THE DESIGN OF THE ASSEMBLY TOOLS FOR THE ITER TOKAMAK

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This paper describes the conceptual design of the purpose-built assembly tools required for ITER tokamak assembly.

The ITER machine assembly is sub-divided into six major activity groups: lower cryostat, sector sub-assembly, sector assembly, establishment of the tokamak assembly datum, ex-vessel, and in-vessel [1]. The core components, vacuum vessel (VV) and toroidal field magnet, are assembled from nine, 40° sub-assemblies, or machine sectors, each comprising a 40° VV sector, two toroidal field coils (TFCs), and the associated VV thermal shield (VVTS). Prior to installing the machine sectors in the tokamak pit, the lower cryostat activities must be completed to prepare the foundations for the core components, and to locate the lower components that become trapped once the installation of the core components begins. The other in-vessel and ex-vessel activities follow completion of sector assembly.

To perform these assembly activities requires both massive, purpose-built tools, and standard heavy handling and support tools. The tools must have the capability of supporting and adjusting the largest of the ITER components; with maximum linear dimension ~ 20 m, and mass in excess of 400 tonne, with a precision in the low mm range, whilst facilitating the assembly operations, and assuring worker safety throughout the entire assembly process.

Conceptual designs for these tools have been elaborated with the collaboration of the Korean Domestic Agency (KO DA). Interfaces have been identified and resolved. The structural stability of the tools has been evaluated using the ANSYS code, and operating procedures have also been developed.

The future detailed design activities, and the associated schedule are also presented.

[1] R. Shaw, et al., ITER Assembly Plan, ITER Internal Document ITER_D_2263T6, v1.0, 2004