



Contribution ID: 236

Type: **Poster Presentation**

Load specification and embedded plate definition for the ITER cryoline system

Monday, 29 June 2015 09:00 (2 hours)

The ITER cryoline (CL) system is part of overall ITER cryogenic system involving the cryoplant and the cryodistribution. The CLs are complex network of vacuum-insulated multi and single process pipe lines, distributed in three different areas at ITER site. The conceptual design phase of the lines has been completed and the detailed design, fabrication and installation will be performed by contractors appointed by India, responsible for in-kind supply of CL system to the ITER project.

The CLs will have to support different operating conditions during the machine life-time of 20 years; either considered as normal, occasional or exceptional and will be designed to withstand these scenarios. The major loads considered for the design are inertial, pressure, temperature, assembly, magnetic, snow and enforced relative displacement. All the loads cases and the various load combinations which forms the design basis are put together in Load Specification.

Based on the defined load combinations, conceptual estimations for the reaction loads, has been carried out for the lines located inside the Tokamak building. Adequate numbers of embedded plates (EPs) per line have been defined, integrated in the building design. The finalization of building EPs to support the lines, before detailed design, is one of the major design constraints as the usual logic of the design is altered and has made the cryoline project technically more challenging. At the ITER project level, it was important to finalize EPs to allow adequate design and timely availability of the Tokamak building.

After the brief description of CL system, the paper will describe single loads and load combinations considered in load specification. The paper will also describe the approach for conceptual load estimation and selection of EPs for Toroidal Field Cryoline as example by converting all load combinations in two main load categories; pressure and seismic.

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Session Classification: C1PoD - Cryogenic Distribution Systems

Track Classification: CEC-01 - Large-Scale Refrigeration and Liquefaction