COMPARISON OF BODY-FITTED AND EMBEDDED 3-D EULER PREDICTIONS FOR BLAST LOADS ON COLUMNS

Rainald Löhner[1], Joseph D. Baum[2] and Darren Rice[2]

[1]Applied Simulations, Inc., McLean, VA, USA
[2]Advanced Technology Group, SAIC, McLean, VA, USA

With the advent of robust, accurate flow solvers and automatic grid generators, the task of defining quickly a flow domain and the required boundary conditions has become a key bottleneck for numerical simulations. In many cases first the CSD models (i.e. abstractions of the real geometry) are built, and the 'wetted surface' is exported, serving, in part, as the definition of the flow domain. This data may not be water-tight, may have small strips and geometrical singularities. Therefore, even with sophisticated software toolkits, manual cleanup can take days for a complete building. An alternative is to use grids that 'embed' the triangulations of the wetted surfaces of the structures in them. In order to see if such techniques are accurate enough for blast simulations, typical reinforced concrete and steel columns were subjected to a blast of 100 kg TNT equivalent. Both cases were analyzed with the same solver and code, exercizing the body-fitted and embedded-mesh options. The rather remarkable result is that both peak pressures and impulses coincided closely (within 10%) for almost all stations, and in most cases were even closer. In particular, the stations with the highest pressures and peak impulses were almost identical. The Figure below shows a typical result.