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IT Technical Specifications

Radiographic Test Framework Service Contract - Technical summary

The ITER Organization intends to place Framework Service Contract(s) for on-site Radiographic Testing (RT). This technical summary presents the scope to be executed, the main requirements and the RT on site organization.

Approval Process			
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1 Purpose

The ITER Organization intends to place Framework Service Contract(s) for on-site Radiographic Testing (RT). This technical summary presents the scope to be executed, the main requirements and the RT on site organization.

2 Scope

The scope is divided in two main parts, RT to be performed for the machine assembly and RT to be performed for the plant installation.

Scope 1: machine assembly

The RT concerns pipes (made of stainless steel 304L and 316L) welded in the tokamak pit or in the preparation buildings. Those pipes are used to transport liquid or gas helium necessary for the cooling at cryogenic temperature of the superconducting magnets, their feeders and the cryostat thermal shields.

Pipe diameter	DN8 to DN50
Thickness	1.2 to 3 mm
Number of welds to be RT	Around 10,000
Period of work execution	Q4 2027 – Q1 2033

Scope 2: plant installation

Stainless Steel (304L and 316L) are used for the majority of the systems. Specialized high-performance alloys, including 1.4404 and 1.4910, are used for circuits within the Test Blanket Modules (PBS 56). Carbon Steel (ASTM A53 Grade B) is reserved for general utility services, large-diameter cooling headers, and roof-mounted piping where the superior corrosion resistance of stainless steel is not required. Instrumentation and small-bore lines generally feature 316L tubing.

Pipe diameter	DN8 to DN2000
Thickness/schedule	Schedule 5 to schedule 80
Number of welds to be RT	Around 6,000
Period of work execution	Q4 2027 – Q1 2033

3 Technical requirements

Requirements apply to all pipework activities, unless applicability of a requirement is limited to the specific code or classification.

3.1 Radiography Examination

[ASME] Radiographic examination shall be in accordance with ASME BVP Code Section V Article 2.
[EN] Radiographic examination shall be in accordance with EN ISO 17635:2017, paragraph A.6.
[Cryo] The image quality value (IQI), as defined in annex A of EN 17636 shall be 2 values better than the minimum requirement.
[RCC MR] Radiographic examination shall be in accordance with RCC-MR

Radiography shall be performed after final post weld heat treatment.

3.2 NDE Qualification and Responsibility

Non-Destructive Evaluation (NDE) controllers shall be certified in compliance with requirements of EN ISO 9712.
Non-Destructive Test (NDT) qualification shall be approved by Authorised Notified Body (ANB) or Recognized Third Party Organization (RTPO).
When pipework is classified either as ESPN N2 or N3, NDE controllers shall be approved by the ANB or RTPO approved by the ASN.

4 Radiographic Test organization on the ITER site

The RT companies shall be formally authorized by the ASNR to hold ionizing radiation sources and to perform radiological tests. Under the overall surveillance of the IO, these companies shall oversee all administrative and operational actions to demonstrate the good application of the related applicable French laws and regulation.

The RT Company shall have its own Radio Protection Advisor (RPA) who is systematically involved in the preparation of the RT and is the interlocutor of the IO RPA.
The RT shall be performed by a team of two persons (the RT responsible officer and a RT Operator) including a minimum of two CAMARI (Certificat d'Aptitude à la Manipulation d'Appareils de Radiologie Industrielle) certified person (RT Operator).

Moreover, the RT Company shall provide the IO RPA all the evidence demonstrating that the following elements used on the ITER Site are compliant with the regulation:
- The ionizing radiation source and accessories; maintenance and control records
- Measuring equipment (radiation detector, dosimeters); calibration and control records.

The RT Company shall perform all the actions necessary for the:
- Access and work to the ITER Site, including trainings and health and safety documentation, compliance with transport regulations.

- Preparation of the RT activities:
    - Participation to the preparation meetings and transmission of the RT associated documentation (including work permits).
    - Information of the Operators of the specific conditions met on the site,
    - Check that the conditions foreseen in the RT Intervention File and the RP permit are met.
- RT performance. The Operators shall:
    - Carry out the transport of ionizing radiation sources in road safety conditions adequate and in compliance with the French laws & regulations,
    - Implement the exclusion area in compliance with the RT Intervention File and the Radio Protection permit,
    - Inform the RT Coordinator about the beginning and end of RT activities,
    - Stop the RT operation in case of anomaly, and immediately inform the RT Coordinator,
    - Confirm shooting location is coherent with drawing / diagram mark-up.
    - Close the RT session
- The results of the RT itself, i.e. digital scans of films and transmitted to the IO.

The contractors are then requested to keep the films and to transfer them to the IO with the as constructed / as-built files.