A CASE STUDY IN ANALYZING THE RESPONSE OF STRUCTURES TO A JET FUEL VAPOR-PHASE EXPLOSION

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Hydrocarbon vapor-phase explosions have long been known to create destructive blast overpressures and impulses when ignited both inside and outside buildings. This creates a hazard to both building elements and personnel. We have recently implemented the Baker-Strehlow[1] and Baker-Strehlow-Tang[2] curves into our Blast Analysis Module (BAM) code which computes the performance of structural members exposed to air-blast to determine component level of damage.

A case study on the design of an internal laboratory cell to an accidental vapor-phase explosion of jet-fuel will be presented. The lab is approx. 3200 sq. ft. with a 25' clear height and it is internal to a larger building (approx. 20,000 sq. ft.). This cell must be designed to survive an explosion with a level of damage that prohibits collapse, but it may be vented to the atmosphere to reduce the pressure as described by ASCE[3] and NFPA[4]. The case-study will document the blast overpressure and impulse inside the lab cell, demonstrate the trade-offs between structural hardening of the walls and roof and deflagration venting, and the final design with the response of the system.

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[1] Baker, W.E., P.A. Cox, P.S. Westine, J.J Kulesz, R.A. Strehlow. *Explosion Hazards and Evaluation*. Fundamental Series in Engineering 5, El Sevier Scientific Publishing Company, 1983.
[2] Tang, M.J. and Q.A. Baker. A new Set of Blast Curves from Vapor Cloud Explosion. Process Safety Progress (Vol. 18, No. 3).
[3] ASCE Task Committee on Blast Resistant Design. *Design of Blast Resistant Buildings in Petrochemical Facilities*. ASCE Publications, 1997.
[4] NFPA 68. *Standard on Explosion Protection by Deflagration Venting*. 2007.