

EFFECTS OF BLAST LOADS IN STRUCTURES AND APPLICABILITY OF LOADING APPROXIMATIONS

KLAUS,M.H.

The objective of this paper is twofold: At first the severeness of blast loads with respect to structures is investigated. Secondly loading approximations are checked on the ability to evoke proper structural responses (as evaluated in the first part). For the first item it turns out that the fronts of blastwaves can obtain virtually any velocity (higher than shock speed) on the surfaces of structures, depending only on their angle of incidence. Thus the movement of the blast front can coincide with the frequency of every mode in the structure. The analysis of such critical case reveals conditions for the structure, which are as severe as in the case of regular reflection. The effect is only limited by the finiteness of the wave propagation phase by the dispersive nature of bending waves.

The response of a blast loaded structure is often evaluated by a one-degree-freedom model. The propagation effects of a moving load cannot be included in such models. Therefore the analyst has to rely on loading approximations which are space independent, like the one suggested by Kinney. Using a simple beam structure as an example, Kinney's approximation for a side-on blast exhibits phase shifts and increasingly different response amplitudes for shorter blast waves. Therefore a new approximation has been created, which conserves the imparted impulse and takes into account the time dependent pressure decay behind the shock front. For the whole range of the p-I diagram this new method yields excellent results.