notes from the editor

Scott L. Melnick

Even more than two years later, it's hard to not think of the World Trade Center when someone mentions blast resistance and buildings in the same sentence. But as numerous speakers pointed out during a recent Symposium on Blast and Progressive Collapse Resistance in New York City, designers need to put the events in proper perspective and consider the situations their buildings are likely to experience.

Perhaps Jon Magnusson of Magnusson Klemencic Associates (formerly Skilling Ward Magnusson Barkshire) in Seattle, summed it up the best when he briefly looked at the events of 9/11. Magnusson pointed out that one of the main reasons the Towers survived as long as they did is that they are truly massive buildings—wide enough that the remaining structure could bridge over the 140'-wide holes created by the aircraft flown into each of the World Trade Center towers. Noting that his office is in a 40-story building that is 140' wide, he said: "It doesn't take a structural engineer to figure out what happens when you put a 140'-wide hole in a 140'-wide structure."

R. Shankar Nair of Teng and Associates agreed with Magnusson. He examined three famous cases of what is commonly referred to as progressive collapse: Ronan Point in the UK, Alfred P. Murrah Federal Building in Oklahoma City, and the World Trade Center. Nair contends that "progressive collapse" is a misnomer and instead engineers should concern themselves with "disproportionate collapse" and damage control. Under that criteria, he made a strong case that of the three, only the Murrah Building truly could be considered an example of disproportionate collapse.

Instead of concentrating on truly disproportionate cataclysmic events, designers need to consider more realistic scenarios. Is blast even a design consideration in the first place? When it is, blast and progressive collapse resistance are more likely to center on smaller intentional attacks (such as from a briefcase bomb or a truck bomb) or an accidental blast (such as an industrial accident or a gas leak). And as most of the speakers agreed, structural steel's performance is as good—or in most cases better—than any other material's.

Joe Englot, assistant chief engineer with the Port Authority of New York and New Jersey, presented a fascinating look at how the Port Authority assesses buildings for how much protection is needed. They examine the likelihood of the structure being a target (for example, courthouses score high in this category), the impact of the threat (a car bomb exploding near a column of the World Trade Center—such as happened in 1993—did not pose a substantial threat to the building), and the impact of the result (for example, how many people occupy the building), to determine the economic need for proactive measures. And these measures are different for new construction (where it's relatively inexpensive to beef up connections, for example) and existing buildings (where your major option is increased security).

Structural solutions are not the full answer to blast resistance. Penn State's Ted Krauthammer noted that the structure is the last line of defense. Of equal or greater importance is designing to minimize flying projectiles—such as broken glass and other debris. And Mohammed Ettouney of Weidlinger Associates in New York stressed the importance of keeping potential threats away from the structure.

Of course, structural design can be part of the answer and must be when other factors do not allow for the elimination of the blast threat. For lack of a more defined criteria, many people who are considering blast resistance as a design factor are either simply beefing up their connections (more than one speaker discussed looking towards the approved seismic connections in this regard—visit **www.aisc.org/freedownloads** and click on FEMA 350) or designing for the GSA progressive collapse criteria (visit **www.oca.gsa.gov** for more information), which essentially requires the building to survive the removal of one column at the ground level. A number of designs already have been completed with various blast criteria in mind (for example, see "Steel Protection" in the January 2003 issue of *MSC*). Other excellent resources include "Blast Resistant Design with Structural Steel" in the October 2003 issue and "Defensive Design" in the November 2003 issue. For links to all of these articles and much more information, visit **www.aisc.org/blast**.

AISC soon will be distributing copies of the Proceedings (visit **www.aisc.org/blast** to download a copy) from the recent workshop as well as other technical material. In the meantime, take heed of the advice of another speaker at the Symposium, Ronald O. Hamburger of Simpson Gumpertz & Heger Inc. in San Francisco: "If I was building a structure today with progressive collapse resistance in mind, I would use a steel moment resisting frame."

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