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# Inclusion of Fatigue Checks in Current IS Codes for Monopole and Stack Structures

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## Abstract

This paper covers the Fatigue design of Monopoles, spun towers, and steel stacks. Steel stacks/ Spun towers are amongst high vertical, flexible, and wind resisting structures. They help to resist cyclones, wind turbulence and dynamic forces during earthquakes. Mostly, the cyclic stresses due to wind forces are governing in tall steel stack structures. The authors provide methodology of fatigue design for cyclic loadings in these structures. NBC and IS codes fail to provide systematic methodology for fatigue design. This study is carried out to understand the performance of a fatigue resistant design of steel structures by presenting a case study. Due to cyclic loadings, weld connections also need to be checked as per IS 1024.

The paper is subdivided into two parts, former part consists of an introduction to the topic under consideration and explains in brief the methodology that will be adopted for fatigue design. And the later part consists of a case study. As part of a case study, it has been decided to analyse and design a 5m monopole, spun towers of 15m and 20m and to evaluate their feasibility with respect to installation through National Cyclone Risk Mitigation Project which are under construction at Altinho, Panaji Goa from Structural safety point of view.

Monopole/ Steel stacks are subjected to dynamic wind pressures, as a result, joints will be subjected to Fatigue stresses. Hence, it is advisable to check the welded joints for these cyclic stresses. Residual stresses due to installation of bolts or welds are usually not required to be considered in statically loaded structures, but connections in cyclically loaded structures shall be designed considering fatigue as specified by this author. Fatigue assessment is required especially for steel structures supporting lifting or rolling loads, members subjected to repeated stress cycles from vibrating machinery, wind induced oscillations of many cycles in life, and members subjected to crowd induced oscillations of a large number of cycles in life etc.

Furthermore, Modelling and analysis of monopole of 5m and spun towers of 15m and 20m will be carried out using STAAD Pro and ETABS, MIDAS and their corresponding fatigue checks considering the above provisions.

**Keywords:** National cyclone risk mitigation project, ETABS, STAAD, MIDAS