RESPONSE OF BUILDINGS EXPOSED TO BLAST LOAD - METHOD EVALUATION

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Reducing the computing time when analysing structures dynamic characteristics subjected to an air blast is favorably done with reduction of the finite element model according to the Rayleigh-Ritz method. The Rayleigh-Ritz method and the use of Ritz vectors based on static deflection gives sufficient accuracy in the results. Transforming the acting impulse load produced by the air blast on the structure to initial velocities turned out be a useful approach in the dynamic analysis.

Accidental external explosions are not handle in the Eurocodes and structural designers are looking for other ways to design these loads. This combined with lighter building structures is a reason to address the issues of analysing the dynamic behavior of buildings subjected to air blasts from these extreme situations. The structural designers analyze the structures dynamic effects from these attacks with advanced finite element programs. These analysis due to long designing and computational time are normally costly. To minimize the computing time and still acquire adequate accuracy in the results, reduced models of the structure system could be used. The reduction method according to Rayleigh-Ritz is a successful way of handling this.

In this thesis are dynamic models investigated and develop that combines sufficient accuracy with computational efficiency for structures effected by blast wave loads due to explosions. This is achieved by analysing two cases were the blast wave load is handled differently. One approach is to handle the load as a triangular pulse load and the second by transforming it into initial velocities according to the impulse and moment laws, and set as initial values when solving it as a free vibration problem, the two approaches are illustrated in Figure 1. The models in the two approaches

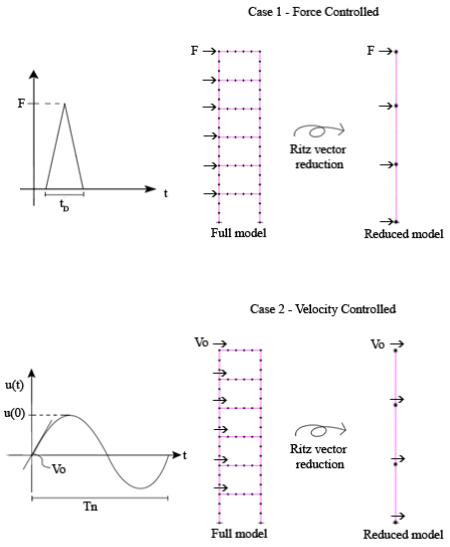

Figure 1: *The two analyzed approaches.*

are reduced with Ritz vectors which are designed by using the deflection of the structure when affected by static load. The deflecting shapes are similar to the four first eigenmodes.
The results showed that the method of designing Ritz vectors according to deflections similar to the eigenshapes gave a satisfying output. The reduction of the equation system with the use of the chosen Ritz vectors showed acceptable values for frequencies and responses for the analyzed structure. The computing time were reduced to lower than 10% with the use of only two Ritz vectors in analyzed cases.

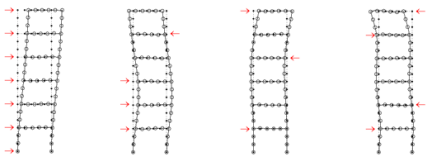

Figure 2: *The designed Ritz vectors 1 - 4.*