

Explosive Device Stand-Off Distances

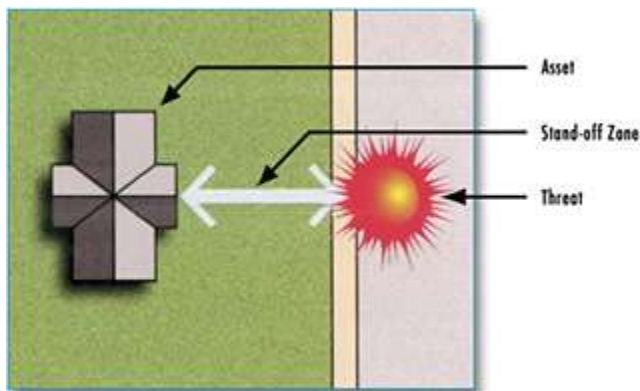
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According to the U.S. Army (2009) explosive devices are the most commonly used terrorist weapon. The explosives used by terrorists may be either commercially manufactured or improvised devices. These explosive devices may be hand emplaced by the terrorist, vehicle borne and driven to the intended target, or even sent through the mail to a specific person or facility.

The hazards of an explosive blast include the destruction of assets within a facility, structural damage to the facility itself, and injuries or fatalities. In addition, explosions may start a fire, which may inflict additional material damage, injuries, or fatalities due to direct exposure or to heat, smoke, and fumes. An explosion is an instantaneous or almost instantaneous chemical reaction resulting in a rapid release of energy. The energy is usually released as rapidly expanding gases and heat, which may be in the form of a fireball. The expanding gases compress the surrounding air creating a shock wave or pressure wave. The pressure wave can cause structural damage to the structure while the fireball may ignite other building materials leading to a larger fire. The strength of a blast depends on the type and amount of explosive material used. A bomb that a person can carry is capable of a smaller blast than an explosive-laden truck. (U.S. Department of Transportation, 2004, para. 3.2.1.2)

Stand-Off Distance



The most effective approach to dealing with the threat of explosive blast is to create a "stand-off distance" between the asset being protected and the area where an explosive device could be placed. When establishing a stand-off distance, every foot of distance between the explosive and the protected asset counts. It is essential that stand-off distance be maximized to the extent possible and that minimum stand-off distances be adhered to

in order to protect physical assets and safeguard life (National Institute of Building Sciences, 2009).








When establishing a safe stand-off distance from an explosive device there are two important calculations. The first is the mandatory evacuation distance, the distance at which an unreinforced building is able to withstand severe damage or collapse. The second is the preferred evacuation distance, the fragment throw distance or glass breakage/falling glass hazard distance; the distance at which individuals in the open are in danger of being injured or killed by items thrown by the explosive blast, or by shattered glass falling from nearby buildings as a result the explosion.

The minimum safe stand-off distance is calculated based on the amount of explosive present and in the case of buildings by the type of construction. Obviously a small pipe bomb is less dangerous than a semi-truck loaded with explosives, and the unreinforced office building or home will suffer much more damage than the reinforced bunker in the same size explosion.

Rule 150/400

When planning explosive device stand-off distances we work from the assumption that a hand emplaced device (such as a bomb carried in a suitcase or backpack) will have an explosives capacity of 50lbs of TNT, and a vehicle borne explosive will have an explosives capacity of 1000lbs of TNT.

Based on this explosive capacity we have Rule 150/400 that says that at a minimum when dealing with a hand emplaced explosive, evacuate all buildings within 150 feet (46 meters) of the device and when dealing with a vehicle borne explosive device evacuate all buildings within 400 feet (122 meters) of the device.

Threat Description	Explosives Capacity ¹ (TNT Equivalent)	Mandatory Evacuation Distance ²	Preferred Evacuation Distance ³
 Pipe Bomb	5 lbs/2.3 kg	70 ft/21 m	1200 ft/366 m
Suicide Vest	20 lbs/9.2 kg	110 ft/34 m	1,700 ft/518 m
 Briefcase/Suitcase Bomb	50 lbs/23 kg	150 ft/46 m	1,850 ft/564 m
 Sedan	500 lbs/227 kg	320 ft/98 m	1,900 ft/580 m
 SUV/Van	1,000 lbs/454 kg	400 ft/122 m	2,400 ft/732 m
 Small Delivery Truck	4,000 lbs/1,814 kg	640 ft/195 m	3,800 ft/1159 m
 Container/Water Truck	10,000 lbs/4,536 kg	860 ft/263 m	5,100 ft/1555 m
 Semi-Trailer	60,000 lbs/27,216 kg	1,570 ft/479 m	9,300 ft/2835 m

(Bomb Threat Stand-Off Distances provided by National Counterterrorism Center, 2012)

Likewise when creating a safety zone (implementing a barrier plan) around a facility to protect against an increased explosive threat we use Rule 150/400. To protect a critical facility it is essential that a hand-emplaced explosive device (50lbs of TNT) cannot be placed within 150 feet of the facility and that a vehicle borne explosive device (1000lbs of TNT) cannot be parked within 400 feet of the facility.

When evacuating personnel from the area of a discovered explosive device it is important to take the outdoor evacuation distance into consideration (1850 feet/564 meters for hand emplaced devices and 2400 feet/732 meters for vehicle borne devices). A known terrorist tactic is to use one device to trigger a building evacuation and attract bystanders and then detonate a larger, more destructive device, significantly increasing human casualties. When evacuating an area because of a found explosive device it is essential to move completely away from the location of the found device.

When planning for a hand emplaced explosive device, a 50lbs explosive capacity is about the maximum that an individual could easily carry and deploy against a target. When considering vehicle borne explosives, while it is of course possible for any type of vehicle to be used, we consider two notable vehicle borne explosive incidents in the United States: the first bombing of the World Trade Center in 1993 (900lbs explosive capacity), and the bombing of the Murrah Federal Building in Oklahoma City in 1995 (4000lbs explosive capacity). In each of these incidents a rental truck was used to deliver the bomb to the target. According to Global Security.Org (2012) “VBIEDs have increasingly used larger amounts of explosives, and the explosive charge has ranged anywhere from 100lbs to well over 1000 pounds.” Examples of VBIED given by CJTF-7 (2004) showed that explosives were in the 1000lbs+ range. Because VBIEDs used by terrorists have generally had 1000lbs+ of explosive capacity, the 400 foot (122 meter) evacuation/stand-off is the minimum that should be used to ensure safety of facilities.



(GTA 90-01-001)

Finally, it is important to understand that both the building stand-off (mandatory evacuation distance) and outdoor (preferred) evacuation distance recommended here are minimum safe distances. Greater stand-off increases safety, while lesser stand-off may significantly increase the likelihood of severe building damage or collapse, and death or injury of personnel in the open.

References

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