Gate Keeping in the 21st Century

New Anti-Ram Standard Enhances Safety, Security

By Dean Alberson, Ph.D., P.E.

In the Middle Ages, gate keepers had it relatively easy.

Castles were considered the pinnacle of defensive warfare technology. To stymie the enemy, you simply drew up the gate or, if there was no moat, lowered the iron portcullis to keep them out. Then gunpowder was invented, and soon holes blasted in castle walls made the moat moot. Medieval strategists had to reevaluate their old way of thinking to deal with the new way of warfare.

A similar change has occurred following terrorist attacks of the last 15 years. The U.S. has reevaluated its approach to gate keeping near its installations to defend better against what has become the preferred weapon of terrorists worldwide: the car bomb.

Anti-ram barriers are typically used around government buildings, airports, military installations, embassies, United Nations facilities, ports and waterways, power plants, or any other location where terrorist activity is a threat. These barriers keep vehicles as far away from buildings as possible to minimize damage should a car bomb explode.

Some barriers are designed to admit pedestrians but not vehicles, while other barriers are designed to let vehicles pass intermittently. Striking a balance between utility and safety challenged medieval strategists, and it is still a challenge when designing barriers today.

The History of Anti-Ram Barrier Standards

In 1985, the U.S. Department of State (DOS) created an anti-ram standard for protecting its embassies. The standard was designed to stop a medium-duty, single-unit truck and accounted for three levels of penetration: L1 (50 feet), L2 (20 feet), and L3 (3 feet). But as the new millennium approached, embassy bombings, like those in Kenya and Tanzania in 1998, demonstrated the need for a new standard.

Characteristics of a medium-duty, single-unit truck (1985 standard):

- Ballasted with rigidly attached steel plate
- Gasoline engine
- 2.5 ton capacity
- 15,000 lb +/- 200 lb. test

Consular facilities, such as embassies in foreign countries, are frequently located in populated urban areas, staffed with prominent administration or military personnel, and often squeezed into high traffic areas on small lots. In 2003, DOS revised its standard to meet the threat at that time more effectively.

The 2003 standard limited penetration concerns to 3 feet, thereby acknowledging the "tight quarters" reality of embassy placements around the world. It also reconstituted the standard for a diesel truck, rather than a gasoline one, because this more closely represented vehicles in the field that were structurally superior. The revised standard met the changing needs of DOS. Other agencies, like the Department of Defense (DOD) and Department of Energy (DOE), found it useful... but incomplete.

Military bases are typically surrounded by wide open spaces, which create a much greater stopping distance for enemy vehicles. The safety of building occupants is enhanced with every foot of space between the facility and a terrorist's bomb.

DOD, for example, liked the 2003 standard but decided to keep the original penetration ratings from the 1985 version, which acknowledged the potential for bombings outside a 3-foot range. Other concerns cropped up as well... the 2003 standard assumed a terrorist would use a 2.5-ton diesel truck to carry out an attack. But recent realities in Iraq, Afghanistan, and other countries make it clear that practically any vehicle will do.

Developing the ASTM F2656-07 Standard

The U.S. Army Corps of Engineers expressed interest in creating a more flexible standard, so ASTM invited interested parties to its fall 2003 meeting. The resulting team developed a new standard – ASTM F2656-07, *Standard Test Method for Vehicle Crash Testing of Perimeter Barriers* – that reintroduces more penetration ratings, adds design flexibility to cover a wide range of vehicles, and specifies different impact velocities for some vehicle categories.

A "super fence" successfully stops a diesel truck. Notice that the cab penetrated the fence, but the cargo bed – the assumed location of an explosive device – did not.

What's New in ASTM F2656-07

- Added vehicle categories
  - Small passenger car
  - 3/4-ton pickup
  - Tandem axle dump truck
- Added penetration ratings
- Added different velocities for some vehicle categories

Another difference is that equipment testing is no longer overseen by DOS. Instead, accredited laboratories like the Texas Transportation Institute's (TTI) Proving Ground Research Facility – which has run approximately 100 of these tests – must issue a mandatory report on how the equipment performed.

The development process took four years from start to finish, and the standard was codified in August 2007. DOS adopted ASTM F2656-07 in October 2008 and activated it on February 1, 2009. Companies will need to become familiar with, and respect,the new standard if they want their products considered for securing U.S. and international facilities worldwide.▪

*Dean Alberson, Ph.D., P.E. (**d-alberson@tamu.edu**), is a Research Engineer, Program Manager and Assistant Agency Director for the Texas Transportation Institute (TTI) and chairs the ASTM working group that created ASTM F2656-07.*

Portions of this article appeared in issue 45.2 of *Texas Transportation Research*, published in July 2009 by the Texas Transportation Institute.