

Protective Cover from Direct and Indirect Fire

Introduction

While there are now various specialist products for protecting staff in camps and buildings from the effects of rifle, mortar and artillery fire some figures for protection levels are useful. The figures given below for commonly available materials come from the British Army, US Army and USMC. If figures have contradicted each other the highest level of protection has been chosen.

Please note, providing protection for staff is a complex matter and a few figures on protection levels are merely scratching the surface. Trained specialists should be used to consider each location, its threats and the context. This will allow a full integrated protection plan to be made. Planners should consider 3 elements:

- Attack prevention
- Reducing the effect of the attack
- Improving asset resilience

Direct and Indirect Fire

For **direct fire** a weapon is pointed directly at a target, for instance a rifle being pointed at a target or a tank aiming its main armament at another tank. Weapons used in the **indirect fire** role are not pointed directly at the target. Their target may not even be visible to the firer and the point of impact is either calculated or estimated. Such weapons include mortars, artillery and some rockets. Their shells (rounds) travel high into the air before hitting the target.

Direct fire weapons are therefore more likely to strike the sides of buildings while indirect fire is more likely to strike the roof of a target. For indirect fire the damage will be caused by blast, penetration and fragmentation. There can be other effects but these are the main ones that need to be considered. The fragmentation is the most lethal of these.

For each shell there is a great significance in how it is fused – or designed to detonate – and this affects the threat it gives.

There are three options:

- Impact/Point Detonation/Super-Quick
- Delay
- Proximity

The majority of rockets, artillery and mortars have an impact or point detonation fuse. This causes the round to explode immediately on impact.

A delayed fuse has a slight delay after the initial impact. This would mean that if the shell hit a roof of a building or bunker it would not explode on the outside but may penetrate and explode inside or buried in the protection.

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A proximity fuse detonates the shell at a predetermined height above the ground. This is used so that the fragmentation has the maximum effect on unprotected personnel in the area – rather than some of the effect being reduced by exploding on the ground.

It should also be noted that dud rounds can also have a great effect. While we may be grateful it has not exploded the round's kinetic energy will carry it forward to some great effect. A dud will penetrate more into solid material than its fragments would have and a medium sized rocket can penetrate 6m of sand.

Thicknesses of material to resist direct and indirect (proximity) fire are below. Please note that for indirect fire this is for proximity fusing and not impact or delayed fusing. Multiple strikes will also weaken protection.

	Thickness of material in metres to resist:				
	Direct Fire		Indirect Fire: Shell fragments from shell bursting 15m away		
Material	7.62mm bullets at 100m	85mm Shaped Charge (RPG7)	82mm Mortar	120/122mm Mortar/Rocket/HE Shell	152mm Mortar/Rocket/HE Shell
Ordinary Soil (Well compacted)	1.5	2	0.45	0.51	0.76
Sandbags	0.75		0.45		
Brickwork	0.45		0.45		
Gravel, small rocks, brick, rubble	0.51	0.61	0.25	0.46	0.51
Reinforced concrete	0.16		0.12		
High density concrete blocks	0.30	0.76	0.12	0.13	0.15
Mild Steel	0.04		0.01		
Timber	1.5	2.29	0.2	0.30	0.36

For mortars firing in open ground on personnel with no protection the danger zones are below. Ground and fusing will affect this.

Mortar surface danger zone, with no protection, in metres	
Calibre	Distance
60mm	300
81mm	400
120mm	600

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Protecting Staff & Facilities

Frequently on mission existing local structures will be used. Depending on context and threat, these will often require some modification to ensure that they provide the protection required. A mission site should be assessed against a number of basic protective measures so that the modifications required, and the risk that will remain, can be calculated. These basic measures are:

- a. Maximum stand-off.
- b. Prevention of structural collapse.
- c. Minimum secondary hazards.
- d. Reduction of fire hazards.
- e. Promotion of effective camp and building layout.
- f. Limitation of airborne and waterborne hazards.
- g. Development of robust services.
- h. Preparation for emergency response.

Horizontal and Vertical Stand-Off

When planning protection stand-off should be considered. Horizontal Stand-off is when mitigation measures are put in place to keep the weapon from the target. This could be a barrier to stop an explosive filled vehicle (VIED) or a screen of wall to detonate a shell away from the main area.

In multi-storey buildings vertical stand-off is had when the top floor is used as a sacrificial layer. While weapons may hit the roof the lethal effects may be limited to the unoccupied upper floors. Additional protection may be required in the upper floors for best effect. All staff must ensure that this upper area doesn't come back into use and its protective purpose be forgotten.

Compartmentalisation

Compartmentalisation can be had by building anti-fragmentation walls between and around structures on a camp – particularly for soft structures such as tents. This is the lowest level of protection and can be upgraded to limited overhead protection or comprehensive indirect fire protection if the threat, facilities and resources demand/allow it.

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