

A COLLECTION OF DESIGN CHARTS FOR PREDICTION OF AIR BLAST LOADING IN TUNNELS DUE TO HE-DETONATIONS NEAR THE TUNNEL ENTRANCE

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The "yellow" Swiss design manual LS 2000 (Blast 2000) of the NC Laboratory Spiez, which has already been widely distributed among members of the MABS community, contains among others a collection of design charts for air blast effects and air blast loading in tunnels due to nuclear explosions.

For the nuclear case, where the wavelength of the blast is much larger than the geometrical tunnel configuration considered, the effect of the blast duration can usually be neglected and the loading characteristics are usually expressed only in terms of the blast peak overpressure. Such a simplification is no longer permissible in the much more complicated conventional case, where dependence on the charge and blast duration cannot be disregarded.

Based on a dimensional analysis and statistical reduction of experimental results, Schläpfer et al. were able to formulate the concept of an "equivalent reduced charge" for blast loading predictions in tunnels. Using previous information presented at MABS 13, we were able to develop simple design charts, each dealing with a particular tunnel configuration. A more complex tunnel arrangement can then be analyzed by combining (superposing) the information of several such elementary data sheets. Design charts are provided for the following conditions and tunnel configurations: influence of the position of the detonation point at the tunnel entrance, bended and branched tunnels, cross section changes, tunnels with baffles, short and blind tunnels as well as straight rough tunnels.

A most valuable feature of these design charts is that the data is largely based on experimental results complemented by some numerical calculations with the AUTODYN 2D code. The data of these design charts can also be used as validation material for further numerical analyses in related problem fields.

The presentation will include a brief review of the concept of the equivalent reduced charge, some typical examples of experimental and numerical results and will give an introduction in the use of the data sheets by means of an example.