulation to IO site.
- Items verified as per 5.9.8
- LTR as per 5.9.4 compiled and delivered
- Approval of the Phase 3 Compliance Matrix. To demonstrate that the performed work is complying with all requirements of Phase 3 of this Technical Specification Contractor shall upload on IDM the "Phase 3 Compliance Matrix" for IO review and approval.

6 Location for Scope of Work Execution

The work is expected to be performed at Contractor's facility. Some tasks can sub-contracted elsewhere, in accordance with the approved Quality Plan.

No work is expected on ITER site.

7 IO Documents & IO Free issue items

7.1 IO Documents

IO documents referred in this document are made available in the same time with present Technical Specification. The most recent versions will be provided at the KOM of each Phase.

7.2 Free Issue Items

Not applicable.

8 Deliverables and Schedule Milestones

The dues dates are specified on the basis of the following main milestones:

- T0: Contract signature
- T0+1 week: Date of the KOM for Phase 1
- T1: Date of KOM of Phase 2
- T2: Date of KOM of Phase 3

IO may need time to resolve design review chits after the FDR (Phase 1). It is therefore possible that Phase 2 will start up to 2 months after the closure of Phase 1,

8.1 Schedule for Equipment Delivery

The Supplier shall deliver to IO the following items, in the application of this technical specification, the GM3S Ref. [1] and any other requirement derived from the application of the contract.

Ref. ID	Description	UOM	Quantity	Delivery Time	Comment
1	51ANW3 piping, supports, thermal insulation, spare materials plus all accessories for on-site installation.	Batch	1	T2+12	

8.2 List of Deliverables

The Supplier shall provide IO with the documents and data required in the application of this technical specification, the GM3S Ref. [1] and any other requirement derived from the application of the contract.

Standard IO document review cycle on IDM is 15 days for review and 15 days for approval. Contractor shall foresee in the schedule the document review time, and possible iterations.

IO is going to review the documents in the best lead time, but regarding the IO Sign Off authority rules, experts review cannot be shortened.

In case of IO disapproval, or request for revision of a document (procedure, drawing…), the contractor shall submit a revised version to IO within 15 working days.

Table 8: Deliverables Phase 1

Phase 1	Deliverable (DL) Title	Type of DL/Comments	Due date (in months)
[DL1-1]	Quality plan for Phase 1	docx/pdf	T0+0.5
[DL1-2]	51ANW3 PHTS distribution piping and supports design optimization and improvements proposals (optimization and improvements shall cover all aspects – design, manufacturing, on-site installation plan, compliance with regulations, in service inspection)	Report in docx/pdf + 3D model : → if asynchronous: native files and step files → if synchronous: CATIA Models saved in ENOVIA Models in DRAFT status	T0+2
[DL1-3]	51ANW3 PHTS 2D diagrams (PFD and P&ID)	docx/pdf → if asynchronous: native files from schematics software → if synchronous: SSD Diagram published in Technical database	T0+3
[DL1-4]	Report on the 51ANW3 piping design (sizing, pressure drop, heat release estimation, insulation material selection, structural validation, determination of loads on interfacing piping)	docx/pdf +analysis files (storage in the IO specific analysis folder)	T0+8
[DL1-5]	Report on supports design (primary and secondary supports structural validation, including whip restrains determination of interfacing loads at attachments)	docx/pdf +analysis files (storage in the IO specific analysis folder)	T0+8

Table 8: Deliverables Phase 1			
Phase 1	**Deliverable (DL) Title**	**Type of DL/Comments**	**Due date (in months)**
[DL1-6]	Demonstration of code compliance to Essential Safety Requirements of the nuclear pressure equipment regulation Ref. [68]	docx/pdf	T0+8
[DL1-7]	3D models (report + 3D model)	docx/pdf + 3D model → if asynchronous: native files and step files → if synchronous: CATIA Models saved in ENOVIA Models in DRAFT status	T0+5
[DL1-8]	Lists of Tagged Items (LTIs) and Bills of Material(BoMs) BOM templates: BOM Mechanical Discipline (ITER_D_YH3HJR v1.7) BOM Template-piping discipline (ITER_D_WKRHM5 v2.1) LTI Template: Template for Final Design Basic Tagged Item List (7) (ITER_D_BW8K5U v2.1)	Excel	T0+5
[DL1-9]	Geneal Arrangement and Interface Drawing	→ if asynchronous: drawing (pdf and dwg/dxf files, stored in SMDD) → if synchronous: drawing drafted in ENOVIA & stored in SMDD (with BOM associated)	T0+5
[DL1-10]	Isometric Drawings (FDR level)	→ if asynchronous: drawing (pdf and dwg/dxf files, stored in SMDD) → if synchronous: drawing drafted in ENOVIA & stored in SMDD (with BOM associated)	T0+8
[DL1-11]	Supports Drawings (FDR level)	→ if asynchronous: drawing (pdf and dwg/dxf files,stored in SMDD) → if synchronous: drawing drafted in ENOVIA & stored in SMDD (with BOM associated)	T0+8
[DL1-12]	Hazard and Risk Analysis (HRA)	docx/pdf	T0+4
[DL1-13]	Nuclear Particular Material Appraisals (NPMAs)	docx/pdf	T0+4
[DL1-14]	List of dimensions necessary to meet the requirements “DNRE” (French acronym “Dimension Nécessaire au Respect d’une Exigence”).	docx/pdf	T0+8
[DL1-15]	Structural Integrity Report	docx/pdf	T0+9

Table 8: Deliverables Phase 1			
Phase 1	**Deliverable (DL) Title**	**Type of DL/Comments**	**Due date (in months)**
[DL1-16]	Qualification Synthesis Report	docx/pdf	T0+10
[DL1-17]	Outcomes of the feasibility mock-ups fabrication, conclusions and recommendations On-site installation plan	docx/pdf +Drawings → if asynchronous: drawing (pdf and dwg/dxf files, stored in SMDD) → if synchronous: drawing drafted in ENOVIA & stored in SMDD (with BOM associated) + 3D model → if asynchronous: native files and step files → if synchronous: CATIA Models saved in ENOVIA Models in DRAFT status	T0+9
[DL1-18]	Maintenance and Inspection Plan including NPE aspects, ALARA approach and maintenance feasibility for: - Mandatory NPE in service inspection - Piping non-permanent part removal and re-installation	docx/pdf	T0+10
[DL1-19]	List of spares	Excel	T0+10

Deliverables for the Phase 1 shall be at Final Design (FD) maturity level, as per IO MQP procedures and templates, Ref. [25] and Ref. [26].

Table 9: Deliverables Phase 2			
Phase 2	**Deliverable (DL) Title**	**Type of DL/Comments**	**Due date (in months)**
[DL2-1]	Quality plan for Phase 2	docx/pdf	T1+0.5
[DL2-2]	Manufacturing Readiness Review (MRR) document package as per Table 6 in section 5.8.	Excel MRR document list with status, as per the template Ref.[27]	T1+4

Deliverables for the Phase 2 shall be at MRR maturity level, as per the procedures Ref.[17] and Ref. [26] and associated templates.

Table 10: Deliverables Phase 3			
Phase 3	**Deliverable (DL) Title**	**Type of DL/Comments**	**Due date (in months)**
[DL3-1]	Quality plan for Phase 3	docx/pdf	T2+0.5
[DL3-2]	Manufacturing Competition Dossier (Lifetime Records, "LTR") Content detailed in Table 7 section 5.9.4	docx/pdf	T2+10
[DL3-3]	DRR Deliverables: Transportation Quality Plan for PIC Contractor Release Note (CRN) Delivery Report Packing List Equipment Storage & Preservation Requirements Form	docx/pdf Templates following Ref.[18]	T2+11
[DL3-4]	Reception of the equipment on IO site and SAT	Docs/pdf SAT report	T2+12

Deliverables for the Phase 3 shall be in line with as per the procedure Ref. [18] and associated templates.

9 Quality Assurance Requirements

The Quality class under this contract is QC1, as per [51], GM3S section 7 of Ref. [1] applies in line with the defined Quality Class.

Prior starting any activity Quality Plan shall be issued (for Phase 1 → [DL1-1], for Phase 2→ [DL2-1], for Phase 3→[DL3-1])

In any step of the contract execution, in case Contractor identifies the deviation from the requirements, he shall submit to IO a Deviation Request (DR), following the Ref.[9]. In case the con-compliances are detected, Non-Conformity Report (NCR) shall be submitted to IO following the Ref.[10].

10 Safety Requirements

The scope under this contract covers PIC components and PIAs, GM3S section 5.3 Ref. [1] applies. PE/NPE component design and manufacturing is also included in the scope of work.

ITER is a Nuclear Facility identified in France by the number-INB-174 ("Installation Nucléaire de Base").

For Protection Important Components and in particular Safety Important Class components (PIC/SIC), the French Nuclear Regulation shall be observed, in application of the Article 14 of the ITER Agreement.

In such case the Contractors and Subcontractors are informed that:

- The Order 7th February 2012 Ref. [65] applies to all the components important for the protection (PIC/SIC) and the activities important for the protection (PIA).
- The compliance with the INB-order shall be demonstrated in the chain of external contractors.

- In application of article II.2.5.4 of the Order 7th February 2012, contracted activities for supervision purposes are also subject to a supervision done by the Nuclear Operator.
- The ITER Policy on Safety Security and Environment Protection Management (ITER_D_43UJN7) Ref.[36] shall be circulated, known, understood and applied by all staff and cascaded down in the managerial lines of the contractor and, if applicable, to the subcontractors.

For the Protection Important Components, structures and systems of the nuclear facility, and Protection Important Activities the contractor shall ensure that a specific management system is implemented for his own activities and for the activities done by any Contractor and Subcontractor following the requirements of the Order 7th February 2012 Ref.[65].

The design and development of PIC components and systems including PIC components is a PIA activity. The ICRH Antenna is a PIC component and includes PIC sub-components. The full classification of the Antenna is given in the reference document Ref.[51]. All the activities specified in the section 5 fall into the scope of Protection Important Activities (given in Ref.[54]). The supplier shall comply with all requirements expressed in Provisions for implementation of the generic safety requirements by the external actors/interveners Ref. [35].

10.1 Nuclear Safety Class

According to components classification Ref.[51], the 51ANW3 piping are classified **Protection Important Components (PIC)** , SIC-1 as highest classification. Contractor shall apply Ref. [6] and Ref. [2] during all phases of the contract execution.

Protection Important Activities (PIAs) specified in accordance with Ref. [54], and shall be taken into account by the Contractor during all phases of the contract execution.

10.2 Seismic Class

According to components classification Ref. [51], the 51ANW3 piping are classified SC-1(S) , as highest. ITER Seismic Nuclear Safety Approach, Ref.[5] shall be applied in the components design.

11 Special Management Requirements

Requirement from Ref. [1] GM3S section 6 applies completed/amended with the specific requirements detailed in the present section.

11.1 Contract Gates

Following the GM3S Ref. [1].

11.2 Work Monitoring

Following the GM3S Ref. [1].

11.3 Meeting Schedule

Meetings can be organised face to face or remotely as agreed by the Parties with the exception of the KOM that has to be face to face at IO site. The kick-off meeting will mark the starting date in the contract planning (referred to as time T0). At this meeting, the contractor will have the opportunity to request and receive answer to any outstanding clarification / questions about the project. IO will confirm all applicable document versions. The KOM will cover the overall project detail with a focus on the Phase 1 scope.

During the execution of the contract, videoconference meetings shall be held to monitor the project progress. The videoconference software will be defined at the kick off meeting. These meetings shall be organized by the contractor, who will also be responsible to maintain the meeting records (minutes, actions and decisions). The Contractor representative has to provide the Minutes Of Meeting (MOM) to the CRO for review no later than one (1) week after the meeting took place. The meetings will be held bi-weekly unless otherwise agreed during the execution of the different phases. At the beginning of the contract, the contractor shall provide a meeting plan covering the whole Phase 1, then for other phases respectively, when triggered.

11.4 CAD Design Requirements

CAD work shall be performed in line with GM3S Ref [1].
According to Ref [1] section 6.2.2.2, the reference scheme is for the Contractor to work in a fully synchronous manner on the ITER CAD platform following the rules described in Specification for CAD data Production in ITER direct contracts, Ref. [13].

However, Contractor may decide to work in an asynchronous manner following the Ref. [13].
In case of asynchronous collaboration, the Contractor shall foresee frequent iterations on CAD deliverables for creation of in IO engineering data bases (such as functional references, part numbers, etc..). Contractor needs to ensure 2D/3D consistency and the CAD quality shall be in line with IO rules and references provided in the Ref. [13].

Drawings, diagrams and 2D/3D native files shall be stored in SMDD by the contractor in a dedicated folder given by IO at the KOM, in line with IO rules Ref.[13].

In asynchronous collaboration, drawings & diagrams shall be stored in SMDD with 2D native files (dxf, dwg) attached to documents, following the rules from ITER_D_JKT5KN - How to use the SMDD Application (System for the Management of Diagrams and Drawings). Publication will be performed by the contractor in a dedicated folder given by IO at the KOM, in line with IO rules Ref.[13]. 3D Model STEP files and 3D native files will be shared using DET (Data Exchange Task) process. All coordinates shall be given in ITER Coordinate Systems Ref.[14].

11.5 Audits and Surveillance

Audits, reviews, surveillance and inspection of the contractor's quality assurance arrangements and the compliance with the French 2012 INB order will be carried out as required by IO appointed representatives according to Ref.[11] and Ref.[12]. These activities may be extended to cover sub-contractors. In respect of any deficiencies revealed, the contractor shall implement,

or ensure that every sub-contractor implements, corrective actions in accordance with an agreed timescale.
IO shall inform the contractor for audits, reviews, surveillance and inspection activities including those involving a sub-contractor.
The contractor shall provide to IO the access to documentation, personnel and to his subcontractor's premises during all stages of the contract for purposes of audit, review, surveillance and inspection.
There could have the ASN/ITER scheduled or non-scheduled inspection/surveillance and the right of access to the contractor property have to be granted.

Appendix 1

To understand the various level of implementation steps, see Working Instruction and Template for a DCM (4GNQEZ v2.0)

Part 1 - List of SRD technical requirements to be satisfied						Part 2 - Implementation (for 51.AN.W3 PHTS)				
	Baselined data extracted from DOORS - not to be modified					Approved, documented evidences demonstrating RQ is implemented into design				
DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
51ICvcm20	51ICs1290	1.0-1.3.0-5	The International System of Units (SI) and its derived units shall be used throughout the IC H&CD System design and procurement.	Requirement	No	Desk-studies	B	Use of SI units, SI derived units, and units used in the applicable standards and host state regulations is requested in Technical Specification (FDQQXH).	Contractor to fill	Contractor to fill
51ICvcm25	51ICs1269	1.0-1.4.0-2	The IC H&CD system shall be compliant with the applicable versions for each Complementary and Input Applicable Document that are given in the REFS-51-IC [ITER_D_YJLU5L https://user.iter.org/?uid=YJLU5L].	Requirement	No	Desk-studies	B	Applicable documents from SRD-51 (28B33K) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm128	51ICs1937	1.1.1.0-1	The IC H&CD system shall be operated in each of the ITER operational phases as described in the ITER research plan [ADc54], [ADc60], [ADc61, [ADc62], [ADc67] and [ADc68].	Requirement	No	Desk-studies	B	30 years of operation propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm159	51ICs1332	1.1.3.0-1	The IC H&CD System, Sub-systems, Structures, and Components (SSC) shall be designed and operated (including qualification, manufacturing, installation, maintenance, preservation, commissioning and testing) in accordance with the requirements imposed by the following classifications: For all SSCs: Quality Class (QC), in accordance with the ITER Quality Classification Determination [ADc01]. Investment Protection Class (IPC), in accordance with ITER Investment Protection Handbook [ADc58]. For pressure equipment: Equipment Sous Pression class (PED), in accordance with Codes and Standards for ITER Mechanical Components [ADc05] For SSCs that (may) contain tritium and/or are (may come) into contact with tritium: Tritium Class (TC) in accordance with ITER Tritium Handbook [ADc28] For SSCs that are exposed to the Tokamak/Cryostat vacuum environment, and/or are part of vacuum systems: Vacuum Class (VQC), in accordance with ITER Vacuum Handbook [ADc12] For SSCs that are designed for maintenance in nuclear environment, and/or that perform nuclear maintenance/radwaste management activities: Remote Handling (RH) class, as defined in ADi2 section 6.14.2.	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > Quality Classification Determination (24VQES) > ITER Seismic Nuclear Safety Approach (2DRVPE) > Tritium Handbook (2LAJTW) > Safety Important Functions and Components Classification Criteria and Methodology (347SF3) > PED (2014/68/EU) > ESPN Order propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm160	51ICs1334	1.1.3.0-2	The Quality classification shall be determined in accordance with the ITER Quality Classification Determination [ADc1].	Requirement	No	Desk-studies	B	ICRH Antenna components classification (Q4MQRL) Quality Classification Determination (24VQES) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm161	51ICs1335	1.1.3.0-3	The IC H&CD Structure, System and Component (SSC) that must perform a safety function, and/or ensure the non-aggression of SIC, during and/or after a SL-2 earthquake shall be allocated the corresponding seismic classification (SC1 or SC2, S or SF), in accordance with the ITER Seismic Nuclear Safety Approach [ADc49] and Table 7-4 of ADi2.	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL), > ITER Seismic Nuclear Safety Approach (2DRVPE) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm163	51ICs1745	1.1.3.0-5	The Tritium classification shall be determined in accordance with the Tritium Handbook [ADc28].	Requirement	No	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL), > Tritium Handbook (2LAJTW) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill

Part 1 - List of SRD technical requirements to be satisfied						Part 2 - Implementation (for 51.AN.W3 PHTS)				
	Baselined data extracted from DOORS - not to be modified					Approved, documented evidences demonstrating RQ is implemented into design				
DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
51ICvcm165	51ICs1831	1.1.3.0-7	The Safety classification shall be determined in accordance with the Safety Important Functions and Components Classification Criteria and Methodology [ADc31]. (See also section 3.1.2, [51ICs1415].)	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > Safety Important Functions and Components > Classification Criteria and Methodology (347SF3) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm166	51ICs32	1.1.3.0-8	As part of the first confinement system, the following components shall be PIC / SIC-1: the antenna port plug flange and attached welded/bolted flanges, the front (that is, primary) RF vacuum windows, the rear (that is, secondary) RF windows, the antenna transmission lines that are located between the RF windows, the diagnostics (probes, thermocouples) electrical feedthroughs, the PHTS external coolant lines. This list is not exhaustive, and the full safety classification of IC H&CD components shall be determined by the design activities (refer to [51ICs1415] and [ADc31]).	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > Quality Classification Determination (24VQES) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm170	51ICs357	1.1.3.0-12	The qualification of the IC H&CD components shall comply with Attachment 1 of the Quality Classification Determination [ADc1].	Requirement	No	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > Quality Classification Determination (24VQES) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm171	51ICs34	1.1.4.0-1	The IC H&CD system shall be subject to the design basis conditions specified in the Load Specifications (LS) [ADc2].	Requirement	No	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm173	51ICs1219	1.1.4.0-3	Specific load specification documents shall apply to the IC H&CD Antenna Port plug [ADc3] and Transmission Lines [ADc20], [ADc64] sub-system.	Requirement	No	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm180	51ICs1082	1.1.5.1.1.0-3	PBS 15 (Vacuum vessel, ELM and Manifolds): · Physical and functional interface · Interface Control Document (ICD) between Vacuum Vessel (PBS 15) and IC H&CD (PBS 51) [ITER_D_2E3B4R https://user.iter.org/?uid=2E3B4R]	Requirement	No	Desk-studies	B	IS-15-51-001 (2EAQDT) IS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm187	51ICs1086	1.1.5.1.5.0-2	PBS 23 (Remote Handling System): · Physical and functional interface · Interface Control Document (ICD) Remote Handling System (PBS 23) - Ion Cyclotron H&CD (PBS 51) [ITER_D_2ZVFYN https://user.iter.org/?uid=2ZVFYN]	Requirement	No	Desk-studies	B	IS-23-51-001 (6EE6U) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm193	51ICs1088	1.1.5.1.6.0-6	PBS 26-PH (Tokamak Cooling Water System): · Physical and functional interface · Interface Control Document (ICD) between Ion Cyclotron H&CD (PBS 51) & Tokamak Cooling Water System (PBS 26-PH) [ITER_D_2NPUEH https://user.iter.org/?uid=2NPUEH]	Requirement	No	Desk-studies	B	IS-26.PH-51-001 (4C3AZH) IS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm283	51ICs1206	1.2.1.1.0-1	The IC H&CD system shall be designed to operate for the whole operating lifetime of ITER, namely not less than 20 years.	Requirement	No	Desk-studies	B	30 years of operation propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm293	51ICs1366	1.2.1.1.0-11	The IC H&CD system shall be designed to accommodate 500 baking cycles from the commissioning phase to the end of life of ITER.	Requirement	No	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm309	51ICs120	1.2.1.3.0-2	All of the IC H&CD system components shall use technology that is available and which reliability can be demonstrated before being installed in ITER.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > Application of EN 13480, which implies the use of	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
								standard component for pressure purposes only > Application of MQP L3 Procedure for Qualification of Protection Important Components (PIC) (XB5ABP) if some non qualified materials need to be used > Qualification Synthesis Report according to Design Review Procedure (2832CF)		
51ICvcm318	51ICs1172	1.2.1.3.0-11	The IC H&CD equipment shall be delivered to ITER site in packaging designed to provide environmental protection and to maintain cleanliness during transport and on-site storage.	Requirement	No	Desk-studies	B	Shipment and storage related deliverables foreseen in the Technical Specification (FDQQXH): > Equipment Storage & Preservation > Transportation Quality Plan Requirements from Working Instruction for the Delivery Readiness Review (DRR) (X3NEGB) applies entirely	Contractor to fill	Contractor to fill
51ICvcm326	51ICs1814	1.2.1.5.0-1	The design of the IC H&CD system shall comply with the use of coordinates systems specified in ITER Coordinate Systems [ADc24].	Requirement	No	Desk-studies	B	ITER Coordinate Systems (2A9PXZ) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm331	51ICs570	1.2.1.5.0-6	The permanently installed IC H&CD system equipment shall not obstruct the access for remote handling operations in the port cell.	Requirement	No	Desk-studies	B	Space reservation for permanent parts is delimited in PBS-51 CMM propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm344	51ICs482	1.2.2.1.0-12	The antenna structure and components shall be designed with technology which reliability can be demonstrated before being installed in ITER.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > Application of EN 13480, which implies the use of standard component for pressure purposes only > Application of MQP L3 Procedure for Qualification of Protection Important Components (PIC) (XB5ABP) if some non qualified materials need to be used > Qualification Synthesis Report according to Design Review Procedure (2832CF)	Contractor to fill	Contractor to fill
51ICvcm348	51ICs469	1.2.2.1.0-16	The antenna shall be designed to allow hands-on operations to prepare the RH cask docking.	Requirement	No	Desk-studies	B	IS-23-51-001 (6EE6U) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm450	51ICs124	1.2.3.0-1	Codes and standards for IC H&CD mechanical components shall follow the general ITER specifications: Codes and Standards for ITER Mechanical Components [ADc5].	Requirement	No	Desk-studies	B	Codes and Standards for ITER Mechanical Components (25EW4K) Application of the EN 13480 and EUROCODE 3 propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm454	51ICs147	1.2.4.0-1	The mechanical structure of the IC H&CD system components shall satisfy the design criteria that are specified in the applicable codes and standards. See [51ICs124-R] and [ADc5]; in particular, for the in-vessel components, the SDC-IC [ADc26] applies.	Requirement	No	Desk-studies	B	Codes and Standards for ITER Mechanical Components (25EW4K) Application of the EN 13480 and EUROCODE 3 propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm470	51ICs155	1.2.5.0-1	The design of the IC H&CD system shall take into consideration loading values that result from seismic events that are categorized under SL-1, SMHV and SL-2, inclusive of any applicable amplification factor.	Requirement	Yes	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
51ICvcm475	51ICs1438	1.2.5.0-6	The combination of loads from earthquakes with other loading events shall be considered.	Requirement	Yes	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm476	51ICs1436	1.2.5.0-7	The IC H&CD Structures, Systems and Components (SSC) that are allocated a seismic class shall be designed, constructed and operated (including its maintenance) such that their capabilities are maintained as credited during/after the SL-2 seism, as defined in ITER Seismic Nuclear Safety Approach [ADC49].	Requirement	Yes	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm477	51ICs1437	1.2.5.0-8	The collapse, falling, dislodgement or any other spatial response of a component, as a result of an earthquake, shall not jeopardize the functioning of other components that provide a safety function during or after the earthquake.	Requirement	Yes	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm478	51ICs1874	1.2.5.0-9	The PBS 51 components located inside nuclear buildings and subject to creating a missile hazard to PIC shall at minimum be classified as SL2-SC2.	Requirement	Yes	Desk-studies	B	ICRH Antenna components classification (Q4MQRL) Quality Classification Determination (24VQES) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm488	51ICs1604	1.2.6.0-4	Potential ignition sources in the IC H&CD system shall be prevented or limited. Where an ignition source is present in a room, area or component, appropriate protection measures shall be taken.	Requirement	Yes	Desk-studies	B	51ANW3 are composed of non-combustible materials (steel and mineral wool). Not crating additional fire loads. Fire event covered in the Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm490	51ICs1967	1.2.6.0-6	When an IC H&CD system SIC component is required to perform a safety function during/after a fire occurring within its fire sector, provisions shall be implemented (as needed) to ensure that the IC H&CD system SIC component can perform its credited safety function.	Requirement	Yes	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm665	51ICs173	1.2.16.0-3	Corrosion, electrochemical, and other chemical effects shall be limited to acceptable levels over the whole life of the system, including the deactivation and decommissioning phase.	Requirement	No	Desk-studies	B	Stainless steel materials and mineral wool are selected in Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm673	51ICs669	1.2.17.0-1	The materials for the IC H&CD system shall be selected in accordance with the properties specified in the Materials Properties Handbook (MPH) [ADc30], ITER Vacuum Handbook [ADc12], ITER Tritium Handbook [ADc28], Chemical Impurities document [ADc32] and Nuclear Radiation Compatibility for Electrical, Electronic and Electromechanical Components [ADc65].	Requirement	No	Desk-studies	B	Tritium Handbook (2LAJTW) Chemical composition and impurity requirements for materials (REYV5V) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm674	51ICs667	1.2.17.0-2	Material choice considerations shall include IC H&CD system performance, vacuum and tritium compatibility, resistance to radiation, activation during operation, and minimizing the introduction of impurities in the plasma.	Requirement	Yes	Desk-studies	B	> Tritium Handbook (2LAJTW) > Chemical composition and impurity requirements for materials (REYV5V) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm675	51ICs666	1.2.17.0-3	The source of material properties for design analysis shall either be the applicable structural code or the ITER Material Properties Handbook [ADc30]. In case of differences between these references the MPH shall take precedence. (This requirement is not applicable for ceramics.)	Requirement	No	Desk-studies	B	Application of the EN 13480 and EUROCODE propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
51ICvcm676	51ICs782	1.2.17.0-4	Low activation materials shall be selected when this enables to reduce the contact dose, decay heat and the activation level of radioactive waste.	Requirement	Yes	Desk-studies	B	Chemical composition and impurity requirements for materials (REYV5V) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm677	51ICs1370	1.2.17.0-5	Depending on operational conditions (such as maximum expected neutron flux and fluence) and allowable dose rate, the admissible contents of materials in impurities significantly contributing to the activation shall be established. These limits on impurity concentration shall be technically feasible and reasonably achievable. The requirements for limit of impurities are defined in [ADc32].	Requirement	Yes	Desk-studies	B	Chemical composition and impurity requirements for materials (REYV5V) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm678	51ICs1809	1.2.17.0-6	Magnetic materials with a relative permeability exceeding 1.03 shall not be used inside the vacuum vessel nor within the IC H&CD port cell interspaces without formal project approval.	Requirement	No	Desk-studies	B	Relative magnetic permeability for materials below 1.03 propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm679	51ICs1371	1.2.17.0-7	Materials and their joints which are in contact with fluid shall be selected taking into account their corrosion resistance during ITER lifetime.	Requirement	No	Desk-studies	B	Stainless steel defined for the piping Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm680	51ICs1047	1.2.17.0-8	On all IC H&CD demineralized water cooling circuits, the use of brass and other materials subject to corrosion by demineralised water shall be prohibited. This requirement applies to all pipework and fittings.	Requirement	No	Desk-studies	B	Stainless steel defined for the piping Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm685	51ICs670	1.2.17.0-13	The use of halogenated materials is forbidden in areas or volumes that are served by the Detritiation System (DS) or by the Tokamak Exhaust Processing System (TEPS). Exceptions shall require a formal project approval. (The procedure for formal project approval shall include approval of the Nuclear Safety and Tritium Plant Responsible Officers.)	Requirement	Yes	Desk-studies	B	Tritium Handbook (2LAJTW) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm686	51ICs664	1.2.17.0-14	Commercial materials shall conform to the applicable standards (ASTM, JIS, DIN) for the definition of their grade, physical, chemical and electrical properties and related testing.	Requirement	No	Desk-studies	B	Codes and Standards for ITER Mechanical Components (25EW4K) Application of the EN 13480 and EUROCODE 3 propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm687	51ICs671	1.2.17.0-15	All materials for which a suitable certification from the supplier is not available shall be tested to determine the relevant properties, as part of the procurement.	Requirement	No	Desk-studies	B	Application of the EN 13480 and EUROCODE 3, implies the use of standard materials. Additional requested material properties are specified in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm689	51ICs674	1.2.17.0-17	A complete traceability of all the materials, including welding materials, shall be provided.	Requirement	No	Desk-studies	B	Application of the EN 13480 and EUROCODE 3, requires the traceability materials. Additional requested material properties are specified in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm702	51ICs185	1.2.18.0-1	The manufacturing tolerances shall be consistent with achieving the overall installation tolerances, taking into account inaccuracies that result from installation and tolerances of mating components.	Requirement	No	Desk-studies	B	Interfacing equipment locations and tolerances provided to the contractor. On-site installation plan and means of adjustments is a required deliverable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm703	51ICs186	1.2.18.0-2	All IC H&CD system components shall be qualified for compliance with their requirements; and the manufactured / assembled components shall be compliant with their design.	Requirement	Yes	Desk-studies	B	Technical Specification (FDQQXH) requires: > Application of EN 13480, which implies the use of standard component for pressure purposes only > Application of MQP L3 Procedure for Qualification of Protection Important Components (PIC) (XB5ABP) if some	Contractor to fill	Contractor to fill

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								non qualified materials need to be used > Qualification Synthesis Report according to Design Review Procedure (2832CF)		
51ICvcm707	51ICs692	1.2.18.0-6	The manufacturing of the IC H&CD components that are exposed to the tokamak vacuum, and of nuclear safety relevant equipment located in the nuclear buildings, shall comply with the requirements listed in Table 1 of Codes and Standards for ITER Mechanical Components [ADc5].	Requirement	Yes	Desk-studies	B	Codes and Standards for ITER Mechanical Components (25EW4K) Application of the EN 13480 and EUROCODE 3 propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm726	51ICs204	1.2.21.0-1	Prior to installation, the IC H&CD system deliveries will be placed in storage facilities at the ITER site. The required space, the required ambient conditions and the storage schedule shall be established prior to delivery and submitted to IO for approval.	Requirement	No	Desk-studies	B	Shipment and storage related deliverables foreseen in the Technical Specification (FDQQXH): > Equipment Storage & Preservation > Transportation Quality Plan Requirements from Working Instruction for the Delivery Readiness Review (DRR) (X3NEGB) applies entirely	Contractor to fill	Contractor to fill
51ICvcm741	51ICs757	1.2.22.0-3	Test phases that are envisioned for the IC H&CD subsystems shall be performed both at the factory and on site at various phases, as illustrated in Figure 2.22.	Requirement	No	Desk-studies	B	Test and Inspection defined in Technical Specification (FDQQXH) >FAT >SAT	Contractor to fill	Contractor to fill
51ICvcm746	51ICs760	1.2.22.0-7	Where relevant, the following types of factory tests shall be performed on sub-components or parts of sub-components: · Dimensional checks · Pressure and thermal tests · Vacuum test (leak and outgassing) · Hydraulic flow test · Electrical test · Mechanical test · Functional test.	Requirement	No	Desk-studies	B	Test and Inspection defined in Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm782	51ICs1379	1.2.24.3.0-3	Design verification by qualification testing shall be performed as early as possible and prior to the point when related system, structures, and/or components are installed.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > Application of EN 13480, which implies the use of standard component for pressure purposes only > Application of MQP L3 Procedure for Qualification of Protection Important Components (PIC) (XB5ABP) if some non qualified materials need to be used > Qualification Synthesis Report according to Design Review Procedure (2832CF)	Contractor to fill	Contractor to fill
51ICvcm784	51ICs1978	1.2.24.3.0-5	All IC H&CD Structures, Systems and Components (SSC) shall be qualified to demonstrate they can perform their allocated functions with the required level of quality and performances. The extent and type of qualification (studies, calculations, testing, R&D, etc) shall be compliant with the applicable specifications, codes and standards, and commensurate with the level of risks associated with the SSC role, technological novelty and complexity, etc.	Requirement	Yes	Desk-studies	B	Technical Specification (FDQQXH) requires: > Application of EN 13480, which implies the use of standard component for pressure purposes only > Application of MQP L3 Procedure for Qualification of Protection Important Components (PIC) (XB5ABP) if some non qualified materials need to be used > Qualification Synthesis Report according to Design Review Procedure (2832CF)	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
51ICvcm790	51ICs1783	1.2.24.4.0-2	Where traceability is required, as for all PIC systems, structures or components, or for parts whose lifecycle has to be monitored during the life of the project, unique identification of individual items or batches shall be implemented [R33].	Requirement	No	Desk-studies	B	Procedure for Identification and Controls of Items (U344WG) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm791	51ICs1708	1.2.24.5.0-1	All labelling, colour coding and signage installed on the IC H&CD system shall comply with the ITER Site Signage and Graphics Standards [ADc39].	Requirement	Yes	Desk-studies	B	> ITER Site Signage & Graphics Standards (4ALJEU) > Procedure for Identification and Controls of Items (4ALJEU) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm794	51ICs1979	1.2.24.5.0-4	All IC H&CD system identification, labelling and signage shall be standardised to reduce the likelihood of error. (Labelling of Equipment on ITER Project [ADc43])	Requirement	No	Desk-studies	B	Specification for Labelling of Equipment on ITER Project (TL25DK) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm800	51ICs1400	1.3.1.1.0-5	The design of the IC H&CD system safety structures, systems and components (SSC) shall be failure-tolerant	Requirement	Yes	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm801	51ICs1980	1.3.1.1.0-6	No failure of the IC H&CD system safety structures, systems and components (SSC) shall result in unacceptable consequences to the workers, public and/or environment.	Requirement	Yes	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm804	51ICs399	1.3.1.1.0-9	The contributions of the IC H&CD to the tokamak first confinement system shall include static barriers; on this confinement system double windows shall be provided. These contributions shall comprise the following components: · Antenna port plug flange and attached welded/bolted flanges · The primary (that is, front) and secondary (that is, rear) RF windows · The antenna transmission lines that are located between RF windows · The vacuum pumping system of the antenna transmission lines and the vacuum circuit that is associated with the vacuum leak test system · Diagnostics electrical feedthroughs (probes, thermocouples) · The external coolant lines connecting to the PHTS This list is not exhaustive, and the full list shall be determined by the design activities (refer to [51ICs1415] and [ADc31]).	Requirement	Yes	Desk-studies	B	51ANW3 PHTS piping is part of a confinement system (IBED PHTS loop). It is accordingly classified (SIC-1) and designed. > ICRH Antenna components classification (Q4MQRL) > Load Specification for the IC H&CD Antenna (33CETP) applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm806	51ICs1414	1.3.1.2.0-1	Sub-systems, Structures and Components of the IC H&CD system that play an important role in the protection of ITER and its environment, shall be classified as Protection Important Components, as considered in the INB order of 7 February 2012 [R18].	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > Safety Important Functions and Components Classification Criteria and Methodology (347SF3) Applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm808	51ICs1416	1.3.1.2.0-3	The IC H&CD system SIC that are pressure equipment containing radioactive substances with a specific level of risk of radioactive release in case of failure, shall be classified as ITER nuclear pressure equipment (NPE), in compliance with Codes and Standards for ITER Mechanical Components [ADc5]	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > PED (2014/68/EU) > ESPN Order propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm811	51ICs1424	1.3.1.2.0-6	The design of the IC H&CD system SIC systems, structures, and components shall include all loading events (see 51ICs1230-R and 51ICs1989 for PR 6137-R) for which the components may be required to perform a safety function.	Requirement	Yes	Desk-studies	B	Load Specification for the IC H&CD Antenna (33CETP) LS applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill

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			This shall include, as necessary, the ageing effect of the environmental conditions and loads to which a SIC is exposed during its expected service life, followed by the incidental/accidental conditions and loads during/after which the SIC must perform its required safety function.							
51ICvcm812	51ICs1425	1.3.1.2.0-7	The IC H&CD SIC Structures, Systems and Components shall be designed (including qualification), fabricated, installed, commissioned, inspected and maintained in accordance with the applicable codes, standards, and authorized ITER specifications. Related rules and standards are selected for each SIC using the guidelines that are given in Safety Important Functions and Components Classification Criteria and Methodology [ADc31].	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > Safety Important Functions and Components Classification Criteria and Methodology (347SF3) > Load Specification for the IC H&CD Antenna (33CETP) Applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm816	51ICs1982	1.3.1.2.0-11	The IC H&CD system SIC components that are classified as Nuclear Pressure Equipment (NPE) shall be designed, manufactured, installed, operated, maintained and tested in compliance with Radioprotection guide for NPE application [ADc50].	Requirement	Yes	Desk-studies	B	> Radioprotection guide for NPE application (2LTQ96) > Radiation Protection Requirements for the ITER Vacuum Vessel and Ports Components (2M2F8H) Applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm820	51ICs1452	1.3.1.3.0-1	At ITER two confinement systems is provided for each principal inventory of radioactive or toxic material, and this means for the IC H&CD systems that: All IC H&CD components containing radioactive/toxic materials shall be confined in an appropriate secondary confinement system (usually provided by nuclear buildings). This concerns the IC penetrations through the primary confinement systems (like VV) and the IC components cooling channels and piping containing the radioactive PHTS coolant up to the interfaces with PHTS. All IC H&CD components that are activated and/or contaminated with radioactive/toxic materials shall be confined in an appropriate primary confinement system (VV, port cells, cask, hot cell, waste package...). Formal project approval shall be required for a single confinement system of any radioactive/toxic inventories of IC H&CD system.	Requirement	Yes	Desk-studies	B	51ANW3 PHTS distribution is located exclusively inside the Port Cell #13 As per the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm823	51ICs1456	1.3.1.3.0-4	When a confinement system of the IC H&CD is removed, compensatory measures shall be taken to limit the risk in the unlikely event of a challenge to the remaining confinement system. These compensatory measures shall include, as necessary: Limiting the mobilizable source term: The volumes (potentially) containing tritium- atmosphere shall be detritiated prior to opening to obtain a low tritium concentration in the volume (in particular for the vacuum vessel). Inventories shall be segregated or stabilized to a safe state. Limiting the energy that is available to mobilize inventories: Processes shall be shut down. Cooling water systems servicing in-vessel components shall be depressurized. Confinement measures: Filtration and/or detritiation shall be maintained. Leak-tight, fire-resistant transfer casks shall be used to transfer activated components, and components that are contaminated with toxic or	Requirement	Yes	Desk-studies	B	51ANW3 PHTS distribution piping is designed to be drained and dried together with PBS-26 PHTS loop. 51ANW3 PHTS design parameters are covering PHTS loop draining, drying, blowout. IS-26.PH-51-001 (4C3AZH) IS applicable in the Technical Specification (FDQQXH) and design parameters specified.	Contractor to fill	Contractor to fill

Part 1 - List of SRD technical requirements to be satisfied						Part 2 - Implementation (for 51.AN.W3 PHTS)				
	Baselined data extracted from DOORS - not to be modified					Approved, documented evidences demonstrating RQ is implemented into design				
DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
			radioactive contaminants, between the Tokamak Machine and Nuclear Maintenance and Radioactive Waste Management Facilities. Alternate, temporary systems and/or barriers (like tents) shall be provided.							
51ICvcm830	51ICs1462	1.3.1.3.0-11	The IC H&CD confinement systems shall be designed to ensure their function in all conditions and events for which their function is credited in the safety analysis.	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > Load Specification for the IC H&CD Antenna (33CETP) Applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm833	51ICs1463	1.3.1.3.0-14	The IC H&CD confinement system shall be designed against all loads and conditions that result from accident sequences during/after which their function is credited in the safety analysis.	Requirement	Yes	Desk-studies	B	> ICRH Antenna components classification (Q4MQRL) > Load Specification for the IC H&CD Antenna (33CETP) Applicable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm834	51ICs1465	1.3.1.3.0-15	The IC H&CD system shall minimize its fire loading in each fire sector (including during maintenance activities), in compliance with the relevant fire hazard analysis.	Requirement	Yes	Desk-studies	B	Technical Specification (FDQQXH) minimizes the fire loading as follows: > Only metallic materials and mineral wool are part of the system > Robust design targeted to limit the maintenance tasks to the regulatory in-service inspection	Contractor to fill	Contractor to fill
51ICvcm851	51ICs1487	1.3.1.3.0-32	Components of the IC H&CD system (such as high energy fluid piping/containers and components with risk of explosion or with potential failure of moving parts) that could impact SIC systems or confinement, shall be designed to prevent the generation of a missile or to limit the consequences associated with this hazard. This shall include periodic control, testing and inspection in order to detect precursor signs of associated missile risks.	Requirement	Yes	Desk-studies	B	HELB aspects and pipe whip restrains supply are in scope of the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm852	51ICs1488	1.3.1.3.0-33	Components of the IC H&CD system that transport high energy fluids (with a pressure greater than 20 bar absolute, or a temperature greater than 100ºC) shall be designed to prevent pipe whipping, or to limit the consequences that are associated with this hazard. This shall include periodic control, testing and inspection, to detect precursor signs of associated pipe whip risks.	Requirement	Yes	Desk-studies	B	HELB aspects and pipe whip restrains supply are in scope of the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm853	51ICs1489	1.3.1.3.0-34	The IC H&CD PIC components shall be protected against the risk that is associated with potential missiles from high energy fluid circuits (pressures greater than 20 bar absolute or temperatures greater than 100ºC), or from other potential sources of missiles (such as internal explosion or failure of a machine with moving parts).	Requirement	Yes	Desk-studies	B	HELB aspects and pipe whip restrains supply are in scope of the Technical Specification (FDQQXH) (as surrounding PIC cannot be protected, 51ANW3 shall be designed to avoid pipe whip)	Contractor to fill	Contractor to fill
51ICvcm854	51ICs1490	1.3.1.3.0-35	The IC H&CD PIC components shall be protected against the risks that are associated with potential pipe whipping from high energy fluid circuits (pressures greater than 20 bar absolute, or temperatures greater than 100ºC)	Requirement	Yes	Desk-studies	B	HELB aspects and pipe whip restrains supply are in scope of the Technical Specification (FDQQXH) (as surrounding PIC cannot be protected, 51ANW3 shall be designed to avoid pipe whip)	Contractor to fill	Contractor to fill
51ICvcm874	51ICs1509	1.3.1.4.0-1	The As Low As Reasonably Achievable (ALARA) principle shall be applied to minimize occupational doses.	Requirement	Yes	Desk-studies	B	In the Technical Specification (FDQQXH) : > Guidelines for ALARA Implementation (W6655F) is applicable > Chemical composition and impurity requirements for materials (REYV5V) is applicable	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
								> Robust design targeted to limit the maintenance tasks to the regulatory in-service inspection		
51ICvcm876	51ICs1511	1.3.1.4.0-3	For the IC H&CD system and its components that are located and/or are planned to be maintained and/or inspected in nuclear environment, their design and operation shall minimize worker exposure to radiological hazards by applying the ALARA principles, and in all cases by ensuring that occupational doses are within: The General Safety Objectives given for personnel (ADi2 PR1112). Their contributions to the annual target for ITER collective annual worker dose (ADi2 PR1129) is ALARA.	Requirement	Yes	Desk-studies	B	In the Technical Specification (FDQQXH) : > Guidelines for ALARA Implementation (W6655F) is applicable > Chemical composition and impurity requirements for materials (REYV5V) is applicable > Robust design targeted to limit the maintenance tasks to the regulatory in-service inspection	Contractor to fill	Contractor to fill
51ICvcm879	51ICs1514	1.3.1.4.0-6	The contribution of the IC H&CD system to the collective annual worker dose, averaged over the operational lifetime of ITER, shall be calculated and shall be ALARA. (The Project will not exceed an annual target of 0.5 person.Sv.)	Requirement	Yes	Desk-studies	B	In the Technical Specification (FDQQXH) : > Guidelines for ALARA Implementation (W6655F) is applicable > Chemical composition and impurity requirements for materials (REYV5V) is applicable > Robust design targeted to limit the maintenance tasks to the regulatory in-service inspection	Contractor to fill	Contractor to fill
51ICvcm881	51ICs1515	1.3.1.4.0-8	When hands-on activities are performed in a radiological zone (including port cells, nuclear maintenance and storage areas), the dose rate in that zone shall be ALARA. To implement this, as a general principle: The dose rate shall not exceed the target of 100 µSv/h in yellow radiological zones and 10 µSv/h in green radiological zones. For radiological zones close to the Tokamak: this dose rate is to be estimated up to 1E+06 s (about 12 days) after shutdown of the Tokamak Machine. The dose rate in port cells with the bio-shield plug in place, shall not exceed the target of 10 µSv/hr at 24 hours after shutdown of the Tokamak Machine. In both cases, the dose rates are to be estimated at 30 cm from the nearest accessible surface, taking into account (as relevant) the surface contamination, airborne tritium and activated materials. Subsequently, the ALARA principles shall be applied to minimize occupational doses to workers (including both individual and collective doses) and by complying with the requirements in 51ICs1516, 51ICs34, 51ICs170, 51ICs646, and 51ICs782	Requirement	Yes	Desk-studies	B	In the Technical Specification (FDQQXH) : > Guidelines for ALARA Implementation (W6655F) is applicable > Chemical composition and impurity requirements for materials (REYV5V) is applicable > Robust design targeted to limit the maintenance tasks to the regulatory in-service inspection	Contractor to fill	Contractor to fill
51ICvcm882	51ICs1516	1.3.1.4.0-9	When IC H&CD components are (or can become) radioactively contaminated, their design shall permit their efficient decontamination in order to limit workers exposure and spread of contamination (like decontaminable surfaces and no dust trapping).	Requirement	Yes	Desk-studies	B	Technical Specification (FDQQXH) requires: > Piping and supports made of stainless steel and covered with thermal insulation. Stainless steel materials are suitable for decontamination. Insulation materials decontamination is questionable, but no alternative exists.	Contractor to fill	Contractor to fill
51ICvcm900	51ICs1925	1.3.1.4.0-27	During the design development for the components of the IC H&CD System, the designer shall apply the ALARA principle through an iterative optimization process. The guideline can be used for this purpose [R38]. *The confirmation that ALARA approach is properly implemented will be confirmed by TF 02 – Nuclear Integration.	Requirement	Yes	Desk-studies	B	In the Technical Specification (FDQQXH) : > Guidelines for ALARA Implementation (W6655F) is applicable > Chemical composition and impurity requirements for materials (REYV5V) is applicable	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
								> Robust design targeted to limit the maintenance tasks to the regulatory in-service inspection		
51ICvcm902	51ICs1537	1.3.1.5.0-2	The IC H&CD system shall comply with the different categories of zoning established in the nuclear buildings (Ventilation, Radiological, Anti-deflagration, Beryllium, Magnetic, Radiofrequency, Fire, Waste; refer to the detailed tables provided in PR section 7.9 [ADi2]), and with the room zoning listed in the Safety requirement Roombook [ADc37].	Requirement	Yes	Desk-studies	B	Safety requirement Roombook (KF63PB) Load Specification for the IC H&CD Antenna (33CETP) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm906	51ICs1989	1.3.1.5.0-6	The IC H&CD System and components shall be constructed and operated (including their maintenance and inspection) in compliance with the zoning requirements of the rooms/areas where they are located, in terms of (as applicable) Ventilation, Radiological, Anti-deflagration, Beryllium, Magnetic, Fire, Waste, and as specified in the zoning documentation for the relevant nuclear facility. For the Tokamak Complex: For equipment qualification: Radiation maps [ADc33, ADc55, ADc34, ADc35 and ADc36] Magnetic maps [ADc38] For all other zoning: Safety room book [ADc37] For Nuclear Maintenance and Radwaste Facilities: (Yet to be defined).	Requirement	Yes	Desk-studies	B	Safety requirement Roombook (KF63PB) Load Specification for the IC H&CD Antenna (33CETP) propagated to the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm924	51ICs240	1.3.2.0-1	The leak rate through IC H&CD components that provide a confinement function shall contribute to achieving the overall boundary leak rate assumed in the safety analysis for the associated confinement barrier. These leak rates are listed in PR Table 7-3 [ADi2].	Requirement	Yes	Desk-studies	B	Technical Specification (FDQQXH) requires for all 51ANW3 PHTS piping leak tightness proper to TC2A systems 10-5 air equivalent [Pa*m3*s-1], negligible comparing to the IBED loop leak rates are listed in PR Table 7-3 [ADi2].	Contractor to fill	Contractor to fill
51ICvcm926	51ICs797	1.3.2.0-3	Where reasonably achievable, bellows and moveable joints, such as for motion feedthroughs, shall be avoided.	Requirement	Yes	Desk-studies	B	Technical Specification (FDQQXH) defines ESPN nuclear level N2 and pressure Cat.II. Bellows are therefore excluded.	Contractor to fill	Contractor to fill
51ICvcm927	51ICs1447	1.3.2.1.0-1	The IC H&CD system shall be designed and operated so that radioactive and/or toxic inventories are maintained as low as reasonably achievable and within the limits that are authorized for ITER Site, buildings, zones, systems and components.	Requirement	Yes	Desk-studies	B	Activated materials quantities are limited thanks to the impurities limitations: > Chemical composition and impurity requirements for materials (REYV5V) > Guidelines for ALARA Implementation (W6655F) applicable In the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm932	51ICs1451	1.3.2.1.0-6	The level of activated corrosion products (ACP) in water of the in the IC H&CD cooling systems shall be maintained under the limit for its discharge to (as authorized) ITER industrial drainage or for their processing in ITER radwaste management facilities and/or third-party facilities.	Requirement	Yes	Desk-studies	B	In the Technical Specification (FDQQXH) , ACP generation is limited: > Stainless steel material selected for piping > Chemical composition and impurity requirements for materials (REYV5V) applicable	Contractor to fill	Contractor to fill
51ICvcm933	51ICs781	1.3.2.1.0-7	The design of the IC H&CD system shall be such as to avoid contamination, or to allow easy decontamination of components.	Requirement	Yes	Desk-studies	B	Technical Specification (FDQQXH) requires: Piping and supports made of stainless steel and covered with thermal insulation. > Stainless steel materials are suitable for decontamination. > Insulation materials decontamination is questionable, but no alternative exists.	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
51ICvcm956	51ICs246	1.3.5.0-1	The IC H&CD system contributions to the confinement systems and barriers (such as penetrating equipment, ducts, penetrations, and seals) shall be designed and constructed to allow initial and periodic leak testing, inspection, monitoring and maintenance. All these operations shall be designed to assure the initial and continuing performance assumed in the Safety Analysis, both for confinement and pressure requirements.	Requirement	Yes	Desk-studies	B	51ANW3 PHTS piping is part of a confinement system (IBED PHTS loop). It is accordingly classified (SIC-1) and designed. > Load Specification for the IC H&CD Antenna (33CETP) > Robust design targeted to limit the maintenance tasks to the regulatory in-service inspections > As per the Technical Specification (FDQQXH) , helium leak testing is a normal situation for the piping and can be repeated anytime an excessive leaks are detected at the level of the full loop.	Contractor to fill	Contractor to fill
51ICvcm957	51ICs802	1.3.5.0-2	Any modifications that are made to any part of the confinement barrier shall require re-testing to ensure that the integrated confinement barrier leak rate is not degraded.	Requirement	Yes	Desk-studies	B	As per the Technical Specification (FDQQXH) , helium leak testing is a normal situation for the piping and can be repeated anytime a modification has been performed.	Contractor to fill	Contractor to fill
51ICvcm958	51ICs803	1.3.5.0-3	The IC H&CD system contributions to the confinement barriers (such as equipment, ducts, penetrations, and seals) that must contain the design pressure to fulfill the assigned confinement function shall allow for initial and periodic pressure integrity tests.	Requirement	Yes	Desk-studies	B	51ANW3 PHTS piping is part of a confinement system (IBED PHTS loop). It is accordingly classified (SIC-1) and designed. > Load Specification for the IC H&CD Antenna (33CETP) > Technical Specification (FDQQXH) , provides list of normal situations for the piping and test situations > Robust design targeted to limit the maintenance tasks to the regulatory in-service inspections, repeating of the pressure test is not required by the regulations	Contractor to fill	Contractor to fill
51ICvcm962	51ICs785	1.3.6.0-2	The PIC components shall be qualified through a qualification program that shall demonstrate that each component is able to perform its functions in the conditions and events that are foreseen for its functioning.	Requirement	Yes	Desk-studies	B	Technical Specification (FDQQXH) requires: > Application of EN 13480, which implies the use of standard component for pressure purposes only > Application of MQP L3 Procedure for Qualification of Protection Important Components (PIC) (XB5ABP) if some non qualified materials need to be used > Qualification Synthesis Report according to Design Review Procedure (2832CF)	Contractor to fill	Contractor to fill
51ICvcm989	51ICs812	1.3.9.0-2	The volumes and radio-toxicity of material that may remain as long-term waste after decommissioning shall be minimized: · By design-for-repair (particularly of large structural components) · By design-for-re-use (particularly of large structural components) · By limiting the impurities in the materials (see [ADc32]).	Requirement	Yes	Desk-studies	B	Chemical composition and impurity requirements for materials (REYV5V) propagated to the Technical Specification (FDQQXH) Robust design targeted Technical Specification (FDQQXH) to limit the maintenance tasks to the regulatory in-service inspection	Contractor to fill	Contractor to fill
51ICvcm993	51ICs1403	1.3.11.1.0-1	The design of the IC H&CD system and subsystems, and the planning of their shipping, storage, construction and operation, shall take into account the meteorological conditions and the risks of abnormal conditions. The meteorological conditions, and some Cadarache-specific criteria that are imposed by French and European norms, are reported in [ADc46].	Requirement	Yes	Desk-studies	B	Operation: System located indoor. Shipment and storage related deliverables foreseen in the Technical Specification (FDQQXH): > Equipment Storage & Preservation > Transportation Quality Plan Requirements from Working Instruction for the Delivery Readiness Review (DRR) (X3NEGB) applies entirely	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
51ICvcm1065	51ICs347	1.4.2.0-1	The frequency, the duration and the procedures applicable to each of the maintenance operations shall be established in compliance with the ALARA principle, reducing the number of components and taking into account ease of maintenance in their design.	Requirement	Yes	Desk-studies	B	Maintenance and Inspection plan (including ALARA) is a deliverable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm1066	51ICs826	1.4.2.0-2	The operations of hands-on maintenance on components, as well as hands-on assistance and preparation for RH tasks, shall be limited as much as possible.	Requirement	Yes	Desk-studies	B	Maintenance and Inspection plan (including ALARA) is a deliverable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm1067	51ICs1785	1.4.2.1.0-1	Maintenance procedures and tools shall be provided for maintenance scenarios with a probability exceeding 10-1 over the 20-year life of ITER.	Requirement	No	Desk-studies	B	Maintenance and Inspection plan (including ALARA) is a deliverable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm1093	51ICs1995	1.4.2.1.0-27	The IC H&CD system shall identify its SSCs that will require nuclear maintenance (including specific testing) that will be performed in-situ and/or using ITER or 3rd party facilities.	Requirement	No	Desk-studies	B	Maintenance and Inspection plan (including ALARA) is a deliverable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm1097	51ICs1999	1.4.2.1.0-31	During SRO, the maintenance of ex-vessel components of the IC H&CD system shall be performed hands-on.	Requirement	No	Desk-studies	B	Maintenance and Inspection plan (including ALARA) is a deliverable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm1115	51ICs1189	1.4.2.4.0-2	A maintenance plan shall be prepared for the IC H&CD system. The minimum information that is required within this maintenance plan is the following (a maintenance plan template is under preparation by IO): · Scheduled operations (such as controls, checks, adjustments, calibrations, overhauls, and replacements) that are derived from Safety regulations, and that are identified as necessary by the supplier to ensure the best operation of the system in its intended operational scenario. At least task identification and interval is required. · Critical unscheduled operations (such as replacements and repairs) that may impact ITER availability and / or introduce needs for additional support (spares, procedures, training, tools and test equipment, infrastructure).	Requirement	Yes	Desk-studies	B	Maintenance and Inspection plan (including ALARA) is a deliverable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm1119	51ICs1198	1.4.2.4.1.0-2	Any special tools and/or test equipment needed for maintenance or test of IC H&CD components on site shall be part of the components' procurement scope.	Requirement	No	Desk-studies	B	Any special tools and/or test equipment, if needed, for maintenance or periodical inspection shall be provided by the Contractor As per the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm1120	51ICs1199	1.4.2.4.1.0-3	Any special equipment needed for packaging, handling, storage or transport of IC H&CD components are part of these components' procurement scope. The level of protection required by each component shall be established on the basis of the conditions of transport and of the environmental conditions at the ITER site. The supplier of the components shall document the level of protection provided by its packaging.	Requirement	No	Desk-studies	B	Shipment and storage related deliverables foreseen in the Technical Specification (FDQQXH): > Equipment Storage & Preservation > Transportation Quality Plan Requirements from Working Instruction for the Delivery Readiness Review (DRR) (X3NEGB) applies entirely	Contractor to fill	Contractor to fill
51ICvcm1123	51ICs720	1.4.2.4.3.0-1	Access to IC H&CD subsystems and components that may require maintenance shall be eased, and wherever possible shall allow direct hands-on access.	Requirement	No	Desk-studies	B	Maintenance and Inspection plan (including ALARA) is a deliverable in the Technical Specification (FDQQXH)	Contractor to fill	Contractor to fill
51ICvcm1128	51ICs832	1.4.2.4.4.0-2	The routine maintenance on the IC H&CD system shall be limited as much as possible. Routine maintenance that has been identified includes that of air filters, water filters, and pumping components.	Requirement	No	Desk-studies	B	In the Technical Specification (FDQQXH) : > Robust design targeted to limit the maintenance tasks to the regulatory in-service inspection	Contractor to fill	Contractor to fill
51ICvcm1129	51ICs833	1.4.2.4.4.0-3	Components that are structurally exposed to ageing shall be well identified, and their design shall ease their maintainability.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > 30 years of operation	Contractor to fill	Contractor to fill

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DCM ID	SRD Object ID	SRD Section	Statement	Object Type	DRQ	Type	Status	Explanation	Doc Ref	Doc Section
								> compliance with Safety requirement Roombook (KF63PB) > Radiation environment for equipment during operations (3FM52L)		
51ICvcm11142	51ICs195	1.4.2.5.0-9	Any interruption of the ITER operation due to the removal of an antenna port plug shall be minimized by appropriate design.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > minimize time for assembly/disassembly > assembly and disassembly aspects are part of the Maintenance and Inspection plan deliverable	Contractor to fill	Contractor to fill
51ICvcm11155	51ICs1796	1.4.3.1.0-10	All IC H&CD Structures, Systems and Components shall be constructed and operated to ensure they can be accessed for their maintainability and inspectability.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > Maintenance and Inspection plan deliverable > feasibility of in-service inspection is mandatory for a nuclear pressure equipment N2 Cat.II	Contractor to fill	Contractor to fill
51ICvcm11163	51ICs1190	1.4.3.3.0-2	In order to avoid inventory increase, the supplier shall make maximum use of off-the-shelf equipment and component catalogues identified by ITER Organization.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > Application of the European standards EN 13480 and EUROCODE 3 implies use of standard components	Contractor to fill	Contractor to fill
51ICvcm11164	51ICs1192	1.4.3.3.0-3	It is required that suppliers commit to the capability for continuous spares provisioning over the ITER life cycle. The supplier shall inform ITER Organization of any risk associated with component obsolescence, and shall make all pertinent recommendations to minimize such risks.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > Application of the European standards EN 13480 and EUROCODE 3 implies use of standard components	Contractor to fill	Contractor to fill
51ICvcm11165	51ICs1895	1.4.3.3.0-4	If spare parts and/or mobile devices are used as a back-up of the PIC components for any of the internal events/hazards, they shall be stored and housed in accessible rooms protected against any of the internal and external events/hazards considered for the facility.	Requirement	Yes	Desk-studies	B	Storage related deliverables foreseen in the Technical Specification (FDQQXH): > Equipment Storage & Preservation Requirements from Working Instruction for the Delivery Readiness Review (DRR) (X3NEGB) applies entirely	Contractor to fill	Contractor to fill
51ICvcm11168	51ICs2011	1.5.0-3	The construction, operation and decommissioning of the IC H&CD system and each of its sub-systems/components shall be fully documented in accordance with the requirements of ITER Quality Program (QAP) [R10] and of ITER Configuration Management Plan [R38].	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires: > Lifetime quality records (LTR) as deliverable	Contractor to fill	Contractor to fill
51ICvcm11169	51ICs359	1.6.0-1	The codes and standards shall be applied in support of the design, based on component function and safety importance classification.	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires application of: > Codes and Standards for ITER Mechanical Components (25EW4K) > EN 13480 and EUROCODE 3 (plus related standards) > PED EU 2014/68 > ESPN Order	Contractor to fill	Contractor to fill
51ICvcm11172	51ICs845	1.6.2.0-1	The IC H&CD mechanical components shall be designed in accordance with the codes and standards identified in the Codes and Standards for ITER Mechanical Components [ADc05], (which includes the Structural Design Criteria for In-Vessel Components [ADc26]).	Requirement	No	Desk-studies	B	Technical Specification (FDQQXH) requires application of: > Codes and Standards for ITER Mechanical Components (25EW4K) > EN 13480 and EUROCODE 3 (plus related standards) > PED EU 2014/68 > ESPN Order	Contractor to fill	Contractor to fill
51ICvcm11192	51ICs2020	1.7.5.0-5	Provisions shall be implemented in the IC H&CD system to minimize tritium permeation	Requirement	Yes	Desk-studies	A	Tritium permeation from the tritiated water to the steel can be considered as negligible at PHTS IBED operating ranges.	/	/

ANNEX I

EXPRESSION OF INTEREST & PIN ACKNOWLEDGEMENT

To be returned by e-mail to: nadezda.eremina@iter.org copy andrew.brown@iter.org

TENDER No.	**IO/26/OT/10034832/ENA**
DESIGNATION of SERVICES:	**Service and Supply Contract for Design and Manufacturing of 51ANW3 PHTS Distribution Piping.**
OFFICER IN CHARGE:	**Nadezda Eremina – Procurement Division, ITER Organization**

☐ WE ACKNOWLEDGE HAVING READ THE PIN NOTICE FOR THE ABOVE MENTIONED TENDER

☐ WE INTEND TO SUBMIT A TENDER

☐ WE ARE ALREADY REGISTERED IN IPROC

☐ WE INTEND TO REGISTER IN IPROC

Please list the users of ARIBA/IPROC that you wish to add as response team for this tender:

Name	E-mail
…	…

……

Signature:

COMPANY STAMP

Name: .....
Position: .....
Tel: .....
E-mail.....
Date: .....