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# REQUIREMENTS FOR PROCUREMENT OF THE ITER VACUUM VESSEL UPPER PORTS *)

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Procurement Arrangement between ITER International Organization (IO) and Russian Federation provides supply of the upper ports and upper sealing flanges of the ITER vacuum vessel. The main supplier of manufactured equipment is JSC NIIEFA, which provides the entire range of development and research work necessary for the supply of ports in accordance with the schedule provided by ITER IO.

The upper ports of ITER are an all-welded two-layer shell made of austenitic stainless steel with internal water cooling channels [1]. The upper ports, as part of the ITER vacuum vessel, are one of the main elements of the reactor and are classified as equipment important to the nuclear safety of the reactor (SIC/PIC class 1). The production of ports is carried out in accordance with the requirements of the IO Quality Management System (class QC-1) and vacuum requirements (class VQC-1A), and is also classified by the French Nuclear Regulator (ASN) as nuclear pressurized equipment (NPE). The safety requirements of the Nuclear Pressure Equipment Order (ESPN) are met at all stages of the life cycle of the upper ports. The design, manufacture and testing of ports elements are carried out in accordance with the codes and rules of the RCC-MR 2007 [2]. Control of compliance with safety requirements at all stages of production of ports is carried out by the “Project Center ITER”, ITER IO, as well as by an independent Agreed Notified Body (ANB Vincotte).

Based on the results of comprehensive research and development carried out with the participation of JSC NIIEFA, special austenitic steels 316L(N)-IG and 304L, manufactured according to the specifications by ITER IO, were identified as the main structural materials of the upper ports. The manufacture and supply of materials used for ports, as well as manufacture of the ports are provided according to the Manufacturing and Inspection Plans (MIP), under the supervision of “Project Center ITER”, ITER IO, ANB Vincotte, and French Nuclear Regulator (ASN). Verification of all manufacturing procedures used in the manufacturing of materials and ports is carried out on the basis of End of Manufacture Reports (EMR) and Factory Acceptance Tests (FAT) at the manufacturers' sites.

Transportation of the manufactured ports is carried out by the Project Center ITER, in accordance with Transportation Plans (TP) under the control of the ITER IO and ANB Vincotte. Final acceptance of manufactured equipment (SAT) is carried out at the assembly sites of the ITER vacuum vessel sectors in Korea and Italy and at the assembly site of the vacuum vessel at ITER IO.

At the moment, the manufacture of all upper ports of the ITER vacuum vessel has been completed and work on the manufacture of sealing flanges continues.

## References

[1]. Yuri Utin, Alexander Alekseev, Carlo Sborchia, et. al. Fusion Engineering and Design, Volumes 98–99, October 2015, p 1643–1647.

[2]. RCC-MR 2007 Design and Construction Rules for Mechanical components of nuclear installations edited by AFCEN, http://afcen.com/en/publications/rcc-mrx/69/rcc-mr-2007.

*) abstracts of this report in Russian