

Structural analysis for strength and fatigue life of half coupling weldment for large cooling water pipes

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ITER cooling waters system consists of large piping network to remove the heat load of about 950MWatt through various branched connections. Many of the branches are connected to main pipes by half coupling full penetration weld joints. There is requirement is to have full penetration for all the joints however quality classification (QC-2), recommends only 10% testing of the total weldment. In view of this it is expected that there can be some joints with little or no penetration.. The above requirement demands for the structural strength and fatigue life is assessment to ascertain that components is not failing even if there is no weld penetration. The design by analysis approach is considered for structural and fatigue life assessment, for maximum expected loads combination case. The weld joint is structurally qualified using ASME code. Fatigue life of weld joint is calculated using both ASME Section VIII Div.2 and RCC-MR RR3261.12. The maximum stress and fatigue life observed for full penetration is 92 MPa and 315766 cycles as per ASME and 200000 cycles as per RCC-MR. Whereas, in no penetration the stress is 188 MPa and fatigue life is 137210 cycles as per ASME and 1500 cycles as per RCC-MR. It is concluded in the paper that weld joint is safe for both the case in most severe load case combination.

References:

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- ASME Sec VIII Div 2
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- Ansys Theory of Reference

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Authors: Mr BHATT, Kunal (ITER-India, Institute for Plasma Research); Mr SANDHU, Sarbjeet Singh (ITER-India, Institute for Plasma Research); Mr SHARMA, TARUN KUMAR (ITER-India, Institute for Plasma Research)

Co-authors: Mr SINGH, Aditya Prakash (ITER-India, Institute for Plasma Research); Mr JADHAV, Mahesh (ITER-India, Institute for Plasma Research); Mr PADASALAGI, Shrishail (ITER-India, Institute for Plasma Research)

Presenter: Mr BHATT, Kunal (ITER-India, Institute for Plasma Research)

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