

Technical Specifications (In-Cash Procurement)

Development of a Welding Head with filler metal for pipe applications

The purpose of this contract is to develop a welding head with filler capable to cope with the manifolds space constraints and challenging misalignment situations.

The welding head will be further tested on a representative space constraint mockup.

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1 Purpose

In the frame of the assembly of pipes inside the tokamak building, IO will need to use a TIG orbital Welding Head (WH). The baseline is to use a standard closed WH and realize the weld autogenously.

Nevertheless, the tolerances of misalignment and gap during the fit-up are very small for autogenous weld. IO wants to develop a WH with filler to increase their capacity to face all the possible cases encounterable during assembly phase.

2 Scope

This contract will be split in three different phases:

- Development of the WH design based on the IO inputs (space constraint, accessories...)
- Manufacturing of the WH
- Qualification of the WH on representative mock-up

3 Definitions

The following definitions are used in this document.

IO	ITER Organization
IO RO	ITER Organization Responsible Officer
NDT	Non-Destructive Testing
PT	Penetrant Test
QP	Quality Plan
RT	Radiographic Test
VC	Video conference
VT	Visual Test
WPS	Welding Procedure Specification
WH	Welding head
GTAW	Gas Tungsten Arc Welding (TIG)

For a complete list of ITER abbreviations see: ITER_D_2MU6W5 - ITER Abbreviations

4 Applicable Documents

The following codes and standards are applicable for this activity.

AD1	ISO 15609-1 Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding
AD2	EN ISO 14732:2013 Welding Personnel – Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials.
AD3	EN ISO 17636-1: Non-destructive testing of welds - Radiographic testing – Part 1: X-and Gamma-ray techniques with film
AD4	ISO 10675-1 Non-destructive testing of welds — Acceptance levels for radiographic testing — Part 1: Steel, nickel, titanium and their alloys.
AD5	EN ISO 17637: Non-destructive examination of fusion welds – Visual examination
AD6	EN ISO 5817: Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections
AD7	EN ISO 3452-1: Non-destructive testing – Penetrant testing – Part 1: General principles
AD8	ISO 23277 Non-destructive testing of welds - Penetrant testing - Acceptance levels.
AD9	ISO 9712 Non-destructive testing - Qualification and certification of NDT personnel
AD10	EN 10204 Types of inspection documents
AD11	Requirements for Producing a Contractors Release Note (ITER_D_22F52F)
AD12	Delivery Report Template (ITER_D_WZPYVZ)
AD13	Template - Equipment Storage & Preservation Requirements Form (ITER_D_WU9636)
AD14	Package & Packing List Template (ITER_D_XBZLNG)
AD15	Release Note Template (ITER_D_QVEKNQ)
AD16	ITER Procurement Quality Requirements (ITER_D_22MFG4)
AD17	Requirements for Producing a Quality Plan (ITER_D_22MFMW)
AD18	Procedure for management of Nonconformities (ITER_D_22F53X)
AD19	Procedure for the management of Deviation Request (ITER_D_2LZJHB)
AD20	CAD Step file of the pipes and the area that defines the geometrical constrains

5 Scope of the activities

The scope of the activities is defined in the following sections.

5.1 Part 1 – Design of the WH

The supplier shall develop the design of the WH based on :

- Space constraint specified in the step file attached to this call for tender [AD20].

The space constrain to take into consideration is the one for the connection between the upper port pipes and the Bundles (minimum distances are given Figure 2).

- Range of diameter and thickness to be welded. DN40 t2.77mm and DN50 t2.77
- WH shall be provided with an Arc Voltage Control (AVC) system
- Maximum distance between the generator and the weld : 25m
- Wire system
- Cooling system
- Camera to monitor the welding pool (optional)
- Clamping/adaptor system
- Filler guide
- Other accessories that the supplier judge essential for an optimal efficiency of the WH. IO expect proposition from the supplier based on his experience and all the problematic that IO didn't foreseen
- IO will provide the other information that the supplier will judge necessary.

In addition, the WH shall take into account the specific device welded at the end pipe of one side of the pipe: the objective of this part is the following:

In order to better align both parts of the weld, an extra thick part is welded on one pipe. After survey of the exact distance required, this part is machined as below:

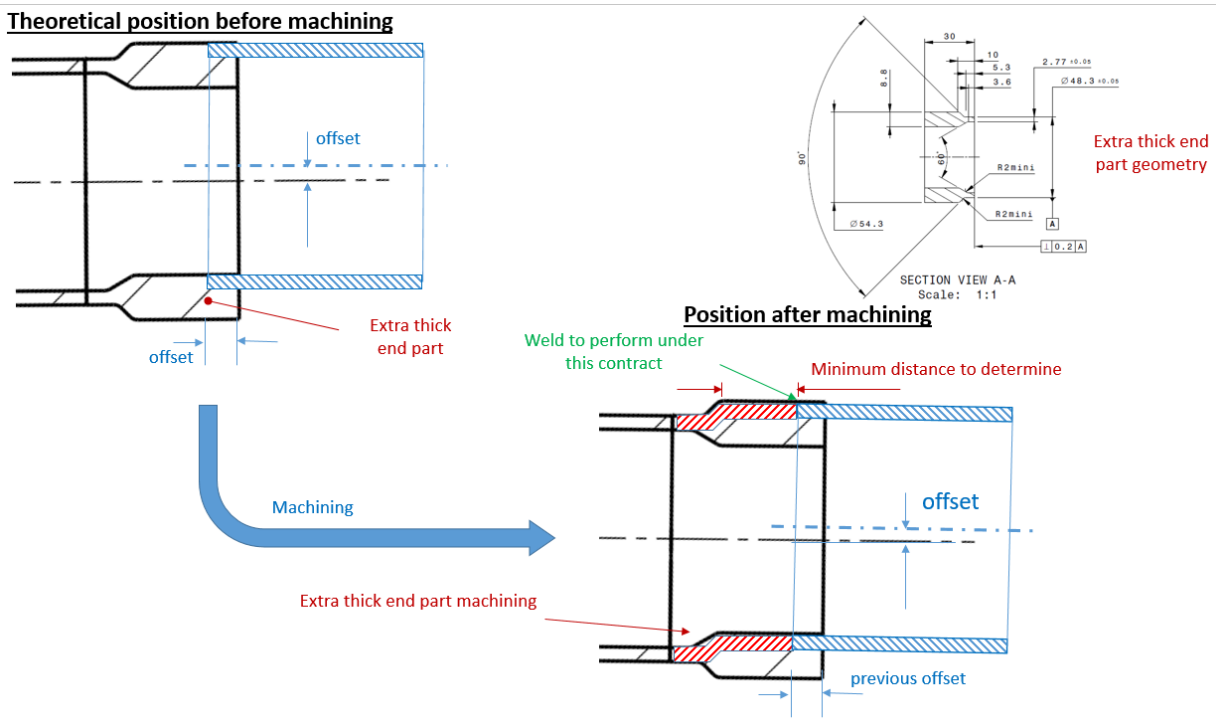


Figure 1 : end pipe extra thick part machining

The design could be based on the customization of an “on the shelf” WH.

A unique WH capable to adapt with the diameter DN40 and DN50 is preferable. However, if it is demonstrated as impossible due to the space constrain, 2 WH can be envisaged, one per diameter.

A design report shall be provided and contains :

- summary of the welding architecture (including all accessories)
- drawings
- a 3D model (stp or Catia native) and views of the WH in the different space constraint location and show how it can be inserted.

5.2 Part 2 – Manufacturing of the WH

After approval of the WH design, the supplier will manufacture it.

The WH is planned to be used for assembly trainings but also for the final on site installation and welding.

5.3 Part 3 – Qualification of the WH

The supplier shall demonstrate that the manufactured WH is able to weld the different cases provided as described in 5.3.1.

5.3.1 Development of the WPSs

A pWPS shall be developed and provided to IO per position (PK,PC, HL045) in accordance with [AD1] based on real welded samples. If needed, a WPS per case could be developed. However, the Supplier shall apply their best effort to develop a unique WPS which cover the 2 different fit-up cases presented below.

Operator shall be qualified in accordance with [AD2]

Pipe of DN40 t2.77mm and DN50 t2.77 in 316L shall be supplied in accordance with EN 10216,D3/T3 with certificate in accordance with [AD10] type 2.2. The length provided is the supplier responsibility. It shall be sufficient to perform all the trials and qualifications for the full program.

For the qualification of WPS, the 20 samples of each of the following configurations shall be welded and inspected.

- perfect fit-up according to supplier recommendation
- Max misalignment and gap (minimum value: 1mm of misalignment and 1mm of gap)

Among the 20 samples for each configuration, 5 samples will include the extra thick end part to be previously machined as described in the Figure 1. The other pipes can remain standards.

After welding, Contractor shall perform the following NDT tests:

NDT technique	Execution standard	Interpretation standard	Quality Level
VT	EN ISO 17637	EN ISO 5817	B
PT	EN ISO 3452-1	EN ISO 23277	2X
RT	EN ISO17636-1	EN ISO 10675-1	Level 1

Table 1 : Inspection requirement

The VT shall be performed in inner and outer face of the weld. The report shall be provided with clear pictures.

Qualification could be witness by IO or an IO representative. Supplier shall inform IO 15 days before the qualification date.

Qualification will be accepted if only one sample per case failed. A root cause analyses shall be provided in case of failure. If more than one sample failed, a new qualification shall be performed with 20 new samples.

A report shall be provided after success of the qualification with :

- NDT reports
- Final WPSs
- NCRs if any

5.3.2 Mock-up in space constraint configuration

A mock-up with the most conservative space constraint shall be manufactured. The space constraint method could be very simple (wood, plastic are allowed if not exposed to the welding induced temperature). The 20 welds will be tested and simulated in the mock-up. If applicable, the welding fumes shall be managed to not agress the operator. The positions are shown below. A pre-study showing what could be the mock-up for the connection between the upper port pipes and the bundle is reported Figure 4.

One space constraint will then be studied, the connection area between the upper port pipes and the bundles,

The mock-up will simulate the pipes to be welded and the space constraint geometry (walls, other pipes).

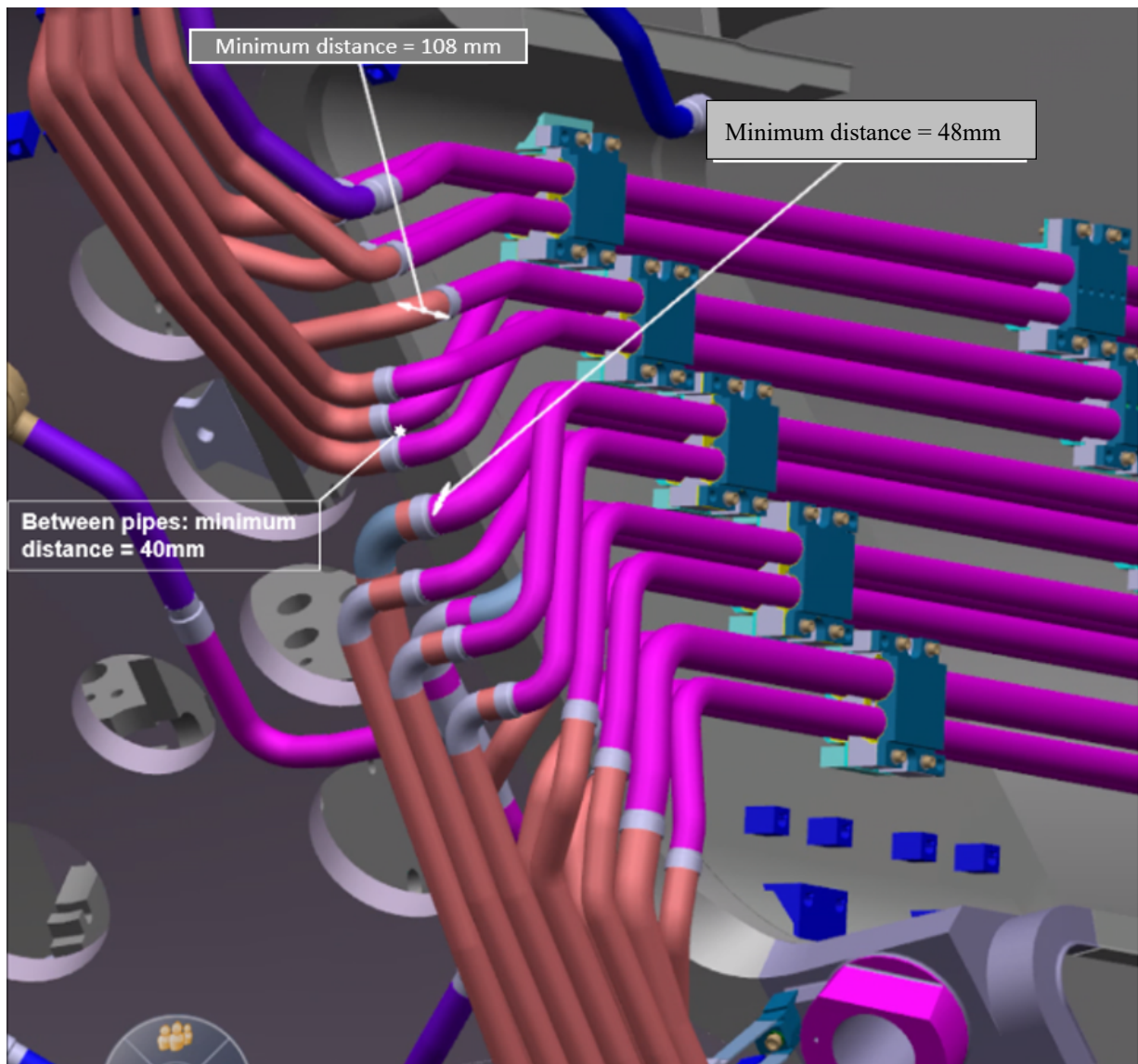


Figure 2 : 20 connection between the upper port pipes and the bundles

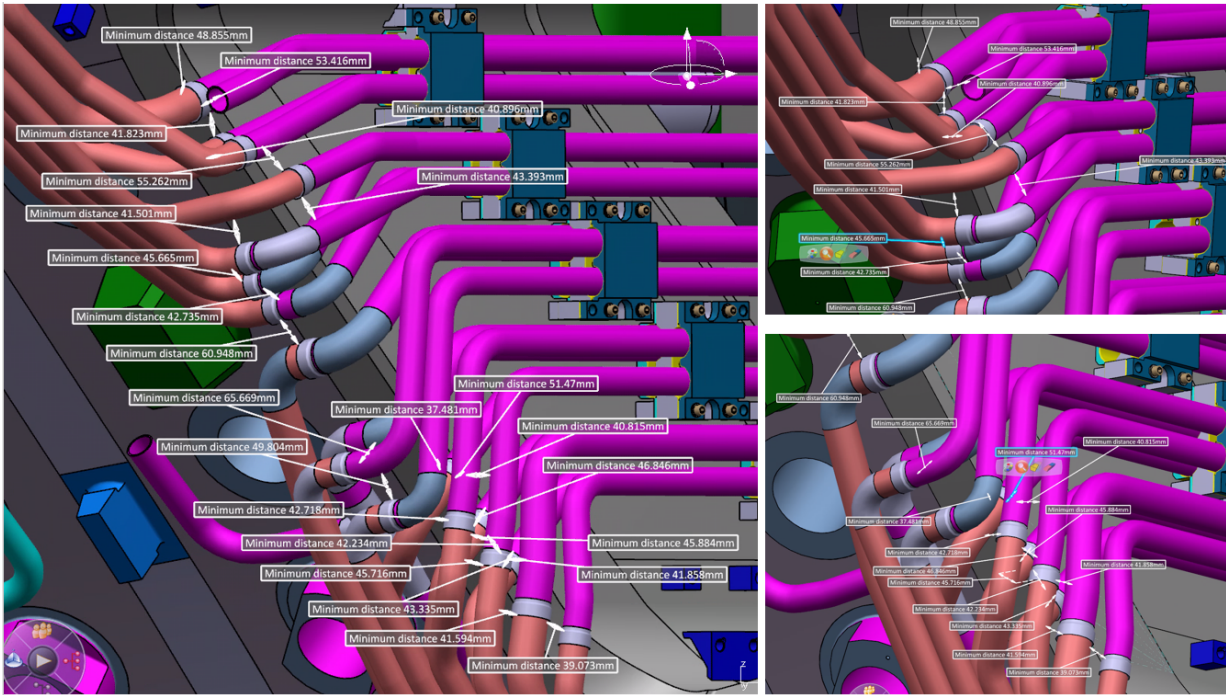


Figure 3 : details of available space for welding

A representation of the mock-up for the upper port/Bundle connection is proposed Figure 4.

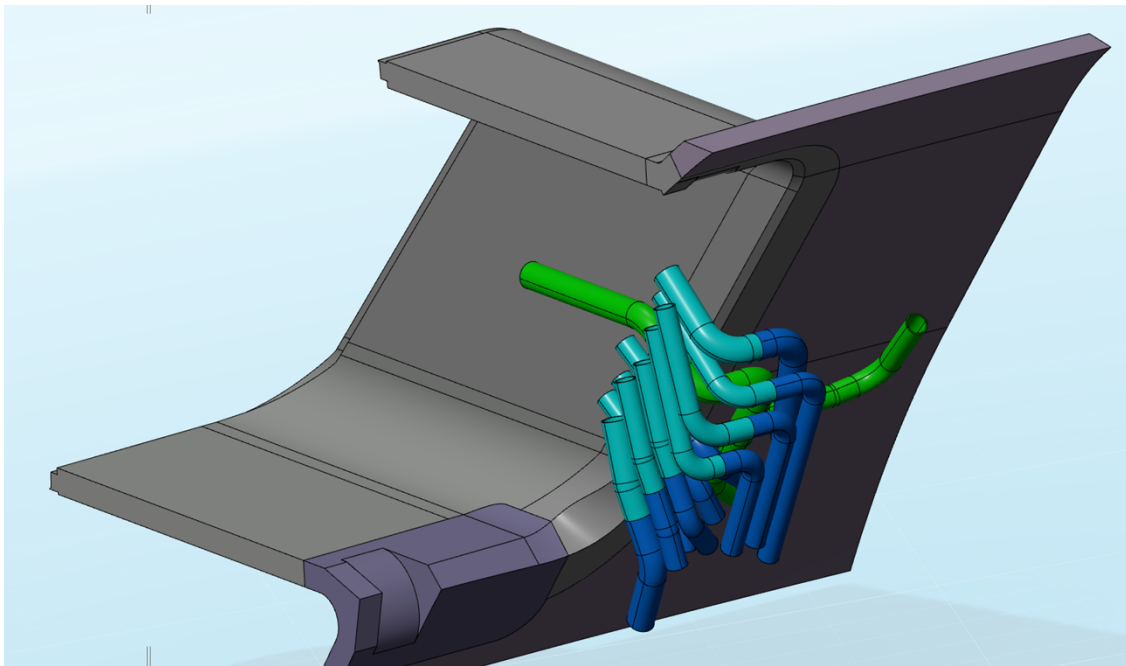


Figure 4 : Mock-up for the upper port/Bundle connection, all pipes not represented

A drawing showing the design of the mock-up shall be provided and accepted by IO before manufacturing.

Welding of pipes shall be performed based on the WPS developed at stage 5.3.1. 3 samples on the perfect condition (no gap nor misalignment) shall be welded. The 3 samples shall be acceptable by VT (inside and outside) as in table 1.

In case of welding issue like failure of the samples, access, wire feeding, positioning of the welding head a NCR shall be produced (or other non-expected event) and the WH or associated equipment shall be modified accordingly.

A report shall be provided with:

- Pictures of the mock-up
- VT report with clear pictures
- RT
- NCRs if any
- A film showing the welding of one sample.

5.4 Part 4 – Packaging, transportation and delivery

Once the equipment is qualified, the WH, cables and the mock-up shall be delivered to IO.

Suitable precautions shall be taken to avoid damage to the equipment. The Supplier shall pack and deliver the supports and bolts to the IO site, located at St Paul lez Durance, France, under his responsibility.

The design of the mock-up and in particular the outer shell shall include the handling interfaces. The components shall be delivered by the logistics service provider (LSP) of contractor's choice, depending on the INCOTERM. If the Incoterm is EXW, DAHER shall be exclusively the LSP in those cases.

Before the shipment, a Release Note shall be prepared in accordance with the "Contractor Release Note" [AD11] and accepted by the IO. Additionally a native file item level packing list and a delivery report shall be provided to logistics.data@iter.org.

Each shipment shall be accompanied by a Delivery Report [AD12] which shall be prepared by the Supplier, including as a minimum:

- The packing date;
- The full address of the place of delivery and the name of the person responsible to receive the package, as well as of the Supplier's name and full address;
- Bill of Materials;
- Security Measures regarding transportation and storage [AD13];
- Manufacturing Dossier;
- Packing List [AD14];
- The declaration of integrity of the package;
- The declaration of integrity of the components;
- Any additional relevant information on the status of the components.

The Delivery Report shall be signed by the IO and the Supplier. The signature by the IO of the Delivery Report prior to shipment represents a Hold Point (HP).

Upon receipt of the package, the IO shall open the package and make a visual inspection and of its content to check:

- The integrity of the package, including identifying visible damage;
- The number and type of components contained in the shipment;
- The enclosed documentation;
- The integrity of the components.

In the case of anomalies the IO shall make any additional relevant remark on the inspection. A decision on acceptance of the delivery of the components will be made by the IO.

If the components are in an acceptable condition, the IO will sign the Delivery Report to certify the acceptance of the delivery.

6 Personal

This project shall be followed by a suitable experienced welding specialist.

Welders shall be certified in accordance EN 14732-1.

NDT personnel (without VT specialist) shall be qualified and certified in accordance with the standard EN ISO 9712. The inspection shall be performed by the NDT inspector of a level 1 at minimum, the interpretation shall be performed by the NDT inspector of a level 2 at minimum.

Visual testing shall be performed and evaluated by an individual with sufficient knowledge and experience with the relevant standards and specifications.

Organization chart and CVs shall be provided in the Quality plan and prove the adequacy with the personal requirements.

7 List of deliverables and due dates

The deliverables and timescales for the scope of supply shall be as described below.

T0: Date of signature of the contract by the last contracting party.

Deliverables	Description	Target Timescales	Acceptance
1	Quality plan and schedule	T0 + 1 month	Accepted by IO
2	Design report from part 1	T0 + 6 months	Accepted by IO
3	Manufacturing report of the welding head (part2)	T0 + 11 months	Accepted by IO
4	WPS and report of the qualification (5.3.1)	T0 + 14 months	Accepted by IO
5	Report of the mock-up qualification (5.3.2)	T0+18 months	Accepted by IO
6	Contractors Release Note [AD11] and [AD15] Delivery of the WH	T0+20 months	Accepted by IO

Table 2 : list of deliverables

The Deliverable D2, D4 and Contractors Release Note represent a Hold Point.

8 Deliverable Acceptance Criteria

The reports shall be prepared and submitted to the IO by the dates outlined above. It is understood that the report is expected to be prepared in Microsoft Word format, however; an alternative format may be used subject to the prior written approval of the IO.

The reports shall be reviewed by the IO who shall inform the supplier in writing of its approval or disapproval of the report within 20 working days after the receipt of each report. In case of disapproval, the IO shall provide a justification to the supplier and necessary measures for improvement shall be taken by the supplier without delay. If no comments are made within this time frame, the report is deemed to be accepted by the IO.

The delivery to IO of the WH and its associated equipment (cables, wire feeder, ...) and the mock-up is part of the contract. Only the generator remains contractor property if this has not been purchase by the contractor specifically for the contract.

All reports and communications shall be in English language

9 Responsibilities

1. The supplier shall be responsible for implementation and coordination of all activities required to support this contract. Ensuring suitably qualified staff and available resources to complete tasks in the proposed timescales.
2. IO shall be responsible for technical input and technical support for the scope identified.

10 Work Monitoring

A monthly progress report shall be provided to describe the status of the activity, progress complete and forecast of activities to be performed in the next month. Regular Video conference (VC), LiveMeeting and teleconferences shall be use to enable supplier and IO to discuss on progress and issues. These will be arranged between respective responsible officers of supplier and IO RO.

The following meetings can be anticipated.

Meeting	Topic	Anticipated Date	Location
1	Kick-off meeting	T0+15 days	VC
2	Design report presentation	T0 +6 months	VC
3	Delivery of the welding head at the supplier premises	T0 + 11 months	VC
4	WPS Qualification report presentation	T0 + 13 months	VC
5	Mock-up qualification report presentation	T0 + 17 months	VC

Table 3 : meeting forecast schedule

11 Right of Access

The supplier shall ensure that appropriate access rights to its facilities, records and those of its sub-contractors are granted to the IO staff and its representatives for inspection or witnessing of tests.

12 Quality Assurance requirements

The organisation conducting these activities shall have an ISO 9001 accredited quality system or equivalent accreditation.

Quality Requirements shall be in accordance with the “ITER Procurement Quality Requirements” [AD16].

The contractor shall deliver a Quality Plan prior to start of work as per Requirements for Producing a Quality Plan [AD17].

Any deviation and non-conformity shall be based on respectively Procedure for management of Nonconformities [AD18] and Procedure for the management of Deviation Request [AD19].

Documentation developed as the result of this Contract shall be retained by the Supplier for a minimum of 5 years and then may be discarded at the direction of the IO.