Important Issues in Building Blast Upgrades

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ABSTRACT

Protecting personnel in refining and chemical plant buildings from explosion hazards is a major challenge facing the chemical processing industry. At times, it may be convenient to move building occupants to a new blast-resistant building or to a remote building that is sufficiently separated from the potential explosion hazards. However, due to considerations such as cost, location, available land, operational constraints, and potential down time, the more desirable solution may be to upgrade an existing building to provide the necessary blast resistance.

Design of blast resistant structural upgrades requires specialized knowledge and experience beyond conventional structural engineering design. Dynamic structural analysis is required to properly account for the transient nature of the blast loading and to evaluate the response of blast loaded structures. The current conditions of the existing structure must be adequately accounted for. Structural behavior and failure mechanism can be drastically different from what is expected in a conventional design. Upgrade concepts must consider possible interference with existing process equipment and ongoing operations. Design details must ensure that the upgrades behave as designed. And finally, the upgrades must be constructed such that the intent of the blast design is maintained, without diminishing the effectiveness of the design.

This paper will discuss: 1) how building response to blast loads differs from response to conventional loads on buildings, using examples from explosion accident investigations and testing; 2) the challenges in blast upgrade design and practical solutions for the refining and chemical industry; 3) the importance of ensuring that design details are consistent with the intent of the blast resistant design; and 4) the upgrade construction process that must be followed to ensure that the upgraded structural conditions are consistent with the blast design intent.