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Coupled corrosion fatigue of A572 hot rolled steel beams

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Coupled corrosion fatigue is the interaction of corrosive environment and cyclic stress variation. It is more detrimental than that of either one acting separately. Corroson reduces the cross sectional area and moment of inertia of the beam which promotes zones of stress concentrations that shorten the fatigue life-time by inducing fatigue crack growth. This paper presents the experimental investigation of S3X5.70 standard hot rolled I beams made from A572 steel. Three groups of beams are tested. The first is tested only under cyclic loads to determine the reference fatigue life-time. The second group is tested in an uncoupled fasion. First, the mid-span of the bottom flange is corroded using an immersed current technique to 3 corrosion levels corresponding to a flange area loss of 3%, 13% and 23% (this represents small, medium and high corrosive environment). After corrosion levels are achieved, the beams are cyclicly tetsed under the same stress range of the first group. The last group is tested under the simelantouls effect of corsoion and fatigue. The fatigue lifetime of the reference (1st) group is compared with the uncoupled (2nd) group and with the coupled (3rd) group. Fatigue testing S-N (Stress-Number of cycles to failure) diagram is construcyted for each group of the tested beams. The results show that coupled corrosion fatigue has a large effect on fatigue life that exceeds the effects of simply uncoupled case. Analytical analysis is used to assess the time-variant damages from their combined effects of corrosion and fatigue on the steel beams.

Biography

Elsayed Salem is a PhD student at Menoufia University, Egypt and currently a Visiting Scholar at Rensselaer Polytechnic Institute, NY, USA.

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