

## ABSTRACT

The present study is an effort to estimate the behaviour of a typical steel column – beam welded joint, under horizontal seismic loads, relatively to the phenomenon of low cycle fatigue (LCF).

It focuses to the comparative evaluation of two similar joints, one with a column and a beam whose sections are not altered in any way and one with a beam with a reduced section, all the rest of the structure and loading characteristics remaining the same. Reduced beam sections (RBS) are manufactured by cutting off parts of the beam's flanges and are preferred in the general framework of the capacity design. However, this process is being approached here under the scope of the LCF phenomenon. The aim is to discover how this kind of intervention affects the behaviour and the bearing capacity in LCF of the joint, and to consider the usefulness of its implementation, beyond its primary purpose.

The study is strictly analytical and is not supported by any experiments. It deals with the definition of the loading limits that can be applied on the specific joints until they collapse by LCF. Apart of the qualitative approach and the useful facts that it provides, there is the question of the quantitative part of the problem that consists of specific results and numeric data. This is attempted in this study, although there is no intention to generalize the results in other kinds of structures and loading patterns.

The analysis begins with a presentation of the whole analysis procedure. The assumptions regarding the failure criteria that are considered, as well as the basic concepts of dealing with this kind of problems are explained. The joint structures are simulated, using the finite element method in a computer with a structural analysis program, The stress results of this first analysis comprise the input data for the subsequent analysis, which is called shakedown analysis. In order to achieve this, two computer programs have been prepared. One was written in the FORTRAN language and executes the shakedown analysis algorithm. The second one was written in Vbscript and serves as an intermediate data form transformer.

In the end, the numeric results of the problem, as well as their rendering and the conclusions are given.