

外部委託業者の募集

References: IO/26/OT/10035602/JPK

"Design, Manufacturing, Installation, and Commissioning of Ion Cyclotron Heating (ICH) Cold Water Loop required for the Test Bed in B55"

(B55 試験設備向けイオンサイクロトロン加熱 (ICH) 冷却水ループの設計、製作、据付および試運転)
IO 締め切り 2026 年 10 月 23 日(金)

○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。

○背景

ITER は平和利用の核融合発電の科学的小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。

○作業範囲

本入札手続は、冷却水ループの設計、供給、製作、納入、据付、試験、試運転および関連文書の作成に係るサービス・供給契約を締結することを目的としています。

受注者は、250kW級のターンキー方式の冷却水システムを納入し、建屋55において完全に稼働可能な状態で引き渡さなければなりません。これらは、Incoterms DAP (ITERサイト渡し) 条件に基づき、ITERサイトへ納入されます。

○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、関心のある候補企業に対し、以下の概略日程に示された期日までに担当調達担当官に添付の関心表明フォームで以下の情報を提出し、競争プロセスへの関心を示すよう正式に要請します。

特に注意:

関心のある候補企業は、IO Ariba の電子調達ツール「IPROC」に登録してください (ま

だ登録していない場合）。手順については、
<https://www.iter.org/fr/proc/overview>
を参照してください。

Ariba (IPROC) に登録する際には、お取引先様に最低 1 名の担当者の登録をお願いしま
す。この連絡担当者は、提案依頼書の発行通知を受け取り、必要と思われる場合は入札書類
を同僚に転送することができます。

➤ 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。

このツールに登録されている企業のみが入札に招待されます。

➤ 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。

○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 10 月 2 日
関心表明フォームの提出	2026 年 10 月 23 日
入札への招待（IIT）の発行	2026 年 10 月 30 日
明確化のための質問（もしあれば）と回答締め切り	2026 年 12 月 4 日
入札提出	2026 年 12 月 11 日
入札評価及び契約授与	2026 年 12 月/2027 年 1 月
契約調印	2027 年 1 月/2 月

○契約期間と実行

ITER機構は2026年の12月/2027年1月ごろに契約を授与します。予想される契約期間は、9か月とします。

○経験

入札者は、技術仕様書（別紙 I）に詳述されているとおり、技術的および産業分野での経験を有していることを示す必要があります。

ITER での使用言語は英語で、流ちょうなプロレベルが求められます（口頭および文書）。

○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。ITER 加盟国は欧州連合(EURATOM メンバー)、日本、中華人民共和国、インド共和国、大韓民国、ロシア連邦、アメリカ合衆国です。

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。

どのコンソーシアムメンバーも IPROC に登録する必要があります。

【※ 詳しくは添付の英語版技術仕様書「**Design, Manufacturing, Installation, and Commissioning of Ion Cyclotron Heating (ICH) Cold Water Loop required for the Test Bed in B55**」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

02 October 2026

To: Domestic Agencies (DAs)

IO Tender Reference: IO/26/OT/10035602/JPK

Title: Design, Manufacturing, Installation, and Commissioning of Ion Cyclotron Heating (ICH) Cold Water Loop required for the Test Bed in B55

Subject: Prior Indicative Notice (PIN)

Dear colleagues,

The ITER Organization intends to launch an Open Tender process in the coming weeks as indicated above and in accordance with the details in the attached Prior Indicative Notice (PIN). In this regard, and to provide some introductory information about the forthcoming tender, we kindly request the attached PIN to be published on your DA website with immediate effect for a period of 15 working days.

china

eu

india

japan

korea

russia

usa

The advance notification is to alert companies, institutions, or other eligible entities to the forthcoming tender, and provide information to promote healthy competition, allowing interested parties time to decide whether to participate in the tender or not.

Please could you kindly acknowledge receipt of this e-mail and confirm once the PIN is published on your website.

Yours sincerely

JunHyung PARK
Procurement Officer
Procurement Division

PRIOR INDICATIVE NOTICE (PIN)

OPEN TENDER SUMMARY

IO/26/OT/10035602/JPK

For

Design, Manufacturing, Installation, and Commissioning of Ion Cyclotron Heating (ICH) Cold Water Loop required for the Test Bed in B55

Annexes

Annex I– Expression of Interest Form

Annex II – Technical Specifications

Abstract

The purpose of this summary is to provide prior notification of the IO's intention to launch a competitive Open Tender process in the coming weeks. This summary provides basic information about the ITER Organisation, the technical scope of this tender, and details of the tender process for procuring supplies and services, including design, manufacture, supply, delivery, installation, testing, commissioning, and documentation of the cooling water loop.

1 Introduction

This Prior Indicative Notice (PIN) is the first step of an Open Tender (OT) Procurement Process leading to the award and execution of a 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.

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 St. 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 present tender process aims to establish a Service and Supply Contract related to the design, supply, manufacture, delivery, installation, testing, commissioning, and documentation of the cooling water loop.

The supplier shall deliver a turnkey 250 kW-class cooling water system and hand over a fully operational system in Building 55. These shall be shipped to the ITER site, respectively, based on the Incoterms DAP ITER site.

The scope under this contract does not cover PIC and/or PIA and/or PE/NPE components.

The Quality class under this contract is QC3.

The work shall be performed off-site and/or on-site.

4 Procurement Process & Objective

The objective is to award a 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 Information Notice (PIN)

The Prior Information Notice is the first stage of the Open Tender process. The IO formally invites interested Suppliers to indicate their interest in the competitive process by returning to the Procurement officer in charge the attached “Expression of Interest and PIN Acknowledgement” by the date indicated under the procurement timetable.

Special attention:

Interested tenderers are kindly requested to register in the IO Ariba e-procurement tool called “IPROC”. You can find all links to proceed along with instruction going to: <https://www.iter.org/fr/proc/overview>.

When registering in Ariba (IPROC), suppliers are kindly requested to nominate at least one contact person. This contact person will be receiving the notification of publication of the Request for Proposal and will then be able to forward the tender documents to colleagues if deemed necessary.

➤ Step 2 - Invitation to Tender

After at least 15 working days of the publication of the PIN, normally the Request for Proposals (RFP) will be published on our digital tool “Iproc”. This stage allows interested bidders who have indicated their interest to the Procurement Officer in charge AND who have registered in IPROC to receive the notification that the RFP is published. They will then prepare and submit their proposals in accordance with the tender instructions detailed in the RFP.

Only companies registered in this tool will be invited to the tender.

➤ Step 3 – Tender Evaluation Process

Tenderers proposals will be evaluated by an impartial evaluation committee of the IO. Tenderers must provide details demonstrating their technical compliance to perform the work in line with the technical scope and in accordance with the particular criteria listed in the RFP.

➤ Step 4 – Contract Award

A Supply contract will be awarded based on the Best Value For Money (BVFM) methodology according to the evaluation criteria and methodology described in the RFP.

Procurement Timetable

The tentative timetable is as follows:

Milestone	Date
Publication of the Prior Indicative Notice (PIN)	2 October 2026
Submission of expression of interest form	23 October 2026
Invitation to Tender (ITT) advertisement	30 October 2026
Clarification Questions (if any) and Answers	4 December 2026
Tender Submission	11 December 2026
Tender Evaluation & Contract Award	December 2026/January 2027
Contract Signature	January/Feb 2027

5 Quality Assurance Requirements

Prior to the commencement of any work under this Contract, a “Quality Plan” shall be produced by the Supplier and submitted to the IO for approval, describing how they will implement the ITER Procurement Quality Requirements.

6 Contract Duration and Execution

The ITER Organization shall award the Supply Contract around December 2026/January 2027. The estimated contract duration shall be 9 months.

7 Cost Range

This scope of work is identified at Cost Range A, which is a range up to 400 000 EUR.

8 Experience

The tenderer shall demonstrate their technical and industrial experience related to the scope of work as detailed in Annex I.

The working language of ITER is English, and a fluent professional level is required (spoken and written).

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 that has legal rights and obligations and is established within an ITER Member State, 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.

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 which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

In order for a consortium to be acceptable, the individual legal entities included therein shall have nominated a consortium 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 leader will explain the composition of the consortium members in its offer. Following this, the Candidate's composition must not be modified without notifying the ITER Organization of any change. Evidence of any such authorisation to represent and bind each consortium member 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.

Any consortium member shall be registered in IPROC.

10 Sub-contracting Rules

All sub-contractors who will be taken on by the Contractor shall be declared together with the tender submission. 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 any sub-contractor which was not notified in the tender and request a copy of the sub-contracting agreement between the tenderer and its sub-contractor(s).

Sub-contracting is allowed but it is limited to one level and its cumulated volume is limited to 30% of the total Contract value.

Technical Specifications (In-Cash Procurement)

Technical specification of ICH Component cooling water system in B55

This is the technical specification towards the design, manufacturing, installation and commissioning of the ICH cold water loop required for the ICH test bed in B55.

SERVICE

Table of Contents

1	PREAMBLE.....	3
2	PURPOSE.....	3
3	ACRONYMS & DEFINITIONS	3
3.1	Acronyms.....	3
3.2	Definitions.....	5
4	APPLICABLE DOCUMENTS & CODES AND STANDARDS.....	5
4.1	Applicable Documents.....	5
4.2	Applicable Codes and Standards.....	7
5	SCOPE OF WORK.....	8
5.1	Description.....	8
5.2	Operating requirements.....	10
5.2.1	General requirements	10
5.2.2	Component requirements	11
5.2.3	CHWS interface	13
5.2.4	Ambient conditions	13
5.3	Interface Requirements	14
5.3.1	General integration.....	14
5.3.2	Pipe connection.....	15
5.3.2.1	Component connection	15
5.3.2.2	CHWS connection	16
5.3.3	Drainage and filling	17
5.4	Mechanical requirement.....	17
5.4.1	Shared support with the plate.....	17
5.4.2	Floor support.....	18
5.5	Electrical requirements	19
5.5.1	Low voltage interface.....	19
5.5.2	Earthing.....	19
5.5.3	Cable interface	20
5.6	I&C requirements.....	20
5.7	Occupational Health Safety Requirements	21
5.8	Coding and Marking requirements	21
5.8.1	Labelling	21
5.8.2	CE Marking.....	21

	SERVICE	
5.9	Acceptance test	21
5.10	Delivery.....	22
5.11	Installation.....	22
5.11.1	Work Site Conditions.....	23
5.11.1.1	Site survey.....	24
5.11.2	Field Change	24
5.11.3	Premanufacturing.....	24
5.11.4	Cleanliness criteria.....	25
5.11.5	Post drilling.....	25
5.11.6	Material identification and tagging.....	25
5.12	Site acceptance test	25
6	TRAINING – SQEP.....	26
7	LIST OF DOCUMENT DELIVERABLES.....	26
7.1	P1 Design phase	26
7.2	P2 Factory acceptance test	27
7.3	P3 Delivery Readiness review	28
7.4	P3 Inspection at delivery.....	28
7.5	P3 As built package at completion.....	28
7.6	P3 Site testing	28
7.7	Summary	30
8	LOCATION FOR SCOPE OF WORK EXECUTION	31
9	QUALITY ASSURANCE REQUIREMENTS.....	31
9.1	Quality plan.....	31
10	SAFETY REQUIREMENTS.....	31
11	SPECIAL MANAGEMENT REQUIREMENTS	31
11.1	Contract Gates.....	32
11.2	Work Monitoring	32
11.3	CAD design requirements.....	32
12	IO DOCUMENTS.....	32

SERVICE

1 Preamble

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

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

2 Purpose

The ITER Ion Cyclotron Range of Frequency (ICRF) system is a high-power Continuous Wave (CW) Radio Frequency (RF) system operating at 40-55MHz. The Antenna allows injection of power into the plasma of the tokamak. A test of a prototype is planned in a dedicated test facility in building 55. The RF equipment needed for the functional tests will require water cooling to operate properly.

The present technical specification details the responsibilities over the design, manufacturing, delivery, installation and site testing of the cooling circuit required by PBS 51 in Building 55 for the test of the IC antenna in the Port Plug Test Facility (PPTF).

This includes three separate phases, which should be linked to hold points:

- Design phase:
 - Development of Detailed Design of the cooling circuit, including the refinement of the interfaces with the equipment, building and services;
 - Justification of the design through analyses (functional, thermal hydraulic, structural & electrical).
- Manufacturing phase:
 - The supply of the base material (pipework components such as straight sections, bends, connection fittings, insulation, beams, plates, fasteners for supports);
 - Supply of the equipment (HX, pump, tank);
 - The pre-fabrication of the pipe spools;
 - The factory acceptance of the pipework components.
- Delivery, Installation and Testing phase:
 - The delivery of the equipment with inspection on IO site;
 - The site assembly of the components in the building;
 - The supply and assembly of the supports, including custom supports;
 - Installation of components and equipment;
 - Witnessing of the site acceptance tests performed by IO.

The objective of the contract is to get from a concept design to a self-standing equipment tested and ready for connection to the test bed equipment.

3 Acronyms & Definitions

3.1 Acronyms

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

Abbreviation	Description
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SERVICE

CA	Compressed Air
CAD	Computer Assisted Design
CD	Current Drive
CHWS	Chilled Water System
CRO	Contract Responsible Officer
CW	Continuous Wave
DRR	Delivery Readiness Review
DT	Deuterium Tritium
EDH	Electrical Design Handbook
ESP	Équipements Sous Pression (Pressure Equipment)
ESPN	Équipement Sous Pression Nucléaire (Nuclear Pressure Equipment)
EWP	Engineering Work Package
FDR	Final Design Review
GM3S	General Management Specification for Service and Supply
HMI	Human Machine Interface
HOP	Handover package
HPA	High Power Amplifier
IC	Ion Cyclotron
ICH	Ion Cyclotron Heating
ICWC	Ion Cyclotron Wall Conditioning
ICRF	Ion Cyclotron Range of Frequency
IDM	ITER Document Management (system)
INB	Installation Nucléaire de Base
ILM	Integrated Material & Logistics Management
ITP	Installation Test Plan
I&C	Instrumentation and Control
IO	ITER Organization
IS	Interface Sheet
ITER	International Tokamak Experimental Reactor
KoM	Kick Off Meeting
OHS	Occupation Health and Safety
LV	Low Voltage
MIP	Manufacturing Inspection Plan
MRR	Manufacturing Readiness Review
PBS	Plant Breakdown Structure
PCDH	Plant Control Design Handbook
PIA	Protection Important Activity
PIC	Protection Important Component
PPTF	Port Plug Test Facility
PRO	Procurement Responsible Officer

SERVICE

QC	Quality Classification
QDC	Quick Disconnecter
RF	Radio Frequency
SEP	Sound Engineering Practice
SIC	Safety Important Class
SRD	System Requirement Document
SRO	Start of Research Operation
SSPA	Steady State Power Amplifier
SQEP	Suitably Qualified Experienced Person
TL	Transmission Line
TRO	Technical Responsible Officer

3.2 Definitions

Supplier: shall mean an economic operator who have signed the Contract in which this document is referenced.

4 Applicable Documents & Codes and standards

4.1 Applicable Documents

This is the responsibility of the Supplier to identify and request 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, it is the responsibility of the Supplier to seek clarification from IO.

Upon notification of any revision of the applicable document transmitted officially to the Supplier, the Supplier 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.

Ref	Title	IDM Doc ID	Version
[1]	General Management Specification for Service and Supply (GM3S)	82MXQK	1.4
[2]	Quality Requirements for IO Performers	22MFG4	6.4
[3]	SRD-51 (ICH&CD) from DOORS	28B33K	7.2
[4]	Procedure for Management of Nonconformities	22F53X	10.3
[5]	Procedure for the management of Deviation Request	2LZJHB	9.1
[6]	ITER Policy on Safety, Security and Environment Protection Management	43UJN7	4.0
[7]	Decree No. 2012-1248 dated 9 November 2012 authorising IO to create a nuclear facility called « ITER » - EN	CZK7M5	1.1
[8]	ASN Decision 2013-DC-0379 dated 12 November 2013 establishing the prescriptions applicable to ITER Organization for the licensed nuclear facility INB No. 174 called ITER - FR	LYH6QS	1.2

SERVICE

[9]	Pressure Equipment Directive 2014/68/UE	RZ6PAK	1.0
[10]	Arrêté du 30 décembre 2015 relatif aux équipements sous pression nucléaires - FR	SFMMMB	1.5
[11]	Safety Important Functions and Components Classification Criteria and Methodology	347SF3	1.8
[12]	Quality Classification Determination	24VQES	8.0
[13]	Procedure for Identification and Controls of Items	U344WG	3.2
[14]	Working Instruction for the Delivery Readiness Review (DRR)	X3NEGB	3.0
[15]	Procedure for Transportation of Components to ITER Site	RY5C6Q	3.1
[16]	Codes and Standards for ITER Mechanical Components	25EW4K	5.0
[17]	EDH Electrical Design Handbook	2F7HD2	1.4
		2E8QVA	1.5
		2E8DLM	1.3
		4B523E	3.0
		4B7ZDG	3.0
[18]	Plant Control Design Handbook	27LH2V	7.1
[19]	IO cabling rules	335VF9	3.3
[20]	IS-51-63.55-002 Interface between Building 55 (PBS 63.55) and ICH&CD System (PBS 51) - CHWS	EZ976B	1.1
[21]	WP1- Thermo-hydraulic analyses of the Pre-matching unit and the RF window	E7K93G	1.1
[22]	IS-51-63.55-004 Interface between Building 55 (PBS 63.55) and ICH&CD System (PBS 51) – Gas	F8L43J	1.0
[23]	Release Note Template	QVEKNQ	3.1
[24]	Delivery Report Template	WZPYVZ	3.0
[25]	Package & Packing List Template	XBZLNG	2.2
[26]	MQP L3 Working Instruction for Construction Field Change Request (FCR)	EBUK3B	5.1
[27]	Procedure for Analyses and Calculations	22MAL7	6.9
[28]	Instructions for Structural Analyses	35BVV3	4.1
[29]	Template for Structural Analysis Reports	VQVTQW	1.0
[30]	Inspection Plan (IP) Template	QV7GQF	1.3
[31]	ITER Numbering System for Components and Parts	28QDBS	5.1
[32]	PBS58 PPTF HIRA Report	PNZVQQ	2.1
[33]	MQP L3 Procedure for Occupational Health and Safety Hazard Identification and Assessment	AJLQRF	6.1
[34]	System Component labelling procedure ITER Project	TL25DK	3.3
[35]	PBS 63.55 - PF Coil Fabrication Building - 3015 Rebar practical maps on the ground slab	SZUGZ2	1.0
[36]	#00 - PGC Volume 1	T6V4RP	6.3
	Internal Regulations	27WDZW	3.1

SERVICE

	Environmental requirements	97WRFP	2.2
	Contractor Safety Management Procedure	Q2GBJF	1.4
	Procedure for Occupational Health and Safety Hazard Identification and Assessment	AJLQRF	6.1
	Vehicle Access and Traffic Circulation and Parking on the ITER Site	N3MG3V	3.2
	ITER Site access Procedure	S3893D	3.3
	General Management Specification for Executing Entities at the ITER Site	YX55YY	2.3
[37]	PGC Annex 00 - List of the applicable annexes to the PGC SPS Volume 1	42FYFZ	4.1
[38]	#00 - PGC Volume 1	T6V4RP	6.3
[39]	PGC Annex 03 - Rules of cooperation between the HSPC and the contractors	UJ95AV	5.2
[40]	ITER Site Life-Saving Rules	YSU3VK	2.1
[41]	PGC Annex 05 - Individual Health Protection and Safety Plan - template	K7C6SZ	5.0
[42]	OHS events follow-up procedure	2CTZTP	2.5
[43]	JIRA-HSR Database Tool (How-To Guide)	FWPHNS	1.0
[44]	ITER Site Permit to Work Procedure	3E8289	5.4

4.2 Applicable Codes and Standards

The supplier assumes the responsibility of Manufacturer for the pressure equipment in the sense of the PED 2014/68/UE.

It is the responsibility of the supplier to derive the list of applicable design and manufacturing codes based on the Codes and Standards for ITER Mechanical Components [16], on the basis of the categories described below.

Table 4-1: Classification of the 51.TF.WD cooling water circuit

Pipework & Vessel Classifications	
PED category [9]	SEP Article 4.3 *
Fluid state and PED fluid group	Liquid Group 2
ESPN Order Nuclear Level [10]	Non-ESPN
Safety Importance Class [11]	Non-SIC
Quality class [12]	3

* The classifications are based on early analysis and may require revision if the analysis performed by the supplier result in an increase of the parameters above the threshold for category change as per [9].

The following list identifies the minimum codes and standards that have been deemed applicable based on the conceptual design realized by IO:

SERVICE

- Mechanical codes:
 - o For anchorage:
 - The code for design of the anchorage shall be chosen in accordance with the code used in design of the pipes.
- Fluid codes (gas and water):
 - o For piping:
 - EN 13480 or ASME B31.3, process piping
 - o For vessel:
 - EN 13445 or ASME BPVC VIII. Div. 1 or Div. 2 if needed.
 - o The code chosen for vessel and piping shall generally be compatible.
- Electrical codes:
 - o Electrical components shall be designed in accordance with the codes and standards identified in the Electrical Design Handbook Part 3: Codes and Standards [17].
 - o For cables, the IO cabling rules shall be followed [19], as well as the following standards:
 - Fire retardancy as per: NFC 32070 C1, IEC 60332-1 and/or IEC 60332-3;
 - Low Smoke as per: IEC 61034;
 - Zero Halogen as per: IEC 60754-1;
 - Non-Toxicity as per: IEC 60754-2;
- Control Handbook:
 - o For the definition of the interfaces between the supplier scope and the upper layer of control, the Plant Design Control Handbook [18] shall be applied.

5 Scope of Work

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

The Supplier will provide his services to the ICH Project towards the design of the water-cooling circuit of the PPTF (Port Plug Test Facility) test equipment in Building 55.

5.1 Description

The water-cooling circuit will provide a local component cooling for the equipment performing functional test of the ICH in the PPTF. The main function of the cooling circuit is to provide water to each component as required by its design, while maintaining the interface fluid temperature within bounds and is shown in Figure 5-1.

To accomplish the functions above, the cooling circuit of the Power test bed shall include at minimum:

- A pumping unit to circulate the water.
- A heat exchanger to transfer extracted heat to the chilled water system provided by the building [20].
- A tank to store water for filling of components.
- Pipes, flexible pipes and manifolds to distribute to the different components.
- Sensors as required to:
 - o Operate the system safely and within bounds.
 - o Protect the components C_i being cooled from failures (interlock).
- Valves to:
 - o Isolate each component C_i .
 - o Adjust the flow delivered to the components in different configurations.

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- o Drain and dry the system for maintenance.
- o Protect the system (pressure reducing valve; pressure relief valve).

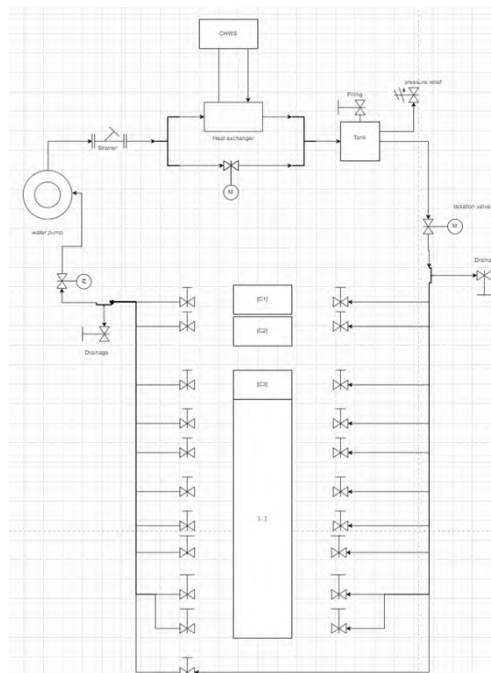


Figure 5-1: Preliminary schematic of the expected delivery

The cooling circuit will interface with:

- The test bed equipment, which generates heat to be extracted and is detailed in the Table 5-2.
- The building chilled water circuit, which will provide chilled water for extraction of the heat.

In addition, the system will interface with:

- The building for support and earthing
- The I&C system for treatment of signals
- The distribution board for LV (Low Voltage) power

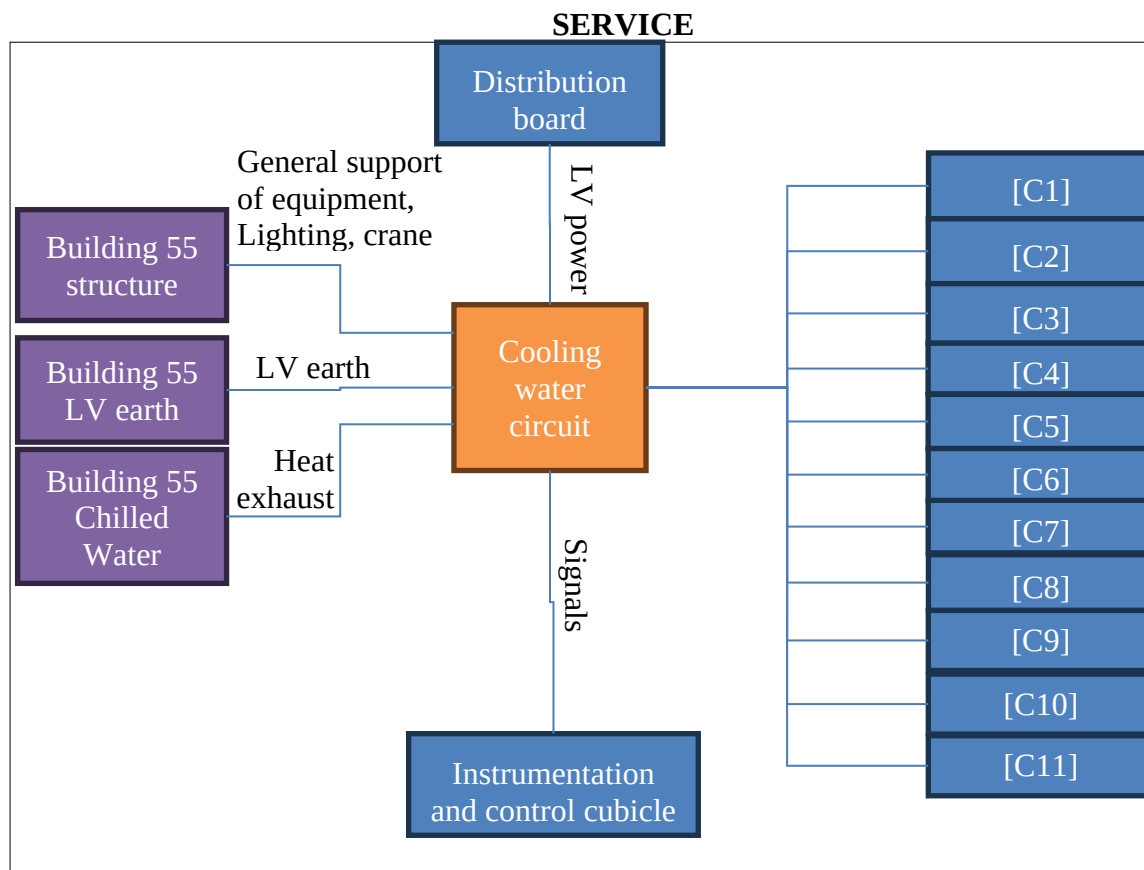


Figure 5-2: Interface diagram of the contract scope (in orange) with the other systems.

Note: see section 5.2.2 for the list of [Cx] components

5.2 Operating requirements

The test bed components have different requirements of water flow rate, maximum pressure and pressure drop and the cooling water shall be configurable to meet all these requirements, in all possible configurations.

5.2.1 General requirements

The inlet temperature of the water, the flow through the components as well as the chemistry of the water need to be compatible with the equipment throughout operation.

The requirements are explicitly listed in the following table:

Table 5-1: Cooling circuit and water requirements

Variable	Maximum value	Minimum value
Inlet water to the components (°C)	31	10
Pressure drop (MPa)	0.35 ¹	
pH @ 25°C	7.5	6.5
Water conductivity @25°C, µS/cm	1.0	
Dissolved O2 concentration, µg/kg	50	

¹ Note that component [C2] cannot receive more than 0.5MPa_g due to the nature of the electrical equipment inside. This should be considered when defining the maximum and minimum pressure in the circuit. The distribution branch for [C2] shall include a protection against overpressure accident from the cooling equipment.

SERVICE

Total organic content, µg/kg	100	
Particles dimensions µm	10	
Chloride µg/kg	10	
Iron µg/kg	10	
Silica µg/kg	200	

As a measure of protection for the serviced equipment, conductivity and O2 concentration shall be monitored (see section 5.6).

The maintenance plan [DL4] shall include an analysis of accessibility with a water tank to operate drainage and refilling.

The material in contact with the water shall be stainless steel, plastic and copper, no brass, aluminium or tin shall be used in the cooling circuit and in the cooled components. The wetted surface of the components may be provided by IO on request. Small quantity of other metals (excluding brass, aluminium, tin) such as silver can be expected.

In case of leak of the components, the supplier shall implement a way to segregate the water tank and heat exchanger from the components.

5.2.2 Component requirements

The equipment being cooled have different requirements as to what should be provided:

Table 5-2: Functional requirement of the test bed equipment

Component	Max Heat Load	Min Flow rate	Maximum allowable pressure²	Evaluated Pressure drop	Instrumentation functions ³ (see section 5.6)
[C1] Steady state power amplifier⁴	10 kW	0.6 kg/s		0.26 MPa	Leak detection + Flow balancing
[C2] High Power Amplifier anode	121 kW	1.7 kg/s	0.5 MPag	0.29 MPa	Calorimetry + Pressure monitoring + Low flow protection
[C3] High Power Amplifier screen grid	0.16 kW	0.33 kg/s		0.29 MPa	Leak detection + Flow balancing
[C4] Auxiliary power supply bleeder	5 kW	0.33 kg/s		0.1 MPa	Leak detection + Flow balancing
[C5] 200kW RF dummy load	120 kW	1.2 kg/s	0.58 MPag	0.35 MPa	Calorimetry + Low flow protection

² For the definition of pressure protection. The most critical maximum allowable pressures are listed. The supplier should either provide a protection against the overpressure accident or give a justification that the pressure is not reached during accidental event.

³ Flow balancing: Ensure equilibrium between the different parallel branches servicing all the equipment – this function is needed for commissioning.

Calorimetry: Ensure measurement of flow and temperature such that the heat loss of the component can be calculated.

Leak detection: Monitor the fluid as to detect a leak in any of the branches.

Pressure monitoring: Ensure protection of equipment against overpressure by means of sensor+ actuator or other means (pressure relief, pressure regulation, risk analysis).

Low flow protection: Ensure detection of low flow in the equipment to allow IO to implement protection functions.

⁴ The SSPA has an internal low-flow-switch, which closes an internal valve if the flow is not sufficient.

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[C6] Matching system – stub1	0.8 kW	0.2 kg/s		Small ⁵	Leak detection + Flow balancing + Low flow protection
[C7] Matching system – stub2	0.8 kW	0.2 kg/s		Small ⁶	Leak detection + Flow balancing + Low flow protection
[C8] Pre-matching unit – outer	19.5 kW	0.4 kg/s	1.85 MPag	[21] – below 0.1 MPa	Calorimetry + Pressure monitoring + Low flow protection
[C9] Pre-matching unit – inner	12.7 kW	0.4 kg/s	1.85 MPag	[21] – below 0.1 MPa	Calorimetry + Pressure monitoring + Low flow protection
[C10] Vacuum system	Negligible	0.009kg/s	0.5 MPag	Below 0.1 MPa	Leak detection + Flow balancing + Pressure monitoring
[C11] Stub Tee	0.8 kW	0.2 kg/s		Small ⁷	Leak detection + Flow balancing

These parameters shall be used for the analysis of the cooling system [DL2].

In addition to the Components-specific functions above, a monitoring of the inlet temperature to the components shall be provided to IO for interlock (see section 5.6).

It must be noted that the cooling circuit will be required to operate in different configurations, illustrated in Table 5-3, representing the sequential installation and site testing of the test bed. The cooling system shall be able to cope with the minimum and maximum values of flow and heat loads.

These configurations would be:

Table 5-3: configurations of the test bed

Test name	Configuration ⁸	Total Heat load	Total flow
Installation	all [Ci] are disconnected	0 kW	0 kg/s
Hydraulic Test of stubs	[C6] or [C7] connected	0 kW	0.2 kg/s
Test of SSPA	[C1] is connected	10 kW	0.6 kg/s
Test of HPA2	[C1]; [C2]; [C3]; [C4]; [C5] are connected	250 kW ⁹	4.3 kg/s
Functional testing	[C1]; [C2]; [C3]; [C4]; [C6]; [C7]; [C8]; [C9] ; [C10]; [C11] are connected Component [C5] is not connected.	~170 kW	~3.9 kg/s

In testing configuration, the system is operating with a duty cycle of 25% for a few seconds/ tens of minutes, with a rest period which cannot exceed 1800s.

The longest duration of testing will be 3600s, which would be followed by 1800s of rest. During rest, some very specific parts will remain powered, which would total to ~10kW. ([C2]; [C3]; [C4])

⁵ equivalent to ~3m of straight pipe

⁶ equivalent to ~3m of straight pipe

⁷ equivalent to ~4m of straight pipe

⁸ Here, only the most demanding (in terms of min and max flow) have been represented.

⁹ When operating on dummy load, the losses in the HPA2 will be lower than in the Table 5-2. 250kW is the maximum value that could be expected to be lost.

SERVICE

In summary, the system shall be able to accommodate the configurations by providing the range of conditions (flow, heat load, pressure drop) expected for each of these configurations.

5.2.3 CHWS interface

The interface point, the flow and temperature of the CHWS (Chilled Water System) water are all defined in [20] of which an extract is shown in Table 5-4.

Table 5-4: Requirement of interface with CHWS

Parameter	Value	Unit
PBS 51 max heat load	252	kW
PBS 63.55 max inlet temperature	6	°C
PBS 63.55 min outlet temperature	12	°C
PBS 51 max ΔT	6	°C
Required flow rate	10	Kg/s
PBS 63.55 maximum pressure drop	0.3	MPa
PBS 63.55 maximum inlet pressure	0.6	MPa

The water chemistry, as measured on the 02/07/2024 as well as the target value of the CHWS chemistry are given in Table 5-5 hereafter:

Table 5-5: Chemistry of the CHWS water

	pH	TH (mg/L aCo ₃)	TA (mg/L aCo ₃)	TAC (mg/L aCo ₃)	Chlorides (mg/L)	Conductivity (μS/cm)	Iron (mg/L)	Copper (mg/L)	Product FS510	Appearance
Target value	9-10	0* or mains water value	-	<600	<150	<1000	<2	<1	>5 Amine	clear
Measured value	8.8	100	20	220	35	430	1.62	<0.1	>20	clear

*0: if softened

5.2.4 Ambient conditions

The environmental conditions inside Building 55 are defined in the following Table 5-6:

Table 5-6: Ambient conditions

Parameters	Value
Internal temperature conditions	Within 19°C-26°C
Air Filtration	F6-GF-F9 (IDA-2, ODA-5; standard EN13779)
Pressure conditions	Overpressure held at > 0 Pa
Make up flow rate	$\geq 0,9$ vol/h o 1,25 vol/h of fresh air. o 1,75 vol/h of recirculated air
Relative Humidity	maintained in the interval [25% - 85%]
High degree of cleanliness with slight overpressure inside as per ISO 8;	
Ventilation time slot regulation (IDA C3);	

Note: The IO is responsible not to degrade the above conditions by:

SERVICE

- Managing of all type of air contamination as fumes, gas or dust coming from its works (vehicle, welding, grinding, cleaning...);
- Limit as much as possible the use of the main motorized doors;
- For any activity creating some atmosphere pollution inside B55, the Supplier shall erect at its expense a temporary airlock around the source generating the contamination. The air inside the airlock shall be managed properly and shall not be released in the building atmosphere. In addition, the noise exposition of the workers and the surrounded areas shall be carefully managed to be compliant with the French labour code. All the associated preventive measures necessary shall be provided by the supplier at its expense.

5.2.5 Procedure for operation and maintenance

As defined in [DL4], the supplier shall deliver a manual of operation and maintenance of the cooling water system.

As a minimum, the operating procedures shall define:

- safe start-up, operation and shutdown of the cooling system
- permitted operating limits for pressure, temperature, flow, etc
- required pre-start checks and conditions to be satisfied before operation;
- actions to be taken following
 - o Alarms, trips or loss of instrumentation;
 - o Abnormal technical events (eg loss of cooling, pump failure, loss of electrical power or abnormal pressure/temperature)
- Appropriate response to detection of water leakage or other loss of containment;
- conditions requiring immediate shutdown or isolation of the system;
- safe isolation and depressurisation requirements before intervention;
- safety measures resulted from hazard identification and risk assessment, specifically identified operational hazards;
- precautions to prevent incorrect valve configuration or operation outside the permitted operating envelope;
- emergency shutdown and recovery arrangements;

The procedures shall clearly identify the hazards associated with each relevant operating activity, the required precautions and the conditions under which operation is prohibited.

The procedures shall be updated by the Supplier following commissioning and Site testing to reflect the final as-built configuration and validated operating limits.

5.3 Interface Requirements

5.3.1 General integration

The current dimensions meant to allow implementation of the cooling circuit are shown in the provisional layout in Figure 5-3.

SERVICE

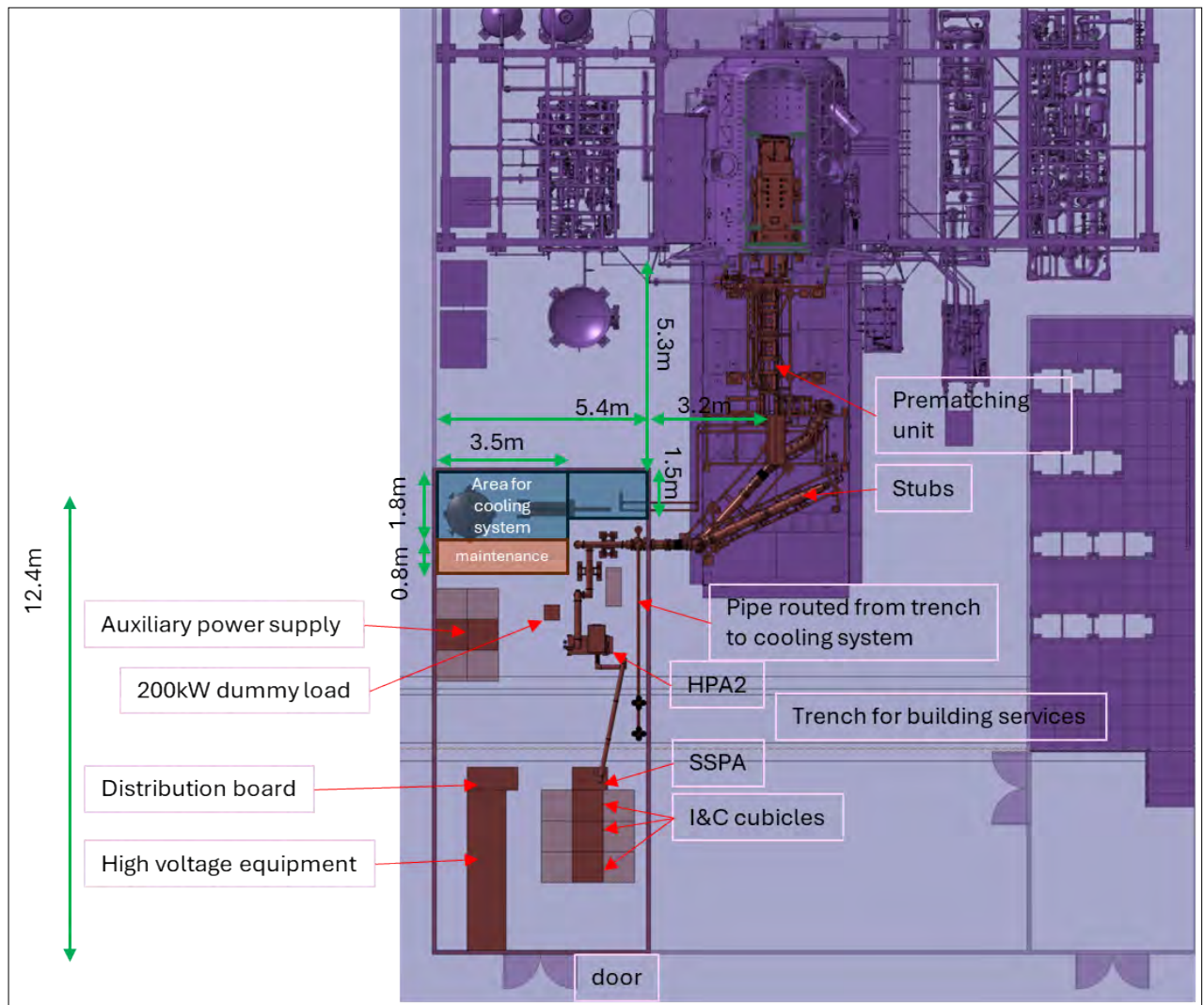


Figure 5-3: Layout of the test bed for integration of the cooling water components.

The Supplier shall ensure that the parts that require manual operation (including valves, drainage pipes and HMI) and/or regular maintenance are accessible from the south.

A .stp model of the equipment interface points will be provided to the supplier with the current technical specification. The supplier shall define the routing of the piping from the cooling system to the equipment. This routing layout (3D model in section 5.9) will be reviewed and validated by IO based on the integration of the PPTF test bed.

5.3.2 Pipe connection

5.3.2.1 Component connection

Flexible pipes shall be used as much as feasible from the main distribution to the serviced equipment to connect with the components of the test bed to be cooled.

The flexible pipe length delivered by the supplier shall consider a 10% length margin for the positioning of the equipment. Length shall be estimated based on the 3D model provided as part of this specification.

The installation of the flexible pipes is out of the scope of the supplier as the supplied equipment are not expected to be installed when the cooling circuit is deployed.

The types of connection are described in Table 5-7.

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Table 5-7: Connection for each component

Component	Connection definition
[C1] SSPA	$\frac{3}{4}$ '' NPT male connection
[C2] HPA2 anode	DN 25 ASME B16.5 Class 150, Flexible pipe flange ¹⁰
[C3] HPA2 screen grid	DN 15 ASME B16.5 Class 150, Flexible QDC ¹⁰
[C4] Auxiliary power supply bleeder	DN 15 ASME B16.5 Class 150, Flexible QDC ¹⁰
[C5] 200kW RF dummy load	$\frac{3}{4}$ '' NPT male connection
[C6] Matching system – stub1	DN 10 – Swagelok connector
[C7] Matching system – stub2	DN 10 – Swagelok connector
[C8] Prematching unit – outer	Inlet: 2x Swagelok VCR connector 8TB7P Outlet: 2x Parker triple-lok male connector 10M20F82EDMXS
[C9] Prematching unit – inner	ASME B16.5 DN40 – 40S – CL150 flanges
[C10] Vacuum	OD10
[C11] Stub Tee	DN 10 – Swagelok connector

Position of the connection point will be visible in the .stp file provided to supplier [IODL1].

¹⁰ The pipe connector in this case is in the scope of the equipment provider.

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The interface points for components inside the fenced area are modelled as *INT_Piping* as per Figure 5-4:

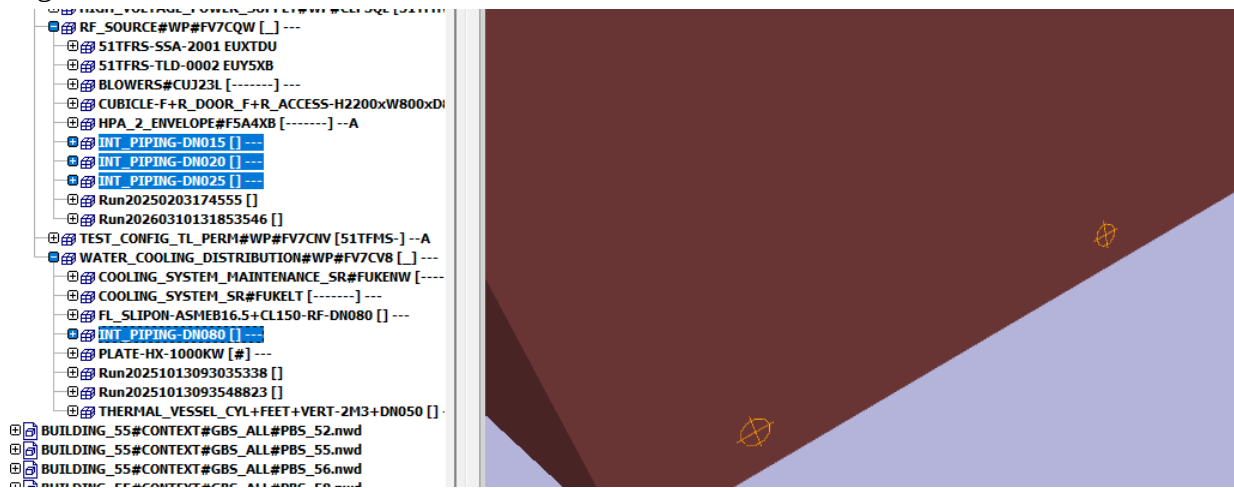


Figure 5-4: INT Piping in model, representing the physical connection point for components in fenced area.

The component outside the fenced area are modelled in Figure 5-5:

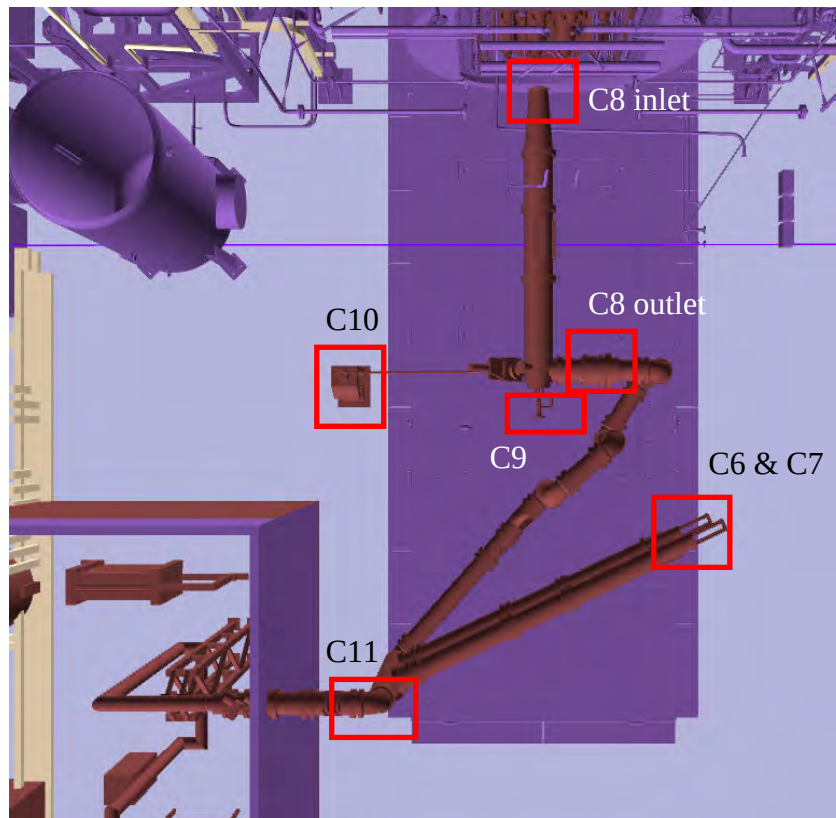


Figure 5-5: Connection point for components in PPTF main area.

5.3.2.2 CHWS connection

For CHWS, the interface is a DN 80 flange (isolation valve is provided on the chilled water side). The connection specification will be fully defined by IO [IODL2].

A preliminary IFP is available in [20], but the coordinates are still being updated by the building responsible officer so some change can be expected. Hereafter in Figure 5-6 is an extract from the execution drawing for installation of the piping. The as-built position will be provided to the supplier at the Kick off meeting [IODL3].

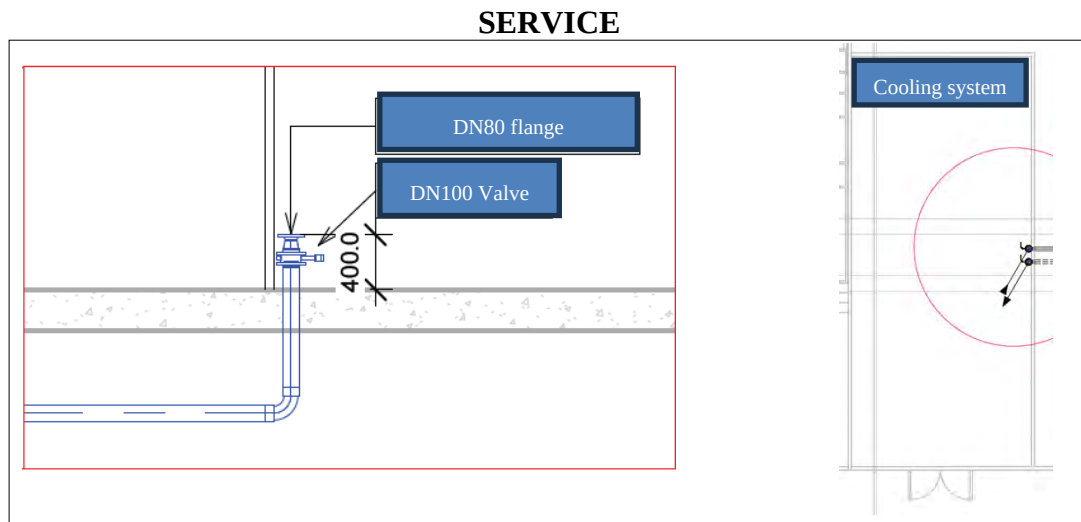


Figure 5-6: Execution drawing provided by the building TRO

5.3.3 Drainage and filling

Drainage and filling of the test bed will occur in the following circumstances:

- Filling of the main system: Tank, pump and main distribution;
- Filling of the serviced components using the tank.
- Drainage of any of the serviced components – the loop should provide capacity for the system to be drained at the level of any equipment, including nitrogen blowout;
- Drainage of the whole loop – at the end of the tests or in case of repair to the loop, to allow long term standby of the system;

The supplier shall define the procedure for drainage in the Maintenance plan (see [DL4]) allowing the flexibility of the above operations, including:

- Appropriate vent points and filling points to allow a proper filling and drainage
- Bypasses as required.

During drainage, the supplier should assume that an empty container is used to collect the drained water and allocate space accordingly.

During filling of the main system, the supplier should assume that a demineralized water container and a temporary pump are used to supply the water up to the loop's tank and allocate space accordingly.

5.4 Mechanical requirement

5.4.1 Shared support with the plate

For the distribution to components [C6] [C7], the matching stubs and [C8] [C9], the prematching unit inner and outer conductors, the pipe routing needs to traverse the area illustrated in the following Figure 5-7:

SERVICE

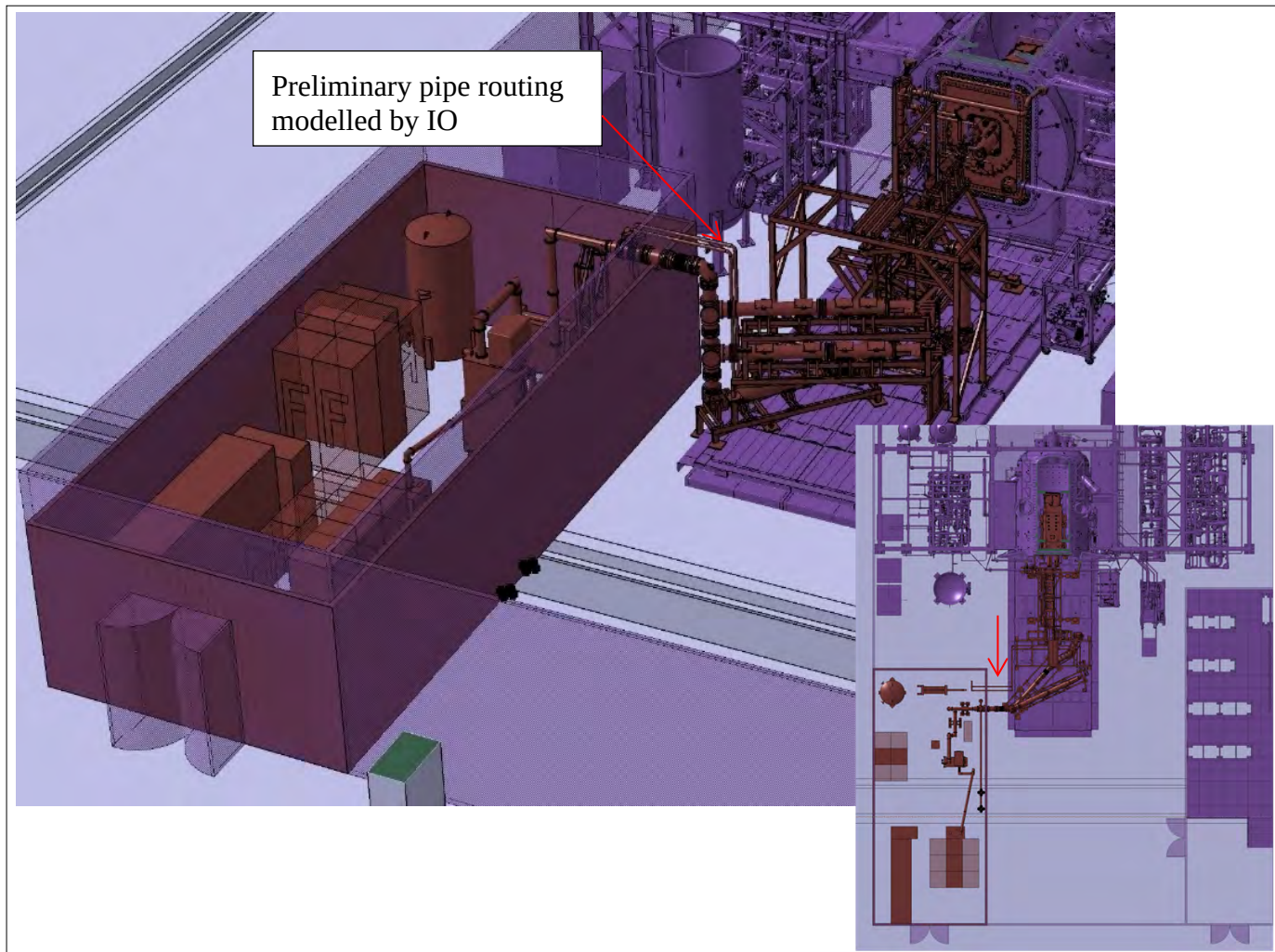


Figure 5-7: 3D model of the equipment installed on the plate.

For the crossing between both areas, access of equipment shall be maintained, so the pipes need to be brought to a height of $\sim 3.3\text{m}$ as indicated in the preliminary pipe routing in Figure 5-7 and no support shall be included between the fence (in brown in Figure 5-7) and the plate (in purple in Figure 5-7).

In this area, the pipes cannot support on the floor, as anchorage on the purple plate can only be done in specific areas. The areas where the support can be attached are visible in the model provided by IO [IODL1]. Threaded holes may be used for attachment. The plate is made for very high loads.

The general design of the equipment beyond the fence shall consider the impact of the Port Plug Test Facility Hazard and Risk Assessment [32]. It defines, amongst other things, that access to that area is prohibited when the PPTF heating circuit is under pressure.

The supplier shall identify all valves, manual actuators, local indicators, drains, vents, emergency isolation devices, located inside the restricted area and determine whether they are required during a condition when entry is prohibited. If yes, they need to be relocated outside the restricted area or remotely actuated/indicated.

5.4.2 Floor support

The support structure of all equipment is in the scope of the supplier.

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Connection with the floor will be post drilled. Information on the concrete floor in the area is available at [35] (zone C1). Floor characteristics inside B55:

- A. Anti-dust painting applied on the top of the concrete slab composed of 25cm of reinforced concrete (2 layers of HA14 gird, $e = 20$ cm), Thickness of the concrete cover: 40mm on top and bottom.
- B. Distributed loadings: 100 kN/m² (10 t/m²),
- C. Flatness of the slab: the slab is flat without slope gradient; and there are several galleries crossing the area with removable covers on all their lengths.

Note that before post drilling beyond the concrete cover, a ferroskan will be required and the support should provide enough flexibility to avoid rebars.

Prior to manufacturing, the supplier shall ensure by analysis [DL2] that the anchorage is properly sized (hand calculation acceptable).

5.5 Electrical requirements

The equipment shall follow the Electrical design Handbook of ITER [17]. The supplier is responsible for defining the list of applicable codes and standards from the list in EDH part 3.

The design of the low voltage distribution shall follow NFC 15-100.

5.5.1 Low voltage interface

The supplier will occupy a single feeder point on the main distribution board of the area. The distribution of the LV to the supplier's equipment is in the supplier's scope. See Figure 5-3 for position of the distribution board in the enclosure, respective to cooling equipment

The cable length will depend on the routing, which will need to be defined in collaboration with the IO. (see Figure 5-8)

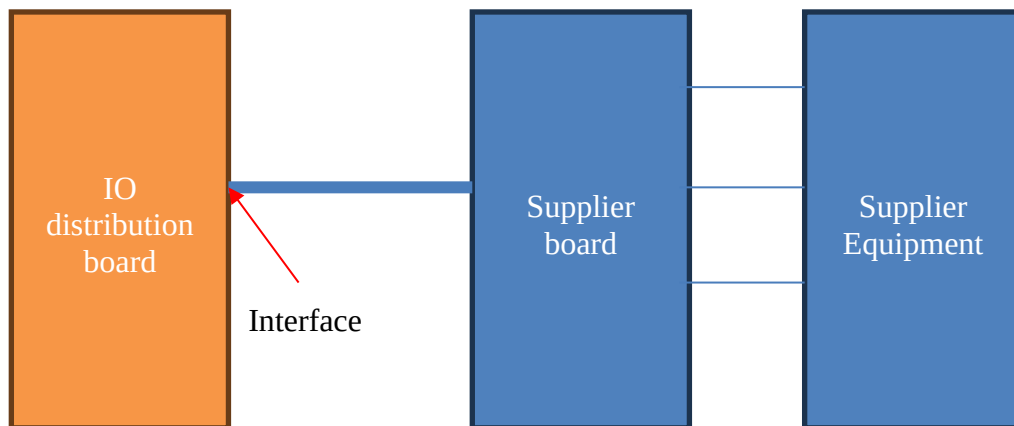


Figure 5-8: Scope of supplier (in blue) in the electrical distribution

The available power is given in Table 5-8:

Table 5-8: Power available for cooling system

Variable	Value	Unit
Voltage	400	V
Power	5	kW
Current	8.5	A
Min power factor	0.85	

SERVICE

The selectivity of circuit breaker on the supplier side shall be coordinated with the IO main distribution board CB selectivity.

5.5.2 Earthing

The requirements of the EDH part 5 shall be applied. This includes equipotential bonding of all metallic parts of the supplied equipment.

The supplier shall provide a unique earth connection point for the IO to run to the building earth bar. This unique connection point shall be defined in [DL5].

The connection of the water circuit's earth connection point to the earth of the building is under IO responsibility (design, procurement & installation) and will be defined by the IO during the contract (prior to the installation phase P3) based on the design of the supplier.

5.5.3 Cable interface

The IO cabling rules [19] define the rules and regulation applicable to all cabling engineering workflow for all cabling related subjects in the ITER facility. The rules apply as well to I&C cables.

The supplier is responsible for providing:

- I&C and power cables between components within the supplier's scope;
- Low voltage power cable between the distribution board and the supplier's scope;
- The cables between the main cubicle and the I&C of the supplier.

The cabling diagram defined in [DL1] will list the cables procured by the supplier and demonstrate compliance with [19].

Lengths of cables will be chosen based on provided layout considering margin for the routing.

5.6 I&C requirements

The cooling system is meant to be self-standing, as to be operated and tested fully in local and connected to other systems only when these are installed and tested. As such, the package includes a Local Control Unit.

The Local Control Unit shall allow the testing of the cooling loop in local mode.

The supplier shall implement all I&C function to ensure his own system operation & protection. The supplier will perform an engineering analysis to describe how the protection is ensured [DL2].

There will be a system under IO scope managing the control of the overall test bed equipment.

The supplier's system shall be capable of being remotely controlled by this upper layer of control (once site testing is complete).

The local control/protection functions identified by the supplier, as well as the ones listed in section 5.2.2, shall be interfaced with the upper layer of control under IO scope.

For the definition of the interfaces between the supplier scope and the upper layer of control, the Plant Design Control Handbook [18] shall be applied (i.e. interface over Profinet and, if needed, direct connections). As per PCDH [18], the supplier shall deliver the software in source format to the IO.

The interface point for the cabling shall be defined by the supplier for IO connection.

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The I&C shall be tested after installation, including remote connection.

The supplier shall deliver a I&C package [DL3] describing the logic of the I&C and how it will connect with the IO I&C for remote control.

5.7 Occupational Health Safety Requirements

The risks shall be listed and mitigation measures implemented in the design documented in the design phase [DL2].

Using the general procedure defined in [33], the assessment shall identify the hazards, risks, risk-control measures and residual risks, including but not limited to:

- rupture of pressure-containing components;
- hot or cold surfaces and hot cooling water;
- leakage, flooding and unintended discharge of cooling water;
- rotating machinery and moving parts associated with pumps;
- electrical shock, electrical fault and stored electrical energy;
- lifting and handling of equipment, pipework and components;
- access to equipment installed above floor level;
- noise;
- exposure to chemicals;
- pressure testing;
- nitrogen blowout and the associated pressure and asphyxiation hazards > (If nitrogen can be released into the room, the ODH shall be assessed);
- fire and hot-work activities;
- maintenance, inspection and replacement of components;
- etc.

Noise generated by the cooling system shall be controlled to minimise occupational exposure and shall comply with the applicable occupational noise exposure requirements of the French Labour Code R4431-2. The Supplier shall identify noise-emitting equipment and processes and provide predicted noise levels for normal and relevant abnormal operating conditions. Appropriate engineering controls shall be implemented where necessary. * MERGEFORMAT

5.8 Coding and Marking requirements

The Supplier shall liaise with the IO CRO to determine the applicable IO Functional reference within the Plant Breakdown structure of 51.TF.WD&GD, in accordance with [31].

The Functional References of the equipment shall be identified before the end of phase P1 (BoM) to allow clear identification of the equipment across documents.

The Product Number Identification of the equipment shall be identified before the end of phase P1 to fully identify the components associated with each function.

5.8.1 Labelling

According to [1] section 9.2, all components and packages supplied by the Supplier shall be physically labelled.

Colour of paint and label for the equipment shall be as defined in [34] section 4.5.2.

SERVICE

5.8.2 CE Marking

CE Markings shall be implemented in accordance with European and French legislation. The list of products for which the CE marking may be applicable is available on the following web-site: https://ec.europa.eu/growth/single-market/ce-marking/manufacturers_en.

Comprehensive guidance on the implementation of EU product rules can be found in the so-called Blue Guide: <https://ec.europa.eu/docsroom/documents/18027/>.

5.9 Acceptance test

Testing shall generally follow the requirement of the chosen design code. The supplier shall establish the testing plan as part of the MIP [DL6] & ITP [DL8] for IO to review prior to start of the manufacturing.

The MIP (see section 7.1) shall define the tests as per standard defined as per section 4.2 .

At the minimum, the following reports are expected for acceptance:

- Material certificates;
- Dimensional check;
- The result of the Weld inspection and testing;
- The pump & the heat exchanger performance test;
- The instrument calibration certificate;
- A report of hydrostatic test;
- Report of the Local Control Unit test.

5.10 Delivery

The supplier is responsible to ensure delivery of the components defined in the Bill of materials [DL1] to the IO.

For all deliveries to ITER site, the requirements of [14] and [15] shall be followed before the Logistics Service Provider begins transporting the components.

The supplier shall attach accelerometers to its sensitive equipment's packaging to monitor the transport.

Note that the delivery process described in [14] and [15] is thought of as a delivery to the IO site storage area, where the package would then be stored waiting for construction readiness. Alternatively, for these components that are installed in the supplier scope, they could be delivered directly to the site of installation, skipping the storage. This is considered an easier option, since it skips the administrative steps of storing and releasing from storage.

5.11 Installation

Upon delivery, the supplier is responsible for installing the component in the area described in section 5.3.1.

Installation of the pipes up to the components is not in the scope of the supplier. Installation of the pipes and supports outside of the fence (see section 5.4.1) is also outside the scope of the supplier. These items will be accepted upon delivery to the storage area. (see section 5.10)

The supplier is responsible for:

- Survey of the work area

SERVICE

- Prefabrication and testing of components
- Erection of scaffold as deemed necessary,
- Installation of equipment, all welding activities
- Ferrosan and anchoring to the building
- Non-Destructive Examinations of the installed equipment, including repair to any defective materials
- Labelling and tagging of all equipment.
- Certification of all processes and personnel.
- As built documentation (See section 7.5)
- Filling of the circuit with demineralized water.

Installation shall be performed following the rules established in the standard used for design.

5.11.1 Work Tools and Equipment

Unless otherwise specified, the Supplier shall supply:

- Manpower to execute the scope of work by qualified personnel, as specified in this technical specification and the contract documents.
- All personal protective equipment required to ensure safety of the workers on site.
- All tools and equipment required for preassembly and installation, such as protective caps, plugs, lifting assemblies, temporary supports and restraints, etc.
- Materials required for protection of equipment or materials for work during and after installation up to the handover of the equipment.
- Any Scaffolding.
- All tools and equipment required for testing (including site acceptance) (with the proper calibration certification if applicable).

For the entire duration of the Contract, the Contractor shall ensure that all work tools, machinery, and equipment, including those used by Subcontractors, are:

- Fit for the intended purpose
- Properly maintained and inspected at regular intervals
- In full compliance with relevant safety standards and manufacturer specifications

5.11.2 Work Site Conditions

The worksite will be generally clean and the building will be equipped with the necessary infrastructure, such as lighting, HVAC, etc. to be able to adequately perform the necessary scope of work.

For installation, the conditions of the area prior to the installation of the cooling circuit will be confirmed by the IO prior to the start of the installation. The current hypothesis is that no other equipment is installed in the general area - except the fences provided by the IO. This is illustrated in Figure 5-9:

SERVICE



Figure 5-9: Anticipated state of the equipment prior to the start of the work

The fence door is roughly 1.8m wide, although the dimensions will be confirmed during the site survey. The supplier should communicate any requirements to the size of the aperture to the IO as soon as the requirements become clear.

The following Figure 5-10 represents the situation in the building and the access points for equipment:

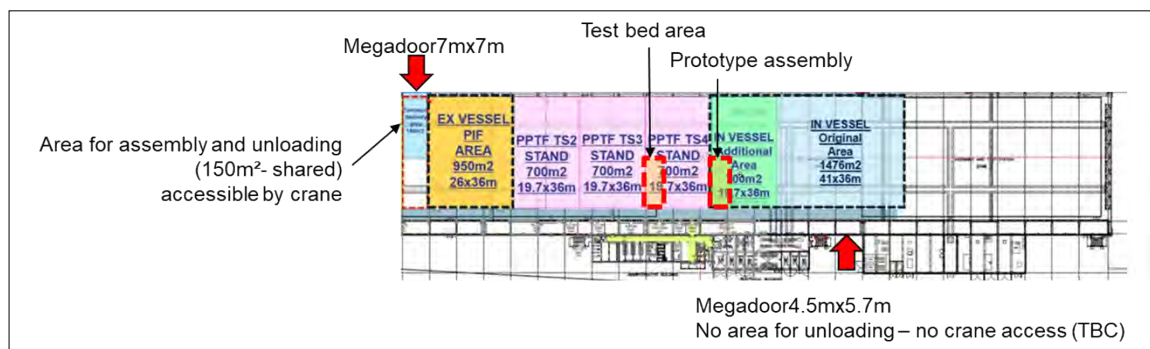


Figure 5-10: General condition of the building and access points

The blue trajectory to the south of the test bed area is about 3.4m wide. The building is equipped with an 8t crane and a 25t crane which could be used by the supplier during installation (crane driver is provided by IO, rigger and banksman to be provided by the supplier).

Access to the areas and to the building facility may be restricted temporarily due to coactivity that will be managed through coordination meetings organized by the IO. In general, request of services provided by the building should go through the weekly coordination meetings.

The supplier shall attend daily and weekly coordination meetings for the duration of the work.

SERVICE

Note that this is the anticipated state, but the actual state shall be confirmed between IO and Supplier as the installation phase P3 begins.

The worksite shall be returned to the state of cleanliness as it was prior to the work commencing with all tools, equipment etc. removed.

Any damage in concrete surfaces and/or Equipment (i.e. pipework, electrical cable trays, supports) arising from the Supplier's operations shall be repaired or removed and replaced by the Supplier. Additional costs will be borne by the Supplier.

5.11.2.1 *Site survey*

The Supplier shall perform a survey of the work area relevant to the installation in the building 55 and check compliance to the modelling, including interface points with the chilled water system.

Site survey shall include the checking of the access, and of the neighbouring ongoing activities, to understand coactivity constraints.

Generally, the survey should establish the maximum size of a package that may be delivered to the area in a single piece, for finalization of the installation/pre-fabrication split.

5.11.3 *Field Change*

When there is a need during the course of installation to amend the design, the Supplier shall inform the IO and follow the Field Change Request (FCR) procedure [26].

After any modification, the tagging and painting of the component needs to be reestablished.

5.11.4 *Premanufacturing*

To prepare the installation, Fabrication isometrics shall be developed by the supplier based on the design isometrics. The component breakdown proposed by the supplier will be presented in the fabrication isometrics, taking into account the assembly requirements, the space available for the assembly, the ability to install the equipment and the use of materials.

The Supplier shall aim to minimize on site working, minimizing coactivity and impact on the building facility, while taking into account the restrictions for access and handling resulting from the ITER site configuration. This could be done by premanufacturing the component in the supplier's own facility or on site, if the supplier has a dedicated workshop space.

For the pre-manufacturing of components, no dimensional deviation shall be allowed outside of the ASME. The fabrication isometrics should clearly mark where green ends are proposed to be used to allow for site fitting of the components.

The Supplier shall prepare and submit the work plan, including the document tracing compliance of installation with the applicable code [DL8]. As part of the work plan, the Supplier shall provide a risk assessment to ensure that all work can be performed safely at all times.

Provisions shall be made throughout the work to ensure that the base materials and components are not damaged during transportation and handling. The Supplier shall fit suitable covers, such as plastic caps, etc. to the components. The procedure for the transportation of components [15] shall be followed for the transport of items by the Supplier on site.

5.11.5 *Cleanliness criteria*

- Stainless steel shall be protected from carbon contamination in entire manufacturing phases.

SERVICE

- Carbon segregation shall be respected by either providing a dedicated stainless-steel workshop or establishing counter measures to protect stainless steel from ferritic particles.
- Tools (i.e. jig, grinder) shall not be mixed with what was used for carbon steel.
- Halogen shall not be used to stainless steel. Any tools (i.e. jig, grinder), consumable product (i.e. vinyl, tape, solutions for NDT), and environmental condition (i.e. fabrication shop, storage shop) shall be controlled to protect the stainless steel from halogen.
- Pickling passivation at the final stage is recommended. However pickling passivation does not guarantee of stainless steel free from carbon and halogen risk. Therefore, cleanliness requirements shall be respected throughout all manufacturing phase in addition to the pickling passivation.

5.11.6 Post drilling

Any post drilling of the concrete shall be preceded by a ferroskan to ensure the drilling will not damage the rebars.

The Supplier shall mark the points to be drilled.

5.11.7 Material identification and tagging

The identification marks on the base material shall be maintained. Then each base material, component and equipment shall be uniquely identifiable in accordance with [13]. For example, if lengths of pipes are cut into two or more parts, resulting in pieces without identification, the identification markings shall be accurately transferred to all parts before cutting.

Components shall have the component name clearly marked on the material or on tags securely fastened to the pipe.

Markings shall only be applied to the external surfaces of the pipework.

5.11.8 Occupational Health Safety Requirements for installation and site acceptance

The Contractor shall comply with and ensure that its Subcontractors and any visitors under its responsibility comply with, the provisions of the French Labour Code, all applicable occupational health and safety legislation, relevant European Directives, harmonised standards, and any other regulatory obligations applicable to the scope of work. This includes obtaining and maintaining any required licenses, permits, and certifications necessary for the performance of the Contract.

In addition, the Contractor shall strictly adhere to all ITER Site specific occupational health and safety (OHS) rules and procedures, including but not limited to the following documentation:

- List of Applicable Annexes to the PGC SPS – Volume 1 [37]
- PGC SPS – Volume 1 IO & F4E [38]
- PGC Annex 03 - Rules of cooperation between the HSPC and the Contractors [39]

The Contractor shall ensure that all personnel under its supervision, including those of Subcontractors, adhere to the ITER Life-Saving Rules [40].

SERVICE

Should the Contractor or any Subcontractor be deemed to be executing work in a manner that is considered unsafe or poses an actual or potential threat to personnel, third parties, property, or the environment, the ITER Organization (IO) reserves the right to require an immediate cessation of the work. Upon such request, the Contractor or Subcontractor shall stop the work without delay. IO shall provide written notification as soon as reasonably practicable, specifying the reasons for the stop-work order and the conditions required for resumption, including appropriate mitigation measures.

5.11.8.1 PPSPS

The Contractor shall identify all potential health and safety hazards related to the work activities, assess associated risks, and propose appropriate control measures. This risk assessment shall be documented in an Individual Health and Safety Protection Plan (PPSPS – Plan Particulier de Sécurité et de Protection de la Santé), using the predefined bilingual format, PGC Annex 05 - Individual Health Protection and Safety Plan – template [41].

The PPSPS shall consider:

- The specific location, methods, tools, and equipment involved in the work
- All relevant OHS regulations and ITER-specific rules
- Rules for managing co-activities (multi-Contractor interface risks)
- Feedback and observations provided by the Health and Safety Protection Coordinator (HSPC) during Common Inspections

When determining control measures, the Contractor shall apply the following hierarchy of controls, in line with international best practices:

1. Elimination of the hazard
2. Substitution with a safer alternative
3. Engineering controls
4. Administrative controls (e.g. procedures, instructions)
5. Personal protective equipment (PPE)

The PPSPS shall include the Contractor's administrative and emergency contact details and shall be maintained up to date throughout the duration of the Contract.

The PPSPS is subject to approval by the HSPC, the organisation appointed by IO to coordinate and oversee OHS matters on the ITER Site. Once approved, and prior to any work commencing, the HSPC shall conduct a Common Inspection – a mandatory meeting to review the scope of work, associated OHS risks, and control measures in place. The Common Inspection and the HSPC's responsibilities are defined under Articles R.4531-11 to R.4532-16 of the French Labour Code.

The Contractor shall identify all PPE required for its personnel and Subcontractors in their respective PPSPS, based on the scope of work described in this Specification and associated risk assessments.

Unless otherwise stated in the Contract, the Contractor shall provide all required PPE for its personnel at its own cost and ensure that it meets applicable EU harmonised standards under

SERVICE

Regulation (EU) 2016/425, is CE marked, and is properly maintained, stored, and replaced as needed.

5.11.8.2 Permit to Work (PTW) Requirements

The Contractor shall implement and comply with the ITER Permit to Work (PTW) system as per ITER Site Permit to Work Procedure [44] which is a mandatory control process used to manage and authorise potentially hazardous work activities on the ITER Site. The PTW system is designed to prevent accidents and ensure coordination of activities, particularly where multiple stakeholders operate simultaneously (co-activity scenarios).

The Contractor shall ensure that no work is commenced without a valid and approved PTW, where required under ITER rules. This obligation extends to all Subcontractors and includes preparation, execution, and closure phases of work activities.

The Contractor shall:

- Appoint competent personnel responsible for preparing and managing PTWs, in coordination with the IO PTW Coordinators and the Health and Safety Protection Coordinator (HSPC)
- Ensure that work supervisors and affected personnel are fully briefed on the PTW conditions and associated risk control measures
- Ensure that all required documentation, risk assessments, method statements, and applicable safety plans (e.g. PPSPS) are attached to the PTW application
- Comply with all precautionary measures, isolations, and controls stipulated in the issued PTW
- Promptly report to IO and HSPC of any deviation from the authorised PTW conditions or any incident/unsafe situation occurring during the work
- Fully cooperate in PTW planning and PTW coordination meetings. PTWs may be subject to suspension or delay due to safety concerns arising from co-activity, and the Contractor shall plan accordingly.
- The Contractor shall not alter or interfere with other Contractors' work zones or PTWs without prior written approval from IO, HSPC or the designated coordination authority.

5.11.8.3 Incident Notification and Investigation

The Contractor shall implement all requirements for incident reporting and investigation as defined in the IO OHS Events follow-up procedure [42]

- An initial verbal notification shall be made as soon as the situation allows.

A formal report shall be submitted via the JIRA HSR tool within 24 hours of the incident, in accordance with JIRA HSR Tool - INCIDENT user's manual appendix [43]

The Contractor is also responsible for fulfilling all obligations regarding the administrative management and legal reporting of occupational injuries and incidents to the relevant French authorities, as per applicable legislation.

SERVICE

5.11.8.4 Occupational Health and Safety Inspections

All Contractor and Subcontractor work activities and workstations are subject to regular OHS inspections conducted by the HSPC and/or the IO designated safety representatives.

These inspections aim to verify compliance with all applicable OHS regulations, contractual obligations, and ITER-specific requirements. Any non-conformities or unsafe conditions identified must be promptly addressed by the Contractor, with corrective and preventive actions taken and documented.

5.12 Site acceptance test

The Site Acceptance Test (SAT) will be performed after installation of the cooling system on site and completion of the CHWS interface connections.

The supplier will perform the following tests under IO witness:

- Hydrostatic test pressure;
- The pump & the heat exchanger functional test;
- Local Control Unit test;
- Electrical loop test.

Upon completion of the site acceptance test, a certificate will be issued. Warranty will start after acceptance of the certificate.

6 Training – SQEP

The Contractor shall ensure that all its personnel, as well as those of any Subcontractors or visitors, are competent to carry out the tasks assigned to them and have received all mandatory training and/or site-specific orientation, in accordance with the French Labour Code and PGC SPS Volume 1.

Unless specified otherwise in the Contract, the cost of such training shall be undertaken by the Contractor and its Subcontractors.

All relevant personnel shall participate in emergency response drills, awareness campaigns, and other safety-related initiatives organised by IO, HSPC, or any designated coordinating entity.

Before any individual (Contractor or Subcontractor) is granted access to the ITER Site to perform work-related activities, they shall attend the mandatory Newcomers Safety Training provided by the HSPC. This training is a prerequisite for obtaining a site access badge but does not relieve the Contractor of its obligation to conduct job-specific or regulatory training as required under Articles L.4141-1 and following of the French Labour Code.

The Contractor shall ensure that all personnel (including those of Subcontractors) involved in the work are medically fit to perform their duties and possess valid medical certificates in accordance with applicable French health and safety regulations.

SERVICE

7 List of document 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.

Supplier is requested to prepare their document schedule based on the below and using the template available in the GM3S Ref [1] appendix II ([click here to download](#)).

7.1 P1 Design phase

The supplier will be responsible to deliver to the IO a package of documentation necessary to demonstrate the capacity of its design to meet the requirements defined above.

In particular, the supplier shall deliver:

- [DL1] – CAD package:
 - o A 3D model of the supplier's scope (provided as per [1]).
 - o Bill of materials listing all the parts including:
 - Grade, Dimension and Quantities;
 - Design temperature, design pressure;
 - The codes and standards applied to each part.
 - o Diagrams :
 - A Cabling diagram detailing the distribution of power and I&C.
 - Process flow diagram defining the functional values of flow, temperature and pressure in the different parts of the system during operation.
 - Piping and instrumentation diagram summarizing the supplier's approach to instrumentation.
- [DL2] – Analysis package:
 - o Thermal Hydraulic analysis (Fathom, ...) demonstrating the performance of the system.
 - o An OHS analysis of the risks associated with the design and their mitigation measures.
 - o A failure engineering analysis of the accidental events that may lead to damage to the serviced [Cx] (see section 5.2.2) and the mitigation measures (I&C or hardware) implemented in the design to mitigate them (pump stalling, water hammer, etc.). (calculation is not required)
- [DL3] – I&C package:
 - o I&C function description (including architecture);
 - o List of signals connected to the plant system I&C including name, type, sampling rate;
 - o Interface data with upper layer control;
 - o Software code & associated documentation.
- [DL4] – Procedures describing the following aspects:
 - o Operation of the system;
 - o Maintenance of the system;
 - o Installation of the system (including site testing).
- [DL5] – Electrical design package;
 - o A detailed wiring diagram describing the wiring inside any I&C cubicle or distribution panel.
 - o Definition of the earth conductor interface with the IO grounding connector (size, position).

SERVICE

In addition, the supplier shall deliver a [DL6] Manufacturing and inspection plan in accordance with [30]. The Plan shall cover:

- All activities requiring inspection shall be captured in a MIP. Control points, e.g. Witness / Hold points shall be defined and agreed between Supplier and IO.
- This is not applicable for the inventory/Stock supply, provided that in that case all the traceability must be secured in accordance with this Technical Specifications.

The approval of all the above documentation by IO will constitute a hold point.

7.2 P2 Factory acceptance test

Reports shall be provided to the IO prior to delivery.

- [DL7] – Report of the tests performed on equipment as per MIP, e.g.:
 - o Dimensional check;
 - o The result of the Weld inspection and testing;
 - o The pump & the heat exchanger performance test;
 - o The instrument calibration certificate;
 - o A report of hydrostatic test.
 - o Declaration of conformity from the supplier that the delivered system is designed as per the present specification.
 - o Material certificate as per the design code used by the supplier see section 4.2.
 - o Local control unit Factory acceptance tests.

Prior to starting the installation, the supplier shall provide the IO with a package of data necessary to establish that the work is well prepared and obtain authorization of the start of work.

The Supplier shall provide the [DL8] - ITP (Installation and Test Plan) in accordance with [2] (template at [30]).

In addition, the supplier shall update the documents delivered at the manufacturing readiness review as required based on possible adjustments made during/after testing.

7.3 P3 Delivery Readiness review

To prepare the delivery, the following information shall be provided at minimum two weeks prior to the forecasted delivery date:

- Supplier Release Note, [23]
- Delivery Report, [24]
- Detailed Packing List at the both item-level and package-level, [25]

Transportation activities shall not occur until the approval by the IO-TRO of the Supplier, Release Note and approval of the Delivery Report by the IO-ILM.

7.4 P3 Inspection at delivery

Upon completion of the delivery, if the delivery is done to the IO storage, an inspection will take place to ensure transportation occurred without damage to the equipment. In case of damage, an anomaly is raised by the storage owner, and the supplier shall raise an NCR and propose a resolution [4].

SERVICE

If the delivery is done directly to the supplier's workshop or installation area, such an inspection shall anyway be conducted by the supplier prior to moving on to the installation. In both cases, the inspection report [DL9] will be necessary to start installing.

For these items which are not installed in the B55 area by the supplier (any equipment going to the [Cx] components), once inspection is performed with no anomalies, the final acceptance certificate [DL9] will be issued by the IO to certify the transfer of ownership.

7.5 P3 As built package at completion

After completion of the installation, the supplier shall provide IO with a package of as-built data, which presents the final configuration of equipment including results of dimension inspection record and DR&NCRs.

More specifically the following documents are at minimum expected updates of the following document if required by changes performed during installation and Site test

- Detailed wiring diagram[DL5]
- 3D model [DL1]
- Bill of materials [DL1]
- ITP [DL8]
- I&C document [DL3]

7.6 P3 Site testing

Site acceptance reports [DL10] will be necessary prior to the transfer of ownership of the components from the supplier to the IO.

Site testing of the equipment shall generally follow the requirement of the chosen design code. The supplier shall establish the testing plan for IO to review prior to start of the installation as part of the ITP [DL8].

Temporary pieces that are necessary to test the hydraulic circuit during erection (blind flanges, etc.) shall be procured by the supplier.

For water filling, the supplier shall procure the filling tank and deliver it to the site as part of the installation process. The demineralized water can be collected from Building 61 on IO site. The supplier must provide the means for filling the system (temporary pump).

SERVICE

7.7 Summary

Phase	Deliverable (DL)	Type of DL	Due date
P1 Design Phase	[DL1] CAD package (3D, BoM + diagrams)	.stp model + Docx/pdf	T0 + 3 months
	[DL2] Analysis package	Docx/pdf	
	[DL3] I&C package for the Local Control Unit	Docx/pdf	
	[DL4] Operation, maintenance and installation procedures	Docx/pdf	
	[DL5] Electrical design package - wiring diagram	Docx/pdf	
	[DL6] Manufacturing Inspection Plan	Docx/pdf	
P2 Manufacturing phase	[DL7] Report of the factory acceptance tests & declaration of conformity	Docx/pdf	T0 + 6 months
	[DL8] Installation and Test Plan	Docx/pdf	
P3 Delivery, Installation and site testing phase	[DL9] Inspection report on IO site	Docx/pdf	T0 + 6½ months
	[DL10] Site acceptance test reports	Docx/pdf	T0+8½months

8 Location for Scope of Work Execution

Supplier can perform the work at their own location.

Installation will be performed in the ITER premises. Premanufacturing will be managed either at the supplier's location or in an on-site workshop if the supplier has one.

The rules defined in [36] should be followed for access to ITER-site.

9 Quality Assurance requirements

The Quality class under this contract is QC3, [1] GM3S section 8 applies in line with the defined Quality Class.

The Supplier shall have an ISO 9001 certified quality system or alternatively a QA Program approved by QARO. In addition, the quality management system shall comply with the IO quality requirements as per [2].

All requirements of this Technical Specification and subsequent changes proposed by the Supplier during the course of execution of this Contract are subject to the Deviation Request process described in [5] and [4].

9.1 Quality plan

The Supplier shall produce a Quality Plan in accordance with [2]. The quality plan is expected by the KoM and revised until IO approval at the latest 10 working days after the KoM. If some of the required topics of the Quality plan are covered in the Contract Management Plan, the Supplier is to organise cross reference between those plans.

Both plans will be updated during the duration of the contract as required by evolution in the design and in the list of sub-suppliers (if any).

10 Safety requirements

No specific safety requirement related to PIC and/or PIA and/or PE/NPE components apply.

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

The Suppliers and Sub-Suppliers (if any) are informed that:

- ITER is a nuclear facility (an "INB", for Installation nucléaire de base, "Basic nuclear installation" in French regulation) identified in France by the number "INB no. 174".
- The ITER Policy [6] must be circulated, known, understood and applied by all staff of the Suppliers and cascaded down in the managerial lines of the Suppliers and sub-Suppliers.

In application of the ITER agreement, article 14, ITER follows the French Regulation for Nuclear safety. Because of its inventory in nuclear materials, ITER has been classified in France as a nuclear facility "Installation Nucléaire de Base" and in particular numbered as INB no.174 per [7] and the associated ASN Decision [8].

11 Special Management requirements

Requirement for [1] GM3S section 6 applies in full.

11.1 Contract Gates

The contract gates are defined in [1] section 6.1.5, this scope of service call for the following technical gates:

- Kick Off Meeting;
- Manufacturing readiness review gate;
- Factory acceptance tests;
- Delivery Readiness review gate [14];
- Inspection at delivery;
- Site acceptance tests.

11.2 Work Monitoring

The work will be managed by means of Progress Meetings and/or formal exchange of documents transmitted by emails, which provide detailed progress. Progress Meetings will be called by the ITER Organization, to review the progress of the work, the technical problems, the interfaces and the planning.

The main purpose of the Progress Meetings is to allow the ITER Organization/ICH project and the Supplier Technical Responsible Officer to:

- a) Allow early detection and correction of issues that may cause delays;
- b) Review the completed and planned activities and assess the progress made;
- c) Permit fast and consensual resolution of unexpected problems;
- d) Clarify doubts and prevent misinterpretations of the specifications.

The frequency of the progress meeting is weekly.

In addition to the Progress Meetings, if necessary, the ITER Organization and/or the Supplier may request additional meetings to address specific issues to be resolved.

For all Progress Meetings, a document describing tasks done, results obtained, blocking points shall be written by the Supplier.

All reports will be stored in the ITER IDM to ensure traceability of the work performed.

11.3 CAD design requirements

For CAD activities performed under this Contract, the Section 6.2.2.2 of GM3S [1] does not apply. The supplier shall deliver the 3D model of the installation as a step file, which IO will use to verify the integration of the proposal. The diagram shall be delivered as pdf. IO will be responsible of the integration of the delivery in the IO database. Any issue of integration will be managed within the review cycle of the supplier's delivery.

The Supplier shall ensure the correct and compliant identification of all items, in accordance with the ITER Numbering System for Components and Parts [31].

12 IO Documents

Under this scope of work, IO will deliver the following documents by the stated date:

Ref	Title	Format	Expected date
[IODL1]	Stp. model of the test bed including:	Stp model	With the present specification

	- Space reservation for equipment + maintenance - Component interface points - CHWS interface point - PPTF plate		
[IODL2]	Connection point for the compressed air (if necessary for pneumatic actuation)	Docx/pdf	Before end of phase P1, based on the supplier's needs.
[IODL3]	Type of connector at the CHWS interface & as-built position of the interface point	Docx/pdf	Kick Off meeting

EXPRESSION OF INTEREST & PIN ACKNOWLEDGEMENT

To be returned by e-mail to: Junhyung.park@iter.org copy to Andrew.Brown@iter.org

Company Name: _____

TENDER No. **IO/26/OT/10035602/JPK**

DESIGNATION of SERVICES: **Design, Manufacturing, Installation, and Commissioning of Ion Cyclotron Heating (ICH) Cold Water Loop required for the Test Bed in B55**

OFFICER IN CHARGE: **JunHyung PARK – Procurement Division ITER Organization**

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

☐ WE INTEND TO SUBMIT A TENDER

Are you registered in Iproc (only entities registered in iPROC will be invited to tender)?:

☐ YES

Please indicate your registration number:

☐ NO, but we shall register before the indicated tender launch date

.....

Signature:

COMPANY STAMP

Contact person:

Position:

Tel:

E-mail:

Date: