美陸軍聯合兵種部隊於城鎮地形之作戰運用-第八章
OBSTACLES,MINES,AND DEMOLITIONS
障礙、地雷及爆破運用

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In urban combat, obstacles and mines are used extensively by the defender to canalize the enemy,impede his movement, and disrupt his attack. The national policy of the United States severely restricts the use of antipersonnel land mines, beginning with those that do not self-destruct but eventually including all types. This policy,currently in effect,applies to all units either engaged in,or training for, operations worldwide.

在城鎮戰鬥中，防守方通常廣泛的運用障礙及地雷，以改變敵軍行動方向、遲滯機動及擾亂攻擊作為。美國的國家政策對於人員殺傷雷的使用限制自原先僅針對無自毀功能地雷實施禁止演變至今，已對全數人員殺傷人實施禁用，目前這項政策仍為有效法令，對各部隊於交戰、訓練及在世界各地作戰均具管制效力。

US national policy forbids US forces from using standard or improvised explosive devices as booby traps. This policy does not affect the standard use of anti-vehicular mines. It does not affect use of the M18 Claymore mine in the command-detonated mode. For the immediate future, units may still use self-destructing antipersonnel mines, such as the ADAM, when authorized by the appropriate commander. Under proper command authority, units may still emplace mixed minefields containing self-destructing antipersonnel land mines used to protect anti-vehicular land mines; for example, MOPMS or Volcano.

美國國家政策禁止美軍部隊運用標準或改造性的爆炸裝置作為詭雷使用，這項政策未對運用標準的防車輛地雷及以遙控方式起爆之 M18 定向式人員殺傷雷進行管制。在不久的未來，部隊可能仍運用例如砲兵區域拒止型地雷等具自毀裝置之人員殺傷雷，在適當層級指揮官授權下，部隊可能仍會設置此類具備自毀功能人員殺傷雷之混合雷區，以保護像是模組化地雷系統及火山地雷系統所設置之防車輛地雷。

Consider all references to antipersonnel mines and the employment of minefields in the light of the national policy limiting the use of non-self-destructing antipersonnel land mines. Readers should not construe any uses of the term mines, antipersonnel obstacle, protective minefield, or minefield contained in this manual to mean a US-emplaced obstacle that contains nonself-destructing antipersonnel land mines or booby traps.

鑑於國家政策對無自毀功能之人員殺傷雷之限制及各項考慮事項，讀者不應自行將本手冊所包含美軍所運設置之各項地雷、防人員障礙、防護性或一般雷區為包含運用非自毀功能之人員殺傷雷及詭雷。

Section I. OBSTACLES

Obstacles are designed to slow or prevent movement by personnel, to separate infantry from tanks, and to slow or stop vehicles.

第一節　障礙

障礙為設計來減緩或防止人員的運動，以迫使敵步戰分離、使車輛速度減緩或停止。

8-1. TYPES OF OBSTACLES

Command-detonated mines, barbed wire, and exploding flame devices are used to construct antipersonnel obstacles (Figures 8-1 through 8-5) These obstacles are used to block the following infantry approaches:

8.1 障礙種類

遙控式起爆地雷、刺絲網及爆炸式火焰裝置均為用於建構防人員障礙使用(如圖 8-1 至 8-5)，這些障礙常被運用於阻絕步兵於下列接近路線：

- Streets. ●街道
- Buildings. ●建築物
- Roofs. ●屋頂
- Open spaces. ●開闊區域
- Dead space. ●封閉區域
- Underground systems. ●地下交通系統

a. The three types of obstacles used in defensive operations are protective, tactical, and supplementary.

(1)Protective obstacles are usually located beyond hand-grenade range (40 to 100 meters) from the defensive position.

(2)Tactical obstacles are positioned to increase the effectiveness of friendly weapons fire. Tactical wire is usually positioned on the friendly side of the machine gun's final protective line (FPL).

(3)Supplementary obstacles are used to break up the pattern of tactical obstacles to prevent the enemy from locating friendly weapons.

a.在防禦作戰中通常運用防護性、戰術性及輔助性等三種障礙物

(1)防護性障礙通常設置在距防禦據點 40-100 公尺之外，以避免敵人投擲手榴彈投擲時對據點內人員造成傷害。

(2)戰術性障礙設置之目的在於增加友軍火力效果，戰術性鐵絲網障礙通常設置在友軍機槍最後防護射擊線的側方。

(3)輔助性障礙通常運用分割戰術型障礙的設置狀況，防敵針對友軍的火力點進行鎖定。

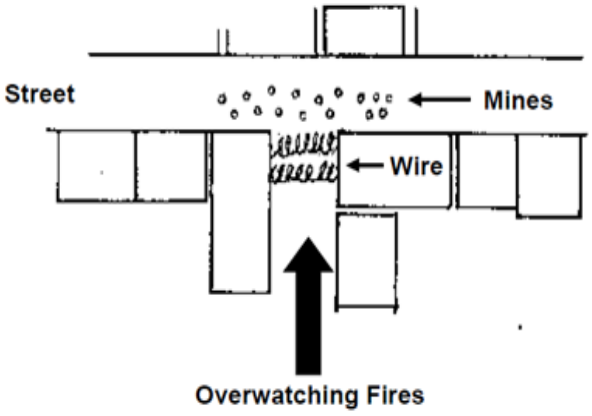


Figure 8-1 Mines and wire

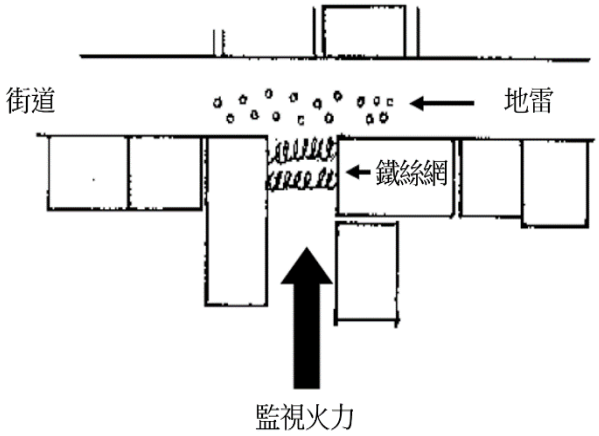


圖 8-1 街區地雷及鐵絲網設置示意圖

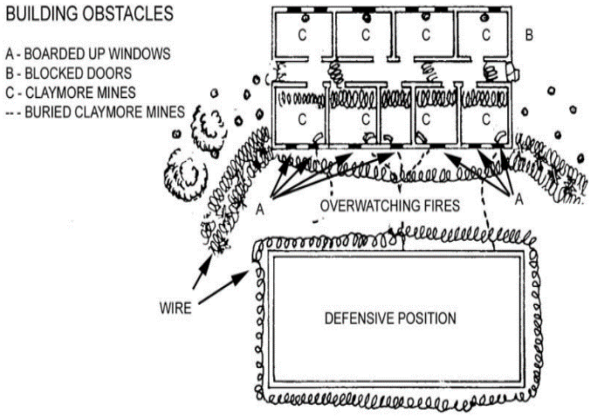


Figure 8-2 Building obstacles

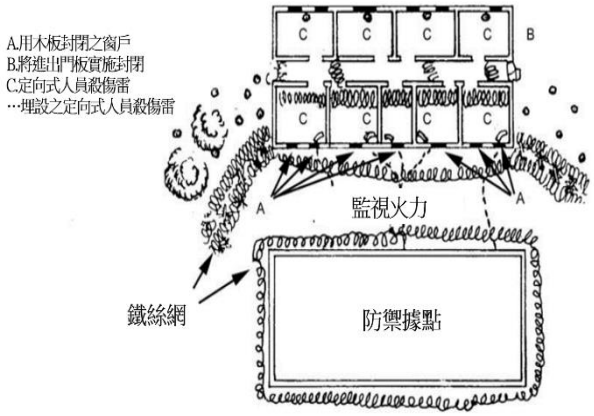


圖 8-2 建物周邊障礙設置示意圖

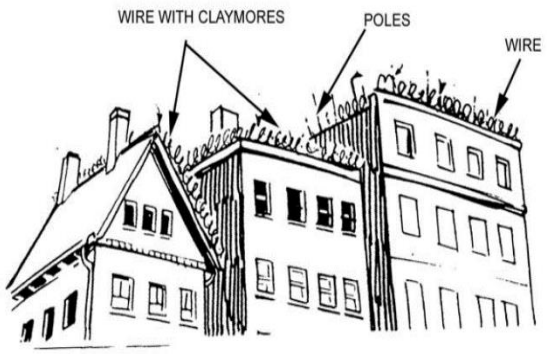


Figure 8-3 Rooftop and helicopter obstacles

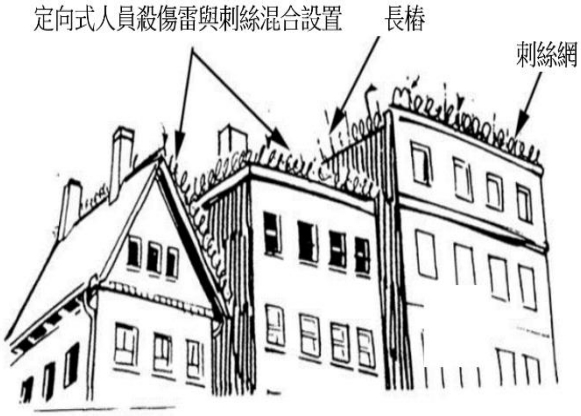


圖 8-3 屋頂及防直升機障礙設置示意圖

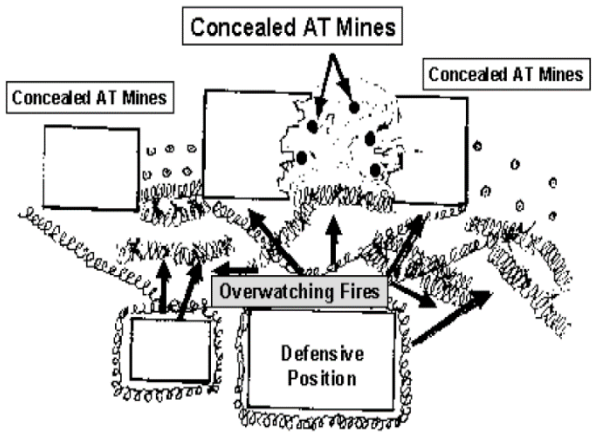


Figure 8-4 Open space obstacles

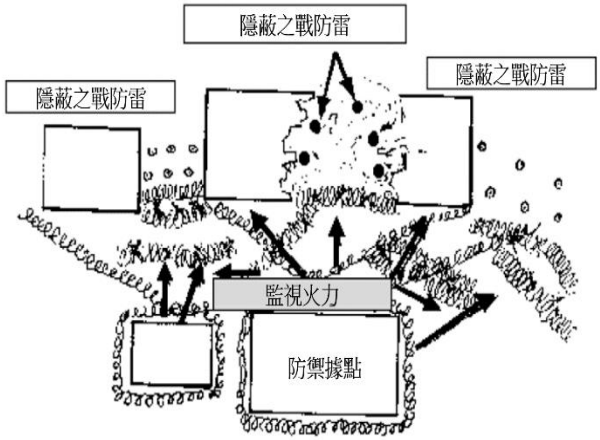


圖 8-4 開闊地障礙設置示意圖

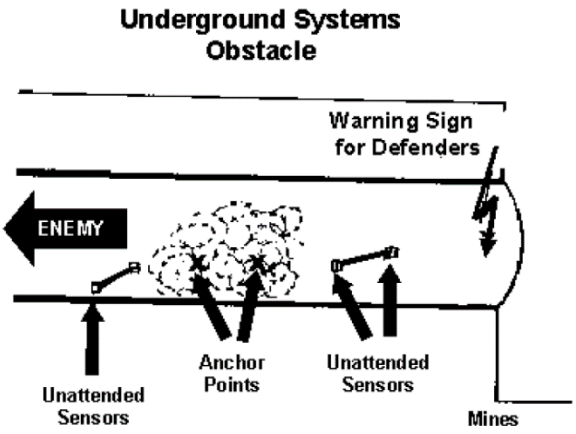


Figure 8-5 Underground systems obstacle

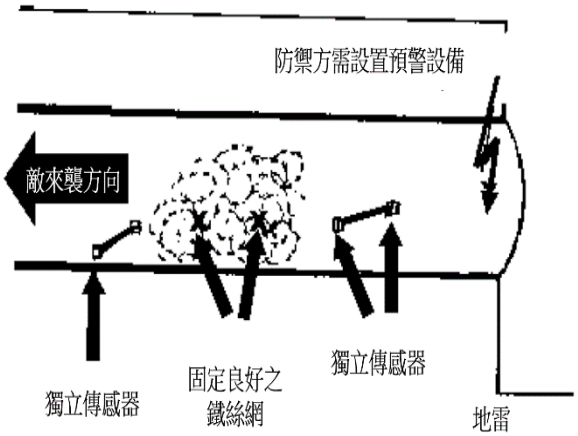


圖 8-5 地下交通系統障礙設置示意圖

b. Dead space obstacles are designed and built to restrict infantry movement in areas that cannot be observed and are protected from direct fires.

c. Anti-armor obstacles are restricted to streets and open areas (Figures 8-6 through 8-11, pages 8-5 through 8-7).

b.封閉性區域內所設置之障礙，是設計用於建構限制步兵於區域內運動、防敵觀測並提供對直射武器的防護。

c.於街道及開闊地區域中設置反裝甲障礙將受到拘限，設置方式如圖 8-6 至圖 8-11 所示。

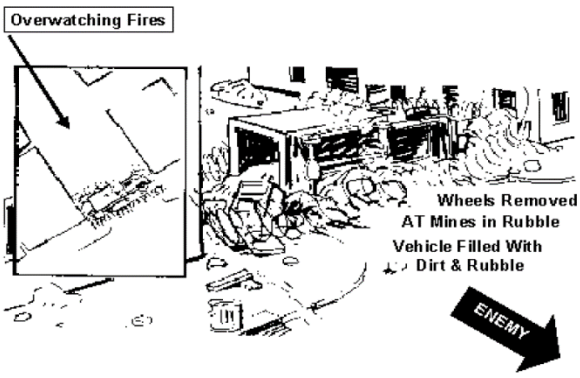


Figure 8-6 Vehicle obstacle

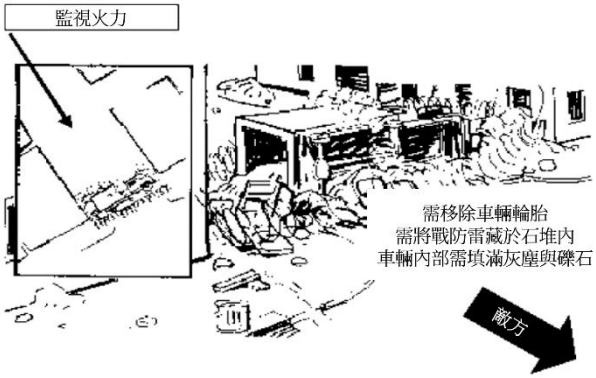


圖 8-6 車輛障礙運用示意圖

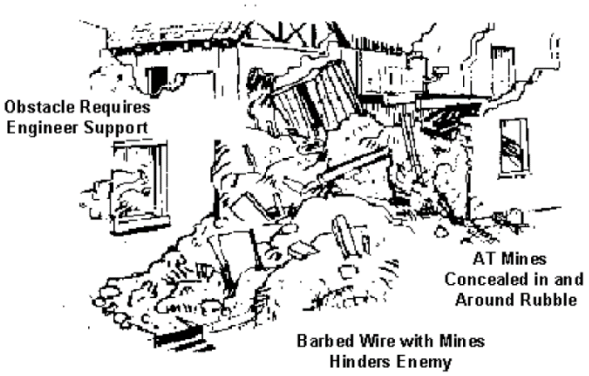


Figure 8-7 Rubble obstacle

圖 8-7 礫石障礙設置示意圖

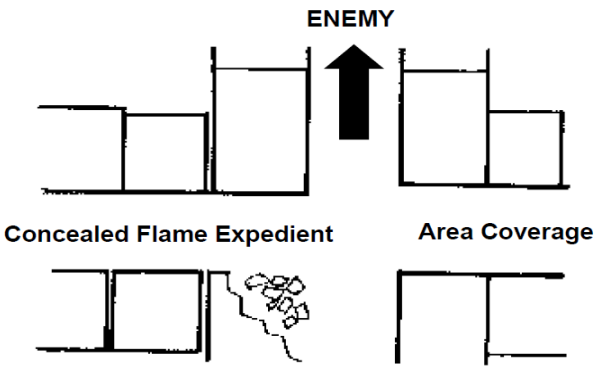


Figure 8-8 Explode flame device

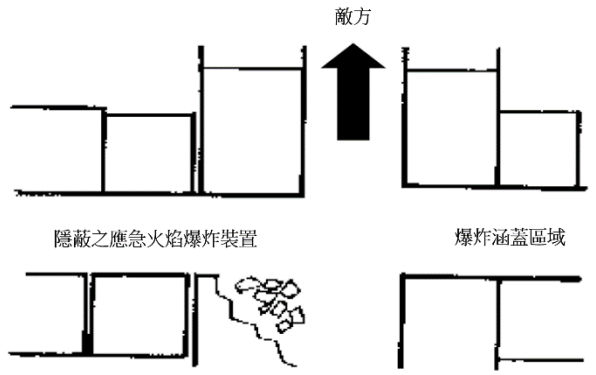


圖 8-8 爆炸式火焰裝置

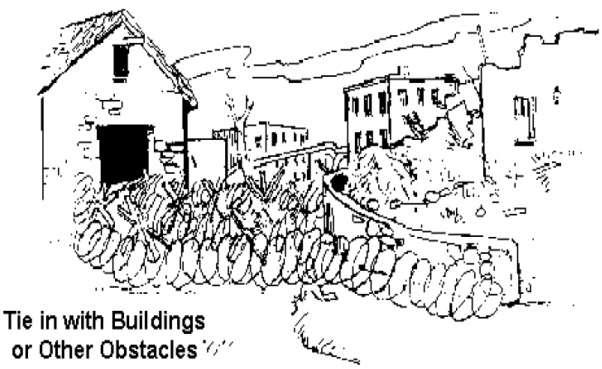


Figure 8-9 Steel hedgehog

圖 8-9 鋼刺蝟設置

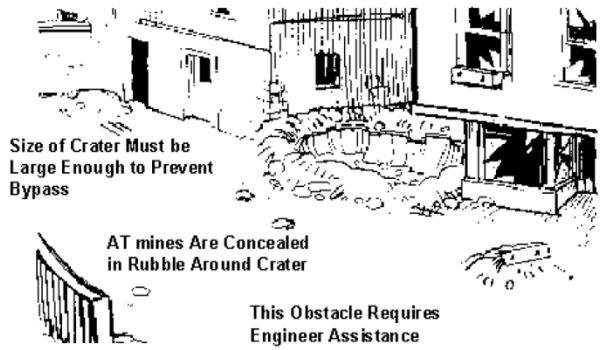


Figure 8-10 Road craft

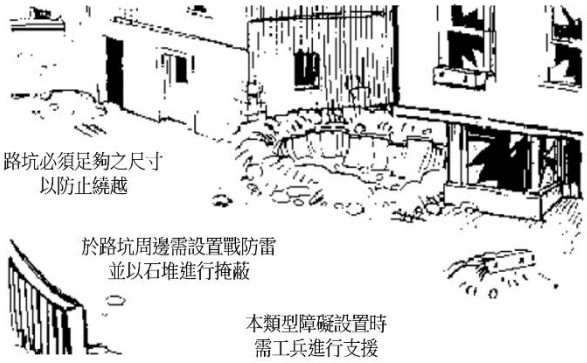


圖 8-10 路坑

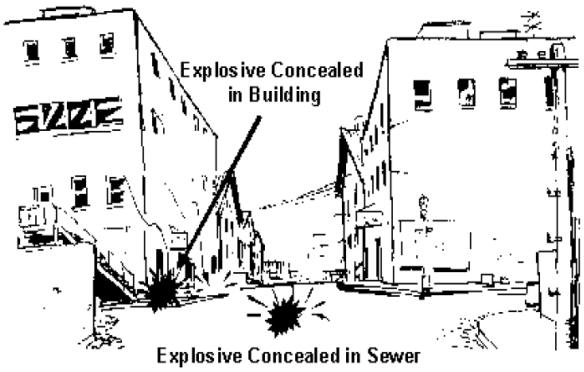


Figure 8-11 Concealed explosive

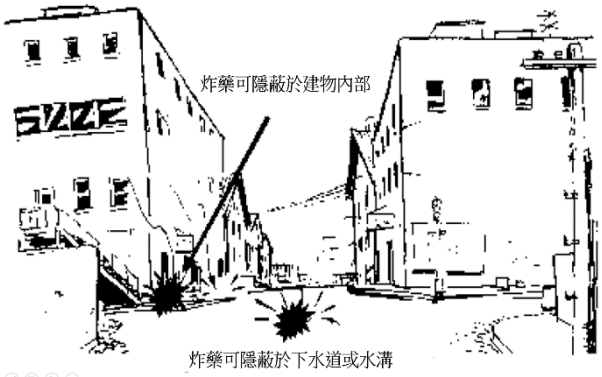


圖 8-11 隱藏之爆藥

8-2. CONSTRUCTION OF OBSTACLES

Obstacles are constructed in buildings to deny enemy infantry covered routes and weapons positions close to friendly defensive positions. They can be constructed by rubbling with explosives or flame, or by using wire. The building can be prepared as an explosive or flame trap for execution after enemy occupation.

8.2 障礙設置

在建物中設置障礙之目的在拒止敵步兵運用接近友軍防禦據點之掩蔽路線與武器陣地，相關的障礙可運用爆炸手段產生之碎石與火焰或運用鐵絲網實施設置，於相關建物完成具爆炸或火焰燃燒效果的陷阱設置準備，並於敵軍佔領後實施啟爆。

Section II. MINES

On 16 May 1996, Public Law 104-295 (Leahy Amendment) took effect. US policy forbids the use of booby traps and nonself-destructing antipersonnel land mines. Mines found in built-up areas should be recorded on a building sketch. The sketch should include the number of the building (taken from a city map) and floor plans. It should also include the type of mine and firing device, if known. When identified, mined buildings should be marked on the friendly side. Clearing areas or buildings that have been mined is extremely difficult. Therefore, they should be considered “NO GO” areas. This factor must be carefully considered when planning and authorizing the placement of mines. (See Table 8-1 for the approving authority for minefields.)

第二節 地雷

於 1996 年 5 月 16 日，美國公法 104-295 生效後，美國政策已禁止使用詭雷及無自毀功能之人員殺傷雷，另針對住民區雷區，為使地雷能夠被發現，必須實施相關紀錄與標繪。標繪之內容必須包含設置區域中所包含之建物數量(需城市地圖資訊結合)及平面圖；另應包含地雷型式及發火裝置種類。在可知狀況下，當確認建物內有設置地雷時，應該在接近友軍一側實施標記，清除區域及建物中已設置之地雷極度困難，因此，相關被確認為有地雷設置之區域，應被標示為不可行區，當計畫及授權實施地雷設置時，必須針對相關因素仔細的進行考慮，(雷區設置之核准權責如表 8-1 所示)

TYPE MINEFIELD	APPROVING AUTHORITY
Protective hasty	Brigade commander (may be delegated down to battalion level or company level on a mission basis
Deliberate	Division or installation commander
Tactical	Division commander (may be delegated to brigade level).
Point	Brigade commander (may be delegated to battalion. level).
Interdiction	Corps commander (may be delegated to division level).
Phony	Corps commander (may be delegated to division level).
Scatterable long duration (24 hours or more).	Corps commander (may be delegated to division level).
Short duration (less than 24 hours)	Corps commander (may be delegated to division, brigade, or battalion level).

Table 8-1. Minefield employment authority

雷區型式	核准權責
應急防護性雷區	旅長(基於任務可委由營級或連級執行)
周密雷區	師長或戰場最高指揮官
戰術性雷區	旅長(可委由旅級執行)
單雷設置	旅長(依任務可委由營級執行)
地雷阻絕區	軍團指揮官(依任務可委由師級執行)
假雷區	軍團指揮官(依任務可委由師級執行)
自毀時間超過 24 小時之散撒雷區	軍團指揮官(依任務可委由師級執行)
自毀時間低於 24 小時之散撒雷區	軍團指揮官(依任務可委由師或旅級執行)

表 8-1. 雷區設置權責

8-3. TYPES OF MINES AND EMPLOYMENT TECHNIQUES

Several types of mines can be employed in built-up areas.

a. The M18A1 Claymore mine can be employed during the reorganization and consolidation phase on likely enemy avenues of approach. It does not have to be installed in the street but can be employed on the sides of buildings or any other sturdy structure.

(1)Claymore mines can be used for demolition against thin-skinned buildings and walls, or the 1 1/2 pounds of composition C4 can be removed from the mine and used as an explosive, if authorized.

(2)Claymore mines can be mixed with antitank mines in nuisance minefields. They can fill the dead space in the final protective fires of automatic weapons (Figure 8-12).

8.3 地雷型式與設置技術

在住民區內可運用下列各式地雷實施設置:

a.M18A1 定向式人員殺傷雷可於鞏固於整頓階段部署於敵可能接近路線，這類地雷不需設置於街道，但可設置於建物或任何堅固結構的外側。

(1) M18A1定向式人員殺傷雷可用於對薄弱建物或牆壁實施爆破，在經過授權的狀況下，可將地雷內部存放之 1 1/2 磅 C4 爆藥移作爆藥使用。

(2) M18A1定向式人員殺傷雷在擾亂性雷區中可與戰防雷混用，並可填補最後防護射擊線自動武器之射擊死角。

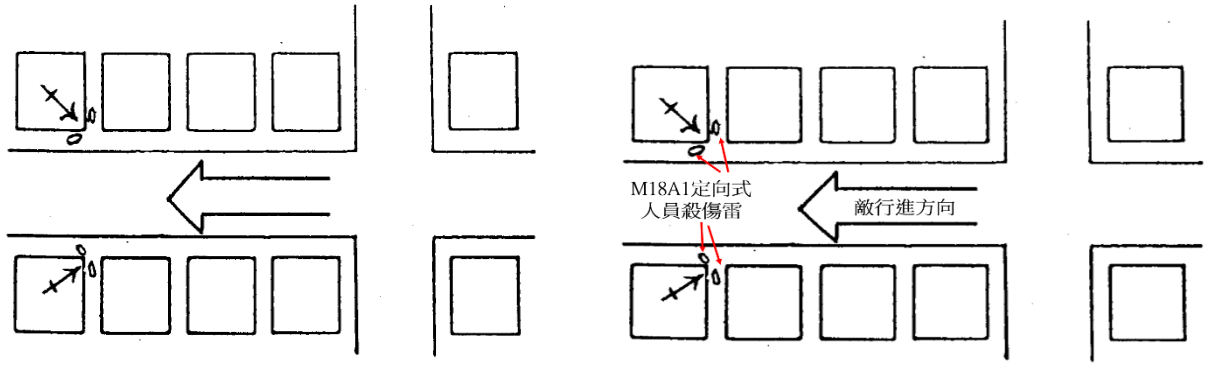


Figure 8-12. Claymore mines used to cover dead space of automatic weapons.

圖 8-12 M18A1 定向式人員殺傷雷用於填補自動武器射擊死角

(3)Claymore mines can be used several ways in the offense. For example, if friendly troops are advancing on a city, Claymore mines can be used in conjunction with blocking positions to cut off enemy escape routes (Figure 8-13).

(3)M18A1 定向式人員殺傷雷在攻擊行動中有許多之運用方法，例如當友軍部隊於城鎮中前進時，M18A1 定向式人員殺傷雷可用於連結阻止陣地，以切斷敵軍撤離路線(如圖 8-13)。

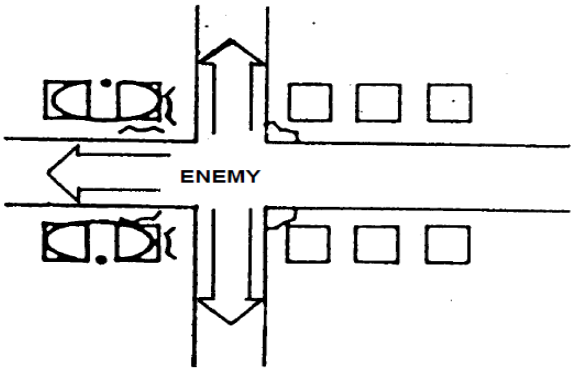


Figure 8-13. Claymore mines used to block enemy escape routes.

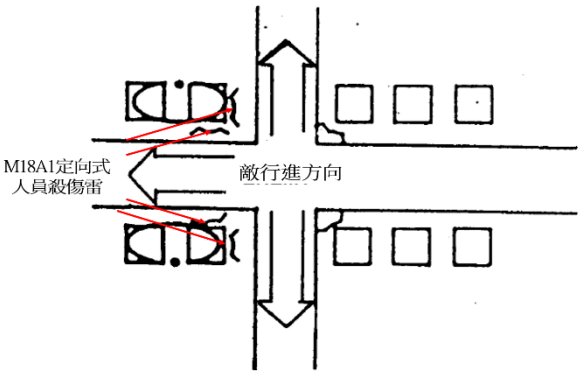


圖 8-13 M18A1 定向式人員殺傷雷用於封阻敵撤離路線

b. The M15, M19, and M21 antitank mines are employed (Figure 8-14)

• In conjunction with other man-made obstacles and covered with fire.

• As standard minefields in large open areas with the aid of the M57 dispenser.

• In streets or alleys to block routes of advance in narrow defiles.

• As command detonated mines with other demolitions.

b.M15、M19 及 M21 戰防雷之設置方式說明如下(如圖 8-14)

●與其他人為障礙實施結合並以火力進行瞰制

●與在大範圍開闊區域設置標準型雷區方式相同，但增加運用 M57 發火器實施引爆

●在街區及巷道中隘道封阻敵之前進路線

●與其他爆藥混用，作為遙控式起爆地雷運用

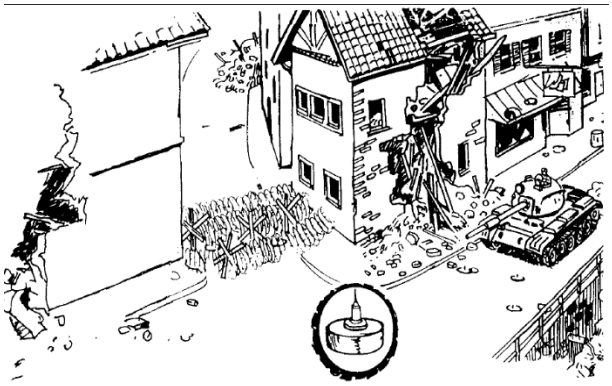


Figure 8- 14. Emplacement of antitank mines.

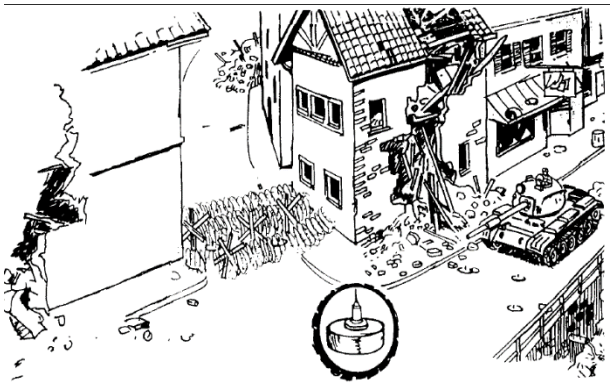


圖 8- 14 戰防雷設置方式.

8-4. ENEMY MINES AND BOOBY TRAPS

Buildings contain many areas and items that are potential hiding places for booby traps such as doors, windows, telephones, stairs, books, canteens, and so on. When moving through a building, soldiers must not pick up anything—food, valuables, enemy weapons, and so on. Such items could be rigged with pressure devices that explode when moved. Soldiers must be well dispersed so that if a booby trap explodes, the number of casualties will be few. Many different types of mines and booby traps could be encountered during urban combat (Figure 8-15).

8.4 敵軍之地雷與詭雷運用

多數建物包含許多區域及物件為潛在可用以隱藏詭雷，例如門、窗、電話、樓梯、書籍、爐灶等地方。當士兵行經建物時，必須禁止士兵撿取任何包含食物、有價物品及敵軍所遺留之武器等物品，類似的物品可能已遭敵裝設具壓發式引信裝置之地雷，當移動時即可能爆炸。士兵必須適當的實施疏散，避免詭雷爆炸時，受傷人數能降低，在城鎮戰鬥中可能會遭遇許多不同種類之地雷與詭雷(如圖 8-15)。

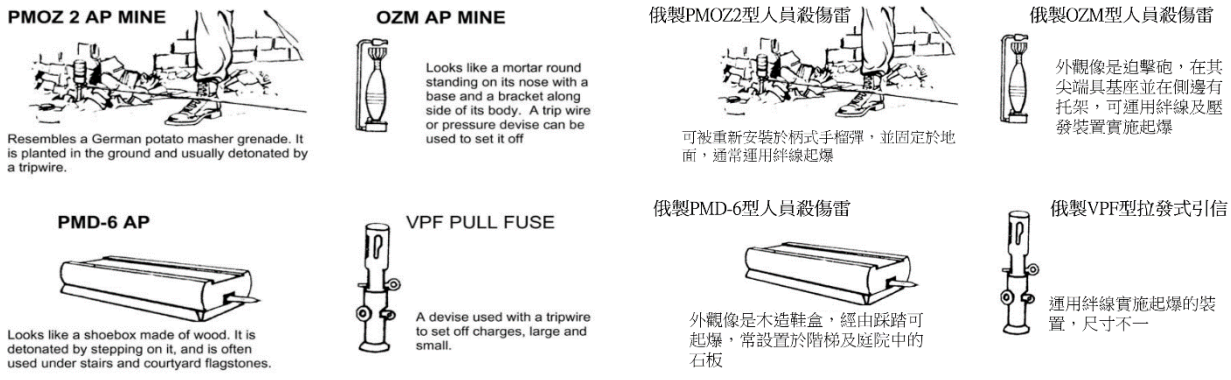


Figure 8-15. Threat mines and booby traps.

圖 8- 15 地雷與詭雷之威脅

a. Equipment used in clearing operations:

a.可用於地雷清除作業之裝備如下。

• Mine detectors.	●地雷探測器
• Probes.	●探針
• Grappling hooks.	●勾爪
• Ropes.	●繩索
• Bulk explosives and firing devices.	●大量的爆藥及點火裝置
• Protective vests (at least PASGT). (EOD vests are best, but heavy).	●防護背心(至少須具備地面部隊單兵防護裝備)(未爆彈處理專用背心為最佳裝備，但較為笨重)
• Eye protection.	●護目裝置
• Engineer tape or other marking devices such as florescent spray paint.	●工兵專用的標示帶或其他標示裝置，例如螢光噴劑

b. If available, scout dogs should be used to alert soldiers to trip wires or mines.

b.在可獲得的情況下，應該運用偵察犬警戒針對絆線或地雷對士兵實施警戒。

c. To detect tripwires, soldiers can use a 10-foot pole with 5 feet of string tied on one end. He attaches a weight to the loose end of the string, which snaps on the trip wire. This allows the lead man to easily detect a trip wire (Figure 8-16, page 8-12).

c.在探測絆線時，士兵可運用 10 英呎長的竿子，並在一端綁上 5 英呎的細繩，於繫繩的游端綁上一具重量的物品，並用以快速地碰觸絆線，這使先頭的人可以輕易地偵測到絆線。(如圖 8-16)

d.Many standard antipersonnel mines are packed in boxes and crates. If a soldier discovers explosive storage boxes, he should sketch them and turn the sketch over to the platoon leader or S2.

d.許多標準化的人員殺傷雷是裝設在箱子或彈藥箱內，如果士兵發現爆炸性物品的儲存箱時，應該將爆炸物品儲放箱的外觀完成描繪，並將描繪的成果交給排長或參二部門。

e. Explosive ordnance disposal (EOD) personnel should neutralize most booby traps. If EOD teams are not available, booby traps can be blown in place. Personnel should move to adequate cover. If the booby trap is in a building, all personnel should go outside before the booby trap is destroyed. Engineer tape placed around the danger area can be used to mark booby traps. If tape is not available, strips ripped from bedsheets can be used.

e.未爆彈處理人員應該清除多數的詭雷，如果在無法獲得未爆彈處理小組進行支援的狀況下，可於現地將詭雷實施引爆，另人員應移動至具備足夠掩蔽處後始可執行爆破，如果在建物內發現詭雷，所有的人員在詭雷被摧毀前均應該移動至建物外，並運用工兵專用的標示帶於危險區域周圍完成標示，以對詭雷完成標示，如果工兵專用之標示帶無法取得，可將床單撕成布條代用。

f. If possible, a guide should lead personnel through known booby-trapped areas. Prisoners and civilians can be a good source of information on where and how booby traps are employed.

f.在可能的狀況下，應運用適宜之導引人員，引導人員通過已知的詭雷區域，針對當地的詭雷在何處及以何種方式實施設置，當地囚犯或居民為良好能提供相關資訊之人員。

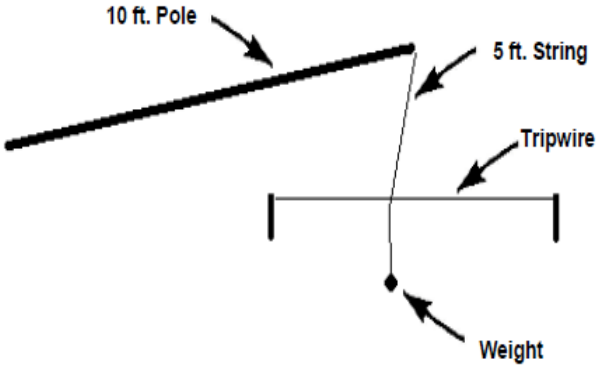


Figure 8-16. Trip wire detection.

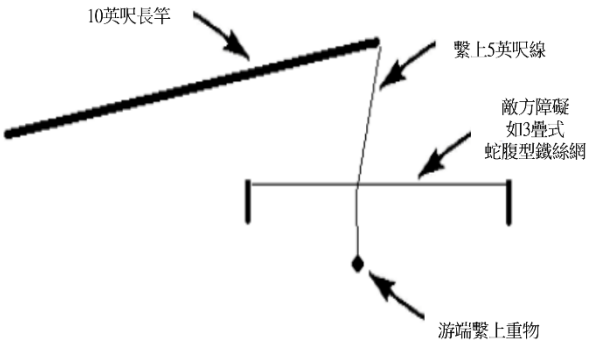


圖 8-16 三疊式鐵絲網詭雷探測方式

Section III. DEMOLITIONS

Demolitions are used more often during urban combat than during operations in open terrain. The engineers that support the brigade, battalion task force, and company team should enforce demolition operations. However, if engineers are involved in preparing and executing the barrier plan, infantrymen can prepare mouseholes, breach walls, and rubble buildings themselves, assisted and advised by the brigade, task force, or team engineer.

第三節 爆破

相較於在開闊地作戰，爆破更常運用於城鎮作戰中。工兵於支援連、營特遣隊或旅級實施作戰時，應該執行爆破作業，然而若工兵參與阻絕計畫的準備與執行時，在連、營或旅級所屬之工兵提供指導與協助下針對運用爆破手段形成狹窄洞口、牆面爆破及炸毀建物形成礫石堆等作業實施爆破作業準備。

8-5. OFFENSIVE USE

When assaulting or clearing an urban area, demolitions enable the maneuver commander to create an avenue of approach through buildings. As discussed earlier, the infantry commander forms his personnel into assault and support elements to seize and clear buildings.

8-5 攻擊

當對某個城鎮區域實施攻擊或清除時，爆破可使任務指揮官創造可穿越建物之接近路線，如前述討論之內容，步兵指揮官編組其人員用以攻擊或支援單位控領或清除建物內之敵軍。

a. Prefabricate expedient charges and initiation systems. Cross load charges and explosives so as not to overburden any one individual with unnecessary explosives, and to keep the charges dispersed if compromised. Ensure that the caps and charges are separate, but within the breach element. As METT-TC dictates, cross loading

explosives within elements of the assault may be necessary. Once a foothold is established, redistribute the explosives for the next COA during consolidation and reorganization.

a.可混用彈藥及爆藥製成預制之應急爆藥及點火系統，以避免任何單兵過度負擔不必要的爆藥，並在與任務不衝突的折衷狀況下，保持爆藥分散攜行。確保起爆管與爆藥由執行破障作業部隊內部之人員分開攜行，依據任務、敵情、可用時間、可用兵力、地形及民情等任務變數決定下，針對攻擊行動可能必須使用之爆藥，在破障部隊內將起爆管與爆藥混合裝填，當據點完成建立後，於鞏固與整頓時，應針對次一行動方案，完成炸藥攜行之重新分配。

b. One of the most difficult breaching operations faced by the assault element is the breaching of masonry and reinforced concrete walls. Always look for an alternate entry point, including safe firing positions and movement routes, before committing the element. Also consider the effects of blast waves, overpressure, and secondary missile projectiles in direct relationship to the charge and charge placement.

b.對攻擊部隊而言所面臨最困難之破障作業為破壞石製或混凝土牆，在派遣任務部隊執行攻擊行動前，遭遇相關障礙應先行完成替代進路點之選定，另需包含安全的射擊位置及運動路線。另外若需執行爆破作業，亦須考量爆炸波與過載爆壓之影響及對次級飛彈彈藥裝藥及補充裝藥之正相關性影響。

(1) Normally, building walls are 15 inches thick or less and will vary depending on the theatre of operations. C4 is an ideal charge to use when assuming all outer walls are constructed of reinforced concrete. When breaching external walls, place six to eight horizontal blocks of C4 10 to 12 inches apart in two columns (three or four blocks in each column). Prime at the outer edge of each block using

a ring main and sliding uli knots. The supplied adhesive may not be strong enough to hold the blocks in place. A frame can be constructed out of cardboard or other available sheeting to mount the charge on, then prop sticks are used to secure the charge in place. (Always use two methods of attachment precluding a failed breach.) When detonated, this will clear concrete from the wall large enough for a man to pass through and expose the rebar reinforcement. (Refer to FM 5-34 for steel-cutting rules of thumb for chains, cables, rods, and bars.)

(1)一般而言，建物牆壁厚度為 15 英寸或更薄，並且將依作戰地區實施變換。對假設建物外部牆體均由混凝土所建造時，C4 即為運用於相關建物實施爆破之理想爆藥，當自牆體外部實施破障時，於柱間以間隔 10-12 英吋之距離設置水平設置 6-8 處 C4 爆藥塊(每柱 3-4 個爆藥塊)，優先在各區塊外緣運用一個環以保持單結的滑動，在設置時僅運用輔助的黏著劑強度可能不足以固定區域中的爆藥塊，可運用硬紙板或其他可獲得的紙板製成外框來裝設爆藥，然後再設置時，設置適宜之支柱以將爆藥固定在其設置區域(多數狀況下，需同時運用兩種方式實施固定以避免破障作業失敗)當爆破完成後，爆破作用會將混凝土牆破壞出大到足以使人能夠穿越的洞，並且結構鋼筋外露。(針對鋼鍊、鋼纜、鋼柱及鋼條的破壞方法，可參考野戰手冊 5-34 鋼材切割經驗法則)。

(2) All reinforced concrete breaches should have two shots planned—one for concrete and one for rebar. Rebar may also be defeated by thermal, mechanical or ballistics means. METT-TC and experience will determine what technique would best fit the situation. In all cases, rebar can be a time-consuming and dangerous objective. Breaching personnel must have extended suppression of enemy fires while this task is being performed due to their level of exposure. Fragmentation or concussion grenades

should be thrown into the opening to clear the area of enemy. The amounts of TNT required to breach concrete are shown in Table 8-2.

(2)對所有的混凝土破障作業而言，均應計畫兩種破壞作業，其一為針對混凝土的破壞作業而另一種則為針對鋼筋之破壞作業，鋼筋同時也可運用加熱、機械破壞或以子彈射擊等手段實施破壞。任務變數及經驗將決定何種技術最適於當下的狀況。在所有案例中顯示，破壞鋼筋為耗時且危險的，由於在執行破障作業時，破障人員必須暴露在其層級火力範圍外，故必須更加延伸能夠制壓敵火，始能確保實施破障的人員安全。針對開闊區域的敵軍，對其投擲具碎片及震波殺傷效能的手榴彈實施殺傷。爆破混凝土所需之 TNT 用量如表 8-2 所示。

REINFORCED CONCRETE		
THICKNESS OF MATERIAL	TNT	SIZE OF OPENING
Up to 10 CM (4 inches)	5 KG (11 LBS)	10 to 15 CM (4 to 6 inches)
10 to 15 CM (4 to 8 inches)	10 KG (22 LBS)	15 to 25 CM(6 to 10 inches)
15 to 20 CM (6 to 8 inches)	20 KG (44 LBS)	20 to 30 CM (8 to 12 inches)
NONREINFORCED CONCERT MASONARY		
THICKNESS OF MATERIAL	TNT	SIZE OF OPENING
Up to 35 CM (14 inches)	1 KG (2.2LBS)	35 CM (14 inches)
35 to 45 CM (14 to 18 inches)	2 KG (4.4 LBS)	45 CM (18 inches)
45 to 50 CM (18 to 20 inches)	3 KG (6.6 LBS)	50 CM (20 inches)

Table 8-2. TNT required to breach concrete

鋼筋混凝土		
材料厚度	TNT 用量	開闢洞口尺寸
未達 10 公分(4 英吋)	5 公斤(11 磅)	10 公分至 15 公分(4 至 6 英吋)
10 公分至 15 公分(4 至 6 英吋)	10 公斤(22 磅)	15 公分至 25 公分(6 至 10 英吋)
15 公分至 20 公分(4 至 8 英吋)	20 公斤(44 磅)	20 公分至 30 公分(8 至 12 英吋)
無鋼筋接著之混凝土塊		
材料厚度	TNT 用量	開闢洞口尺寸
未達 35 公分(14 英吋)	1 公斤(2.2 磅)	35 公分(14 英吋)
35 公分至 45 公分(14 至 18 英吋)	2 公斤(4.4 磅)	45 公分(18 英吋)
45 公分至 50 公分(18 至 20 英吋)	3 公斤(6.6 磅)	50 公分(20 英吋)

表 8-2 爆破混凝土所需之 TNT 用量.

c. Mouse holes provide the safest method of moving between rooms and floors. Although they can be created with explosives, all mechanical means should be used first. When assaulting a unit in the defense, mouse holes may be provided.

d. When enemy fire prevents an approach to the wall, the breaching charge may be attached to a pole and slid into position for detonation at the base of the wall (Figure 8-17, page 8-14). Small-arms fire will not detonate C4 or TNT. The charge must be primed with detonating cord. Soldiers must take cover before detonating the charge.

c.在各房間或樓層間製造狹窄的出入口實施運動為最安全的移動方式，雖然這可以爆破手段製造相關通行通道，但仍應以各種機械式破壞手段優先，當攻擊防禦的單位時。應該提供狹窄通道實施運用。

d.當敵火使破障部隊無法接近預破壞之牆面時，破障所使用的爆藥可固定於長竿上，並滑動至其預定爆破位置的地面(如圖 8-17)，小型口徑的火力並不會將 C4 或 TNT 引爆，爆藥必須與導爆索完成設置，另士兵必須在起爆前找到適宜之掩蔽位置。

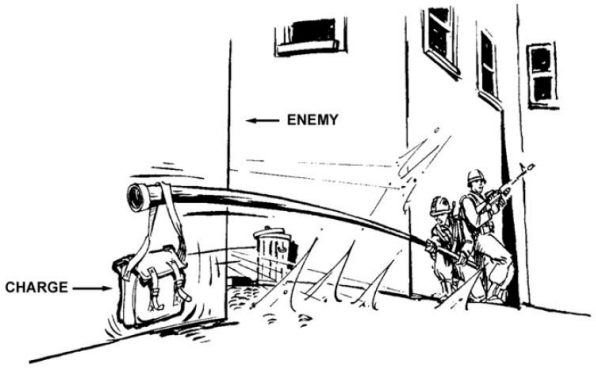


Figure 8-17. Charge placement when small-arms fire cannot be suppressed

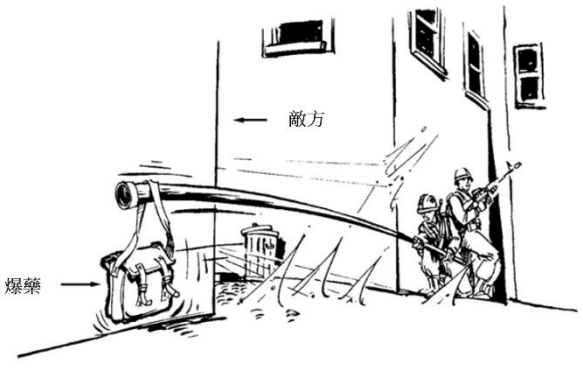


圖 8-17 無法制壓敵小規模火力時
爆藥設置方式

8-6. DEFENSIVE USE

The use of demolitions in defensive operations is the same as in offensive operations. When defending an urban area, demolitions are used to create covered and concealed routes through walls and buildings that can be used for withdrawals, reinforcements,or counterattacks. Demolitions are also used to create obstacles and clear fields of fire.

8.6 防禦

防禦作戰如同攻擊作戰，均運用爆破作為，協助作戰任務遂行，當在城鎮區域實施防禦時，通常運用爆破手段於建物間的牆面創造出可於撤退、增援及反擊時所需之隱、掩蔽路線，另亦常運用爆破手段製造障礙與清掃射界。

a.Infantrymen use demolitions for creating mouseholes and constructing command-detonated mines. Expedient C4 satchel charges can be concealed in areas that are likely enemy weapons positions, in individual firing positions, or on movement routes. Expedient-shaped charges (effective in equipment destruction and against lightly armored vehicles) can also be placed on routes of mounted movement and integrated into anti-armor ambushes.

a.步兵人員通常運用爆破手段以創造可供通行之狹窄通道及建造遙控起爆地雷，應急的 C4 爆破藥包可隱蔽設置於敵人武器據點、單兵射擊位置或運動路線等區域(可有效用於破壞裝備及對抗輕裝甲車輛)，同時亦可設置於乘車運動路線上整合設置，作為反裝甲伏擊手段。

b.Engineers must furnish technical assistance for selective rubbling. ormally, buildings can be rubbled using shaped charges or C4 on the supports and major beams.

b.運用爆破手段製造瓦礫堆時，工兵必須提供技術協助，一般而言，可運用塑形爆藥或是 C4 於建物支撐處或主樑實施爆破，以製造瓦礫堆。

c.Charges should be placed directly against the surface to be breached unless a shaped charge is used. Depending on the desired effect and target material, charges may be tamped, untamped, or buffed depending on the situation. Tamping materials can be sandbags, rubble, or even water blivits when filled (Figure 8-18).

c.除運用塑形爆藥外，其餘爆藥應直接放至於須被破壞之平面，另外依據預期的破壞效果及被爆破物之材質，爆藥可能依狀況需以填塞、未填塞或運用緩衝物質，沙包、碎石甚至運用水袋均可作為於填塞之物質(詳圖 8-18)

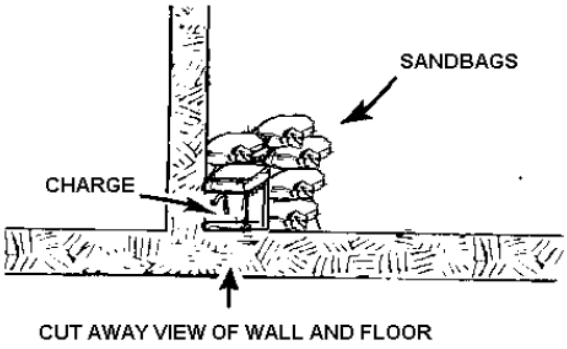


Figure 8-18. Sandbags used to tamp breaching charge

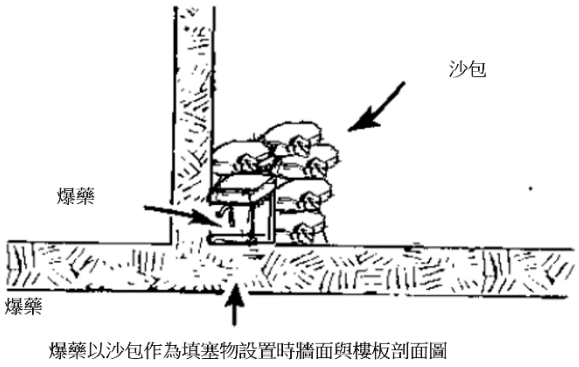


圖 8-18. 運用沙包作為牆面破壞炸藥之填塞物

d. For most exterior walls, tamping of breaching charges could be impossible due to enemy fire. Thus, the untamped ground level charge requires twice the explosive charge to produce the same effect as an elevated charge (Table 8-3).

d.對於多數建物外部牆面而言，在敵火下幾乎不可能對爆藥實施填塞作業，因此需要運用高於爆藥在有填塞狀況兩倍之藥量，將爆藥以未填塞且置於地面方式以對建物產生同樣的效果或可將爆藥離地設置 (詳表 8-3)

METHODS OF PLACEMENT				
THICKNESS OF CONCRETE (FEET)	ELEVATED CHARGE		GROUND-LEVEL CHARGE	
	POUNDS OF TNT	POUNDS OF C4	POUNDS OF TNT	POUNDS OF C4
2	14	11	28	21
2 ½	27	21	54	41
3	39	30	78	59
3 ½	62	47	124	93
4	93	70	185	138
4 ½	132	99	263	196
5	147	106	284	211
5 ½	189	141	376	282
6	245	186	490	366

Table 8-3. Breaching reinforced concrete.

設置方法				
混凝土牆面厚度(英呎)	離地設置		貼地設置	
	所需 TNT 磅數	所需 C4 磅數	所需 TNT 磅數	所需 C4 磅數
2	14	11	28	21
2 1/2	27	21	54	41
3	39	30	78	59
3 1/2	62	47	124	93
4	93	70	185	138
4 1/2	132	99	263	196
5	147	106	284	211
5 1/2	189	141	376	282
6	245	186	490	366

表 8-3. 爆破鋼筋混凝土牆面所需藥量

e. The internal walls of most buildings function as partitions rather than loadbearing members. Therefore, smaller explosive charges can be used to breach them. In the absence of C4 or other military explosives, internal walls can be breached using one or more fragmentation grenades primed with modernized demolition initiator (MDI), or a Claymore mine (Figure 8-19). These devices should be tamped to increase their effectiveness and to reduce the amount of explosive force directed to the rear.

e.多數建物內部牆面多為隔間用途而非承重構件，因此通常可用較少量的爆藥即可實施破壞，在缺乏 C4 或其他種類之軍用爆藥時，可優先運用現代化的起爆器配合一至數顆碎片式手榴彈或運用定向式人員殺傷雷實施牆面爆破(如圖 19)，這些爆破裝置應該在有填塞狀況下實施爆破，以增加爆破威力對牆面之破壞力並減輕爆破威力直接對作業區後方部隊之影響。

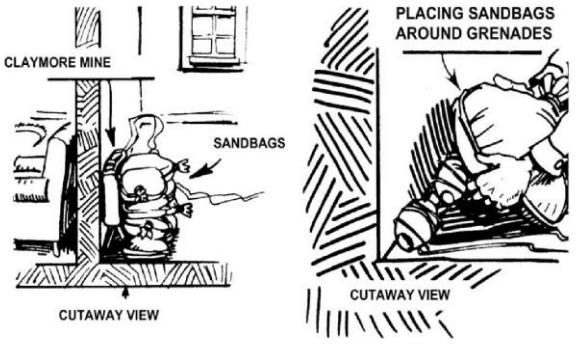


Figure 8-19. Tamping of a Claymore mine and fragmentation grenades to breach internal walls.

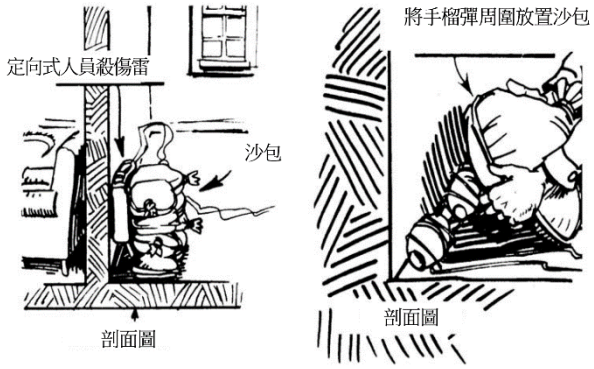


圖 8-19. 運用破片式手榴彈及定向式人員殺傷雷破壞建物內部牆體時之填塞方式

WARNING
Ensure that a safe distance is maintained when throwing the Molotov cocktail. Caution troops against dropping the device. Throw it in the opposite direction of personnel and flammable materials. Do not smoke while making this device.

警告
當投擲汽油彈時，須確保有足夠之安全距離，並注意部隊在作業時，可能發生掉落時產生之危害，於投擲汽油彈時，應朝向人與可燃物品所在位置之反方向進行投擲，另在製作相關裝置時，周圍應禁止抽菸。

f. The Molotov cocktail (Figure 8-20) is an expedient device for disabling both wheeled and tracked vehicles. It is easy to make since most materials are readily available. Results can be very effective because of the close nature of engagements in urban areas. The objective is to ignite a flammable portion of the vehicle or its contents, such as the fuel or ammunition it is transporting.

f.汽油彈(如圖 20)為一種同時可使輪型及履帶車量失去行動能力之應急裝置，在多數材料均完成整備及獲得的狀況下，相當容易進行製作，因接近城鎮作戰特性，故非常有效。汽油彈攻擊的目標為點燃車輛或其油箱等易燃之部分，例如車輛所載運之燃料或彈藥。

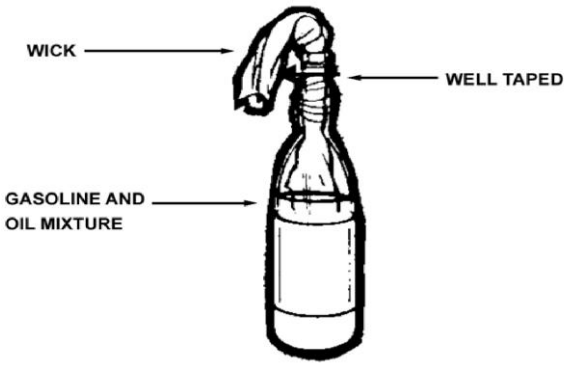


Figure 8-20. Figure 8-20. Molotov cocktail.

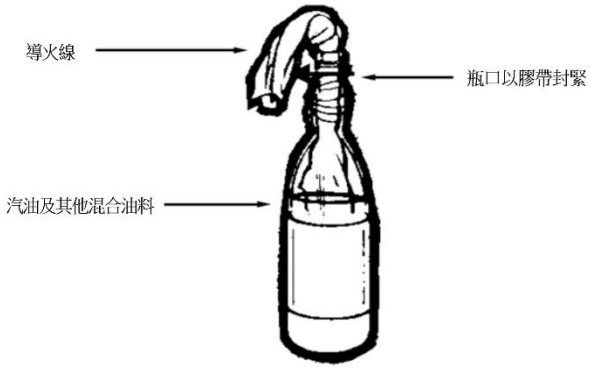


圖 8-20.汽油彈

WARNING

Never carry the device by the handle or igniter. Remove the igniter safety pin only when it is time to use the device. Use extreme care when handling or carrying MDI systems. Protect blasting caps from shock and extreme heat. Do not allow the time fuse to kink or become knotted. Doing so may disrupt the powder train and may cause a misfire. Prime detonating cord and remove the MDI igniter safety pin only when it is time to use the device.

警告

本爆破裝置攜行時，不可以與點火器或起爆器同時攜行，只有當要使用汽油彈之時機，始能移除點火器之安全插銷，運用獲攜行現代化的起爆系統時應該極度謹慎，另應避免起爆管受到撞擊與過熱之溫度，設置時不可與計時起爆引信混用，混用的狀況下可能會影響爆炸效應之鏈結並導致發火失效，在運用現代化的起爆器時，優先使用導爆索並且在使用汽油彈時始可移除安全插銷。

g. The bunker bomb is an expedient explosive flame weapon best used against fortified positions or rooms (Figure 8-21, page 8-18).

g. 掩體炸彈為針對堅固據點及房間攻擊效果最佳的一種應急式爆炸火焰武器(如圖 21)

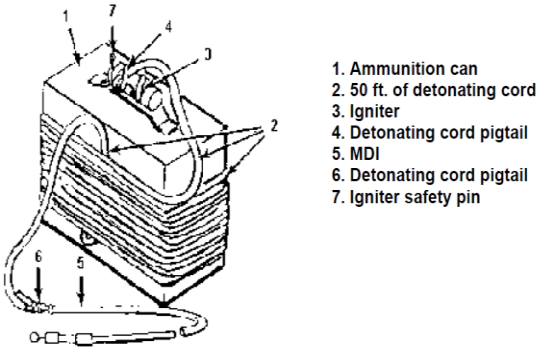


Figure 8-21. Molotov cocktail.

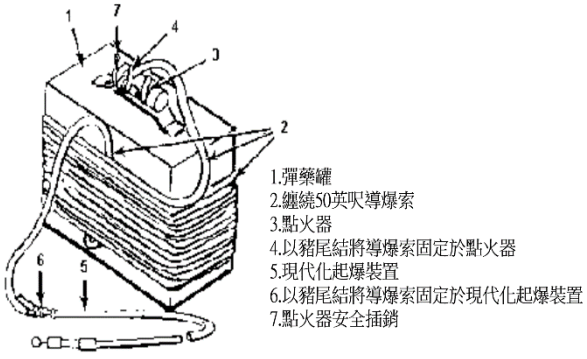


圖 8-21. 運用彈藥罐製作掩體炸彈.

8-7. SAFETY

The greatest dangers to friendly personnel from demolitions are the debris thrown by the explosion and blast overpressure. Leaders must ensure protective measures are enforced, and have personnel trained in procedures for determining overpressure, be it indoors or outdoors, in respect to net explosive weights and room size. The minimum safe distances listed in Table 8-4 indicate the danger of demolition effects.

8.7 安全

對友軍人員爆破作業最大的危害在於爆炸後所拋出的碎片及對人體過壓之爆炸波，指揮官必須確保防護措施已強制執行，並且具受過對不論在室內、室外單純針對爆藥重量及房間尺寸判斷爆破產生之壓力是否超壓訓練之人員，爆破時人員所需保持最低安全距離如表 8-4 所式，顯示爆炸之影響程度。

POUNDS OF EXPLOSIVES	SAFE DISTANCE IN METERS	POUNDS OF EXPLOSIVES	SAFE DISTANCE IN METERS
1 to 27	300	150	514
30	311	175	560
35	327	200	585
40	342	225	605
45	356	250	630
50	369	275	651
60	392	300	670
70	413	325	688
80	431	350	705
90	449	375	722
100	465	400	737
125	500	425 AND OVER	750
NOTE: These distances will be modified in combat when troops are in other buildings, around corners, or behind intervening walls. For example, a platoon leader using demolitions in an urban area with heavy-clad, mass construction buildings available to protect his soldiers, may use this information in conjunction with making a risk assessment and reduce the MSD to 50 meters if he is using a 20- to 25-pound charge.			

Table 8-4. Minimum safe distances (MSD) for personnel in the open.

爆藥磅數	所需安全距離(公尺)	爆藥磅數	所需安全距離(公尺)
1-27	300	150	514
30	311	175	560
35	327	200	585
40	342	225	605
45	356	250	630
50	369	275	651
60	392	300	670
70	413	325	688
80	431	350	705
90	449	375	722
100	465	400	737
125	500	425以上	750
備註:當部隊於建物內部、建物轉角及隔間牆實施爆破時，安全距離將會修正，舉例而言，排長若在由許多建物環繞的城鎮區實施爆破作業時，多數的建物用於士兵之防護使用，在運用本表資訊時，應與所評估之作業風險實施結合，若僅運用20-25磅之爆破實施爆破時,在合理之情況下可將最低安全距離下修至50公尺。			

表 8-4. 在開闊空間人員所需最低安全距離

a. Rules for using demolitions:

•Team/squad leaders and the platoon engineer(s) supervise the employment of demolitions.

• Wear helmets, body armor, ear and eye protection when firing explosives.

• Handle misfires with extreme care.

• Clear the room and protect personnel when blowing interior walls.

a.爆破作業運用原則。

●由小組長/班長及工兵排所屬人員監督爆破作業設置狀況

●起爆時，人員需穿戴安全頭盔、防護衣、護目鏡及聽力防護裝置

●針對不發火狀況應特別小心處置

●針對建物內部牆體完成爆破時，應針對預備爆破空間完成清除及人員防護

b. Some charges should be prepared, minus initiators, beforehand to save time; for example, 10- or 20-pound breaching charges of C4 and expedient-shaped charges in No. 10 cans.

• Use C4 to breach hard targets (masonry construction).

• Do not take chances.

• Do not divide responsibility for explosive work.

• Do not carry explosives and blasting caps together.

b.為節約作業時間，應在未與點火器接續的狀況下，部分爆藥應預先準備及處理，例如將 10 或 20 磅以上的 C4 或應急塑型炸藥裝入 10 號彈藥罐。

●運用 C4 爆藥針對堅硬目標(石造建築)實施排除

●作業時不可心存僥倖

●針對同一處爆破作業，作業權責應集中

●攜行時不可將爆藥及起爆管同處放置

Section IV. FIELD-EXPEDIENT BREACHING OF COMMON URBAN BARRIERS

Urban combat requires access to compounds, buildings, and rooms. Mechanical breaching of doors or windows using sledgehammers, bolt cutters, saws, or crowbars; or ballistic breaching using weapons fire are options. However, mechanical or ballistic breaching are sometimes too slow or exposes soldiers to enemy fire. Explosive breaching is often the fastest and most combat-effective method. With a little time to prepare, units can use slightly modified standard Army demolitions to breach all common urban barriers.

NOTE:The techniques described in this section should be employed by soldiers who have been trained in their use

第四節 對一般城鎮障礙之野戰應急排除方法

城鎮戰鬥奪取由建物圍繞之封閉區域、建物及房間，通常會運用機械破障方式，以大型鐵槌、螺栓切割器、鋸子或橇棒針對門窗實施破壞，或以彈藥針對障礙實施破壞但可能較慢且會有時使士兵曝露於敵火之破壞方式，運用爆破手段實施排除通常為較快且為最具戰鬥效應之方式，僅需運用少量時間實施準備及可運用些微修正的軍用彈藥針對一般的城鎮障礙實施排除。

備註:本節所述之排除技術應由受過訓練之士兵執行用相關作業。

8-8. FORCE PROTECTION

Soldiers must take care when fabricating, carrying, and using field-expedient explosive devices. Leaders must ensure all standard procedures and precautions outlined in doctrinal and training material for Army demolitions activities are followed. This is dictated by more than just the commander's concern for the safety and welfare of his individual soldiers. Accidental or premature detonation of demolitions during combat not only can injure or kill friendly soldiers but can jeopardize the unit's mission. During combat, soldiers often need to position themselves close to breach points to enter quickly and overcome enemy resistance before the effects of the explosion subside. However, a soldier who is too close to an explosion and injured by flying debris becomes a casualty. Fire and extreme dust volumes may be encountered, preventing fluid movements, and must be prepared for. The unit must accomplish its mission without sustaining friendly casualties from its own demolitions.

8.8 部隊防護

當士兵在製造、攜行及運用應急式爆破裝置時必須特別注意，指揮官必須確保執行爆破作業時，需遵從所有在準則及陸軍爆破訓練教材中所提及之標準程序及注意事項。並不僅在指

揮官所關切的士兵個人安全與福祉方面實施說明，亦包含更多的內容。在戰鬥間爆藥意外或提早引爆不僅會造成友軍士兵傷亡，並可能會危害單位的任務遂行。戰鬥間士兵通常需使自己向破障點靠近，並在爆藥的爆炸作用消失前快速進入敵軍陣地並克服敵人的抵抗，然而士兵太過接近爆炸點時，會因飛散破片擊傷而成為傷兵，並且可能會遭遇到火焰及大量的煙塵造成部隊快速的運動受限，所以必須對上述狀況完成相關準備措施。單位必須在不造成支援友軍部隊產生傷亡的狀況下，完成其爆破任務。

8-9. BREACHING REINFORCED AND NONREINFORCED EXTERIOR WALLS

The Army issues both bulk explosives (TNT or C4) and prepackaged satchel charges that are powerful enough to breach all but the most heavily reinforced exterior walls. In some situations, satchel charges may be unavailable or may prove too powerful for the breach required. In high-intensity urban combat, the situation may call for large amounts of bulk explosive, but in many precision conditions the commander may want to create a smaller-size hole than the M37 or M183 satchel charges normally produce. Smaller satchel charges can be improvised. Research and development can determine the correct size of these improvised satchels, depending on the types of walls found in the battle area.

8.9 鋼筋混凝土及未強固之外牆破壞

陸軍撥發包含兩種形式的炸藥塊(TNT 或 C4)及預先包裝完成的爆藥包，兩種形式的炸藥威力均足以破壞大多數的鋼筋混凝土外牆，在部分狀況中，預先包裝完成的爆藥包可能無法取得，且已證明過大的爆炸威力已超過破障作業所需之威力。在高張力的城鎮戰鬥中，狀況可能需要大量的爆藥塊，但在許多確切的情況中，指揮官可能想要創造出比運用 M37 或 M183 爆藥包正常爆破效果更小的洞，較小規模之爆藥包可即興製作，

依據在戰鬥區域所發現牆之種類，經由研究與發展即可判斷這些即興製作的較小尺寸藥包規格。

a. General-purpose satchel charges can be assembled using empty machine gun ammunition bandoleers filled with various amounts of C4 explosive.

a.通用爆藥包可運用空的機槍子彈帶填滿各種不同的藥量之 C4 爆藥製成。

(1) Connect a short length of detonation cord firmly to the explosive and leave it dangling. Tape the explosive securely into the bandoleer.

(1)將一條短導爆索與爆藥確實連結，並使其懸空後，小心的將爆藥固定在子彈帶上。

(2) Hang the charge on a wall by the bandoleer strap or prop it against the wall using a stick or other object. Satchel charges detonated while firmly secured against the target wall at about shoulder height produce the best effects.

(2)運用子彈帶將爆藥懸於牆或運用支撐物將爆藥靠在牆上，引爆爆藥包時，應確定爆藥確實以約在肩膀的高度固定於牆上，以獲得最佳效果。

(3) Prime the charge with an MDI firing system to the short length of detonation cord left dangling. When used against a nonreinforced concrete wall, a satchel charge containing 2 pounds of C4 usually produces a mousehole; 5 pounds creates a hole large enough for a man to move through; 7 pounds creates a hole large enough for two men to move through simultaneously; and 10 pounds of C4 can blow a hole large enough to drive a vehicle through. The 10-pound charge may also destroy the entire building if it is not of sturdy construction.

(3)優先運用具備現代化點火裝置之點火系統以縮短導爆索的懸吊長度。當運用爆藥針對未具鋼筋之混凝土牆實施爆破時，運用 2 磅 C4 爆藥的爆藥包，通常就能形成一個狹窄的小洞；

運用5磅C4爆藥的爆藥包，通常就能形成一個可讓人通行的洞；運用7磅C4爆藥的爆藥包，通常就能形成一個足以讓兩個人同時通行的洞；運用10磅C4爆藥的爆藥包，通常就能形成一個足以讓載具通行的洞，但對不夠堅固的建物而言，10磅C4爆藥亦可能摧毀整棟建物。

b. A useful breaching charge improvised by light engineer sappers during combat operations in Somalia consisted of a 3-foot length of engineer picket (U-shaped engineer stake) packed with 4 to 8 pounds of C4. The explosive was primed with detonation cord and taped securely to the picket. When needed, the picket was placed upright with its flat side against the wall, held to the wall by another stake, and then detonated. This charge could be rapidly fabricated, was sturdy, and could be easily and quickly emplaced. According to reports from the field, this device would blow a hole about 4 feet wide and 8 feet high in a nonreinforced concrete wall (common in the third world). The charge would throw fragments from the picket straight back for long distances (from 50 to 100 meters) but was fairly safe to either side. In combat, infantrymen could stand about 20 meters from the picket, crouched tightly against the wall with their backs turned to the explosive, without undue risk. This allowed them to follow up on the explosion with a rapid assault into the compound or building before the occupants could recover.

b.在索馬利亞作戰期間，輕裝戰鬥工兵急造了一款相當有用的障礙排除爆藥，此款爆藥為在3英呎長之工兵樁(U型工兵樁)上，包覆4至8磅之C4爆藥，並在爆藥內塞入導爆索後，小心地固定於樁上。當需要時將樁立起，並在運用另一根支柱支撐下，將樁的平面側靠在牆上，完成後再實施爆破，此種炸藥可被快速的製成，並且很堅硬，可輕鬆且快速地進行設置，根據自戰場提供之報告，此種爆破裝置可在無鋼筋的混凝土牆面炸

出 4 英呎寬、8 英呎高的洞。並且會將爆炸時樁所產生之碎片拋擲至正後方約 50 至 100 公尺，但是在其他方向就相對安全，在戰鬥中，步兵所屬人員可保持在距爆藥樁約 20 公尺，背對預爆破牆壁之方向蜷伏，在沒有不當的風險狀況下，可使人員於爆破同時，在占領者回復狀況前，進入庭院或建物內進行快速之突擊。

8-10. BREACHING INTERIOR WALLS AND PARTITIONS

Interior walls generally require much less explosive to create a satisfactory breach than do exterior, load-bearing walls. An easily fabricated silhouette charge can further reduce the amount of explosive needed to breach plywood, Sheetrock, or light plaster walls. It can also be used to breach wooden or metal doors. This charge can be emplaced quickly and creates a hole large enough for a man to move through.

8.10 建物內牆及隔間之破壞

一般而言在內牆創造符合需求的破障作業所需爆藥量，比較破壞外牆及承重牆時所需藥量較少，當需要針對膠合板、石板及輕石膏牆體時，可運用輪廓爆藥這種易於製造且更能減少爆藥用量之爆藥，此種爆藥亦可運用於對木質及金屬材質之房門破壞，此爆藥設置快速，且能在爆破後創造出足以讓人穿越之大洞。

a. Tape two E-type silhouette targets, or similar stiff cardboard, together. To make the charge easier to carry, it can be built to fold in the middle (Figure 8-22). Rounding the corners makes the charge easier to handle.

a.將兩個 E 型輪廓目標或相似的硬紙板黏在一起，使其便於攜行，也可做成可自中間對摺之型式，將爆藥環繞在外圍使其易於進行處理。

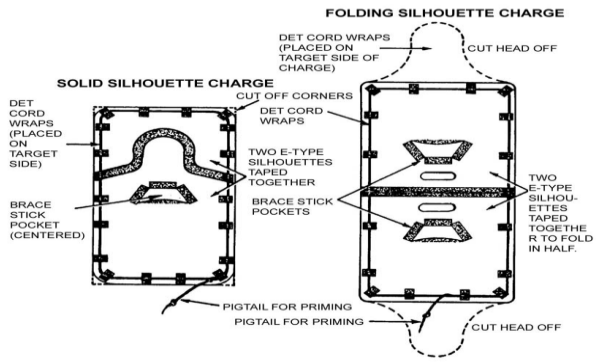


Figure 8-22. Construction of solid and folding silhouette charges.

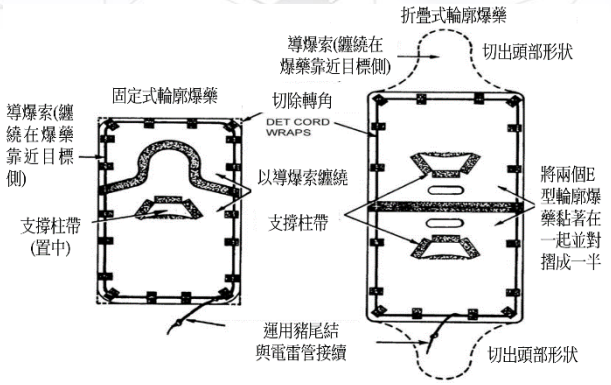


圖 8-22. 固定及折疊式輪廓炸藥構造

b. Place detonation cord or flexible linear-shaped charge (FLSC) around the edges of the silhouettes, leaving a 6-inch tail for priming. Secure the cord to the silhouette using sturdy tape (for example, “100-mph tape”). (See Table 8-5 on page 8-22 for the appropriate number of wraps of detonation cord or FLSC to breach various barriers.) Tape several small dowels or other materials at various places around the silhouette if using FLSC. This provides the necessary standoff distance to ensure the maximum shaped charge effect. (See Table 8-6 on page 8-22 for the required standoff distance for various sizes of FLSC.)

NOTE: Always consider the silhouette material (about 1/8 inch) when determining standoff distance.

b.將導爆索或彈性線型爆藥(FLSC)，沿輪廓邊緣環繞，並留下 6 英吋的尾部與電雷管實施接續，確保運用高黏著力之膠帶將導爆索與輪廓實施結合，(如強力膠帶)(參照表 8-5，查詢排除各式阻材時，導爆索或線型爆藥需於輪廓纏繞圈數)，當運用彈性線型爆藥(FLSC)進行纏繞時，為確保塑形爆藥的最大效力，應運用銷或其他物體在輪廓形狀的周邊實施固定，並提供所需藥量長度所需具備藥量(針對各種尺寸線性爆藥所需之藥量參照表 8-6)。

備註:依爆藥對預訂破壞物體間之距離，應考量作為輪廓之材質(厚度約 1/8)。

NOTE: The information, in Table 8-5, is based on US manufactured materials. Building materials of other countries may be of inferior quality; however, some European companies have standards that surpass that of the US.

備註:表 8-5 所提供之資訊為依據美國所製造之材料所訂定，運用其他國家的材料所建造之相關爆藥可能低於表列品質，雖然部分歐洲公司具備超過美國標準之品質。

Type of Obstacle	Detonation Cord Needed	FLSC Needed
Hollow-core door	1 wrap	75 grain/foot
Particle-filled door (1 inch)	2 wraps	75 grain/foot
Solid wood door (2 inches)	3 wraps	75 grain/foot
High-quality solid door	4 wraps	225 grain/foot
1/4-inch plywood	1 wrap	75 grain foot
1/2-inch plywood	2 wraps	75 grain/foot
3/4-inch plywood	3 wraps	75 grain/foot
Light metal door	NA	225 grain/foot
Medium steel door	NA	300 grain/foot
Heavy steel door	NA	300 grain/foot

Table 8-5. Silhouette charge explosive loads

障礙種類	導爆索纏繞圈數	所需彈性線型爆藥藥量
空心門	1 圈	75 公克/每英呎
門(部分填塞)	2 圈	75 公克/每英呎
2 英寸厚之實木門	3 圈	75 公克/每英呎
高品質實木門	4 圈	225 公克/每英呎
1/4 英呎膠合木板	1 圈	75 公克/每英呎
1/2 英呎膠合木板	2 圈	75 公克/每英呎
3/4 英呎膠合木板	3 圈	75 公克/每英呎
輕型金屬門	不適用	225 公克/每英呎
中型鋼質門	不適用	300 公克/每英呎
厚重鋼質門	不適用	300 公克/每英呎

表 8-5. 輪廓爆藥裝藥量

Standoff Required for FLSC	Standoff
75 grain	0 - 1/16 inch
225 grain	1/8 inch
300 grain	1/8 inch - 3/16 inch
NOTE: FLSC that is 300 grains or higher cannot be molded.	

Table 8-6. Standoff required for flexible linear-shaped charges

所需彈性線型爆藥	目標與爆藥距離
75 公克	0-1/16 英吋
225 公克	1/8 英吋
300 公克	0-1/16 英吋
備註：彈性線型爆藥大於 300 公克時無法時塑型	

表 8-6. 爆炸目標距離與所需使用彈性線型爆藥藥量表

c. Place three or four strips of heavy-duty, double-sided contact tape on the front of the silhouette from top to bottom. Construct a sturdy pocket for a brace stick in the appropriate position on the back of the silhouette.

c.將輪廓面從上至下放置 3 至 4 條強力雙面膠帶，並在輪廓厚放的適當位置建構一個堅固的放置支撐棒之口袋。

d. Pull the covering off the double-sided tape and place the charge against the wall at knee height, bracing it if necessary. Prime the charge, take cover, and detonate.

d.將雙面膠撕開並於靠近牆面側在膝蓋高度部分填入爆藥，如果有需要時在另外運用物體實施支撐，確認作業人員均具備足夠掩蔽時，即可實施爆破。

8-11. DOOR-BREACHING CHARGES

Several different field-expedient charges can be used to breach interior or exterior doors and chain link fence. Among these are the general-purpose charge, the rubber band charge, flexible linear charge, doorknob charge, rubber strip charge, and the chain link charge. All can be made ahead of time and are simple, compact, lightweight, and easy to emplace.

8.11 破壞門所使用之爆藥

許多不同種類的野戰急造爆藥可運用於破壞室內、外門及以鐵絲網圍籬，然而在這些通用性的爆藥中，橡膠環爆藥、彈性線型爆藥、門把爆藥、橡膠條爆藥及串聯爆藥，上述爆藥均可提前製造，並簡單、有效、輕量及易於設置。

CAUTION 警告

Any time explosive charges are used to breach doors, the knobs, locks and hinges made of steel and metal can become lethal projectiles.

任何時刻在運用爆藥針對鋼或金屬製成之門、門把、門鎖及門的活頁片進行破壞時，將造成致命的破片飛散。

a. General-Purpose Charge.

The general-purpose charge is the most useful preassembled charge for breaching a door or other barrier. As its name implies, it is useful not only for door breaching, but it can also cut mild steel chain and destroy captured enemy equipment.

a.通用爆藥

對於門及其他障礙物之排除而言，通用爆藥為最有用的預製爆藥，從其通用名稱可知，此類爆藥不僅可用於破壞門，且可用於切斷鐵鍊並對捕獲之敵軍裝備實施破壞。

(1)Start building the general-purpose charge with a length of detonation cord about 2 feet long. Using another length of detonation cord, tie two uli knots (Figure 8-23) around the 2-foot long cord. The uli knots must have a minimum of six wraps and be loose enough for them to slide along the main line, referred to as a uli slider. Trim excess cord from the uli knots and secure them with tape, if necessary.

(1)製作通用爆藥時首先運用 2 英呎的導爆索，另運用其他長度的導爆索在兩英呎的導爆索上環繞並打兩個單結(如圖 8-23)，單結最少必須纏繞 6 圈並保持足夠的鬆度以在主索上滑動。

Uli knots should be dressed and both knots should slide easily up and down the length of the cord.

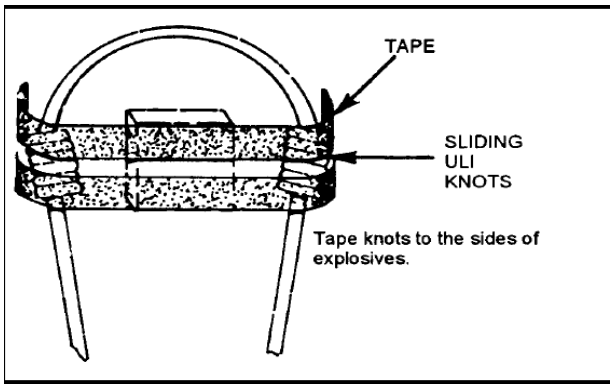
單結應完成包覆且兩個單結均能在繩索中上下滑動

Figure 8-23. Sliding uli knots.

圖 8-23. 滑動之單結示意

(2) Cut a block of C4 explosive to a 2-inch square. Tape one slider knot to each side of the C4 block, leaving the length of detonation cord free to slide through the knots

(2)將 C4 爆藥切成 2 英呎見方，將 C4 爆藥塊各一側均以一個滑動繩結黏合，將導爆索留下可滑動至各單結之長度(詳圖 8-24)。



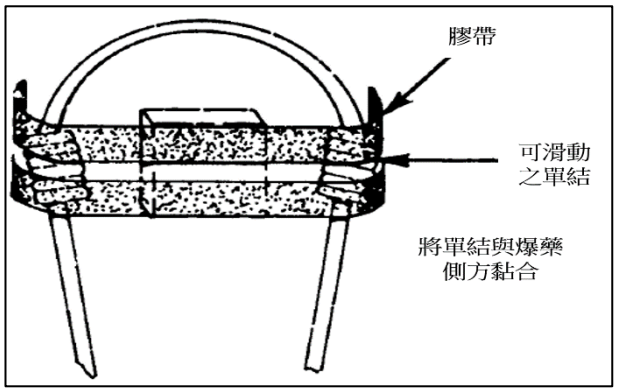


Figure 8-24. Completed general-purpose charge.

圖 8-24. 通用爆藥製作完成示意

(3) To breach a standard door, place the top loop of the charge over the door knob. Slide the uli knots taped to the C4 so that the charge is tight against the knob. Prime the loose ends of the detonation cord with a MDI firing system and detonate (Figure 8-25). To cut mild steel chain, place the loop completely around the chain link to form a girth hitch. Tighten the loop against the link by sliding the uli knots.

(3)針對標準尺寸門進行破壞時，將爆藥置於門把上環，將單結滑動調整至與門把緊密結合的位置並與 C4 爆藥以膠帶黏緊，將游端與導爆索接續並運用現代化起爆裝置實施點火(如圖 8-25)，若要切除鐵鍊，將導爆索完全環繞於鐵鍊周圍並形成繫帶結，並調緊滑動之單結使導爆索環與鐵鍊緊密連結。

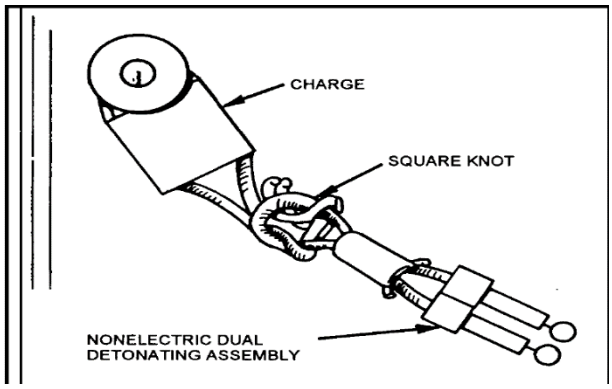


Figure 8-25. Charge placement against doorknob.

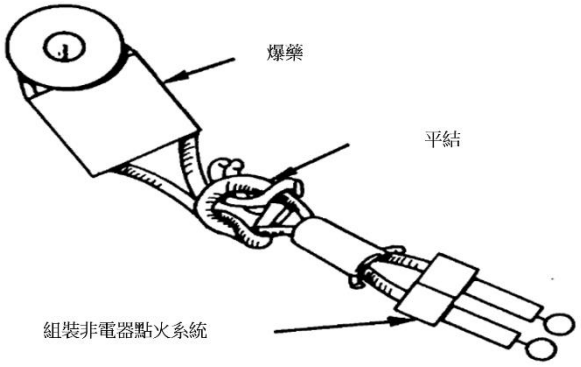


圖 8-25.門把爆藥設置示意圖

b. Rubber Band Charge.

The rubber band charge is another easily fabricated lightweight device that can be used to remove the locking mechanism or doorknob from wooden or light metal doors, or to break a standard-size padlock at the shackle.

b.橡膠環爆藥

橡膠環爆藥為另外一種簡易預製之輕型爆破裝置，可用於移除木質或輕薄金屬所製成之機械鎖定裝置或門把。

(1) Cut a 10-inch piece of detonation cord and tie an overhand knot in one end. Using another piece of detonation cord, tie a uli knot with at least eight wraps around the first length of cord. Slide the uli knot tightly up against the overhand knot. Secure it in place with either tape or string. Loop a strong rubber band around the base of the uli knot tied around the detonation cord. Tie an overhand knot in the other end of the cord to form a pigtail for priming the charge.

(1)切一段 10 英吋長的導爆索並在一端綁上一個反手結，運用另一段導爆索在第一段導爆索上打一個滑動之單結至少

纏繞8圈，並將單結滑動至與反手結緊定之位置，完成後可用膠帶或細繩實施緊定，在這個以纏繞導爆索的單結基礎上環繞一個強力的橡膠圈，於第一段導爆索的另一側打一個反手環並形成一個豬尾結以接續爆藥。

(2) Attach the charge to the doorknob (or locking mechanism) by putting the loose end of the rubber band around the knob. The charge should be placed between the knob and the doorframe. This places the explosive over the bolt that secures the door to the frame.

(2)將游端環繞門把以使爆藥覆著至門把(或機械鎖定裝置)，爆藥放置之位置需置於門框至門把間，確保自門到門框之所有螺栓均完成爆藥設置。

c. Flexible Linear Charge.

One of the simplest field-expedient charges for breaching wooden doors is the flexible linear charge. It can be made in almost any length, and it can be rolled up and carried until needed. It is effective against hollow-core, particle-filled, and solid wood doors. When detonated, the flexible linear charge cuts through the door near the hinges (Figure 8-26).

c.線性彈性爆藥

線性彈性爆藥為在野戰中針對木門破壞，最易於製作的應急爆藥之一，可製作成需要任何的長度，並可於製作後依需求捲起攜行，此類爆藥可有效針對中空、部分填塞及實木門進行破壞，當爆破時，線性彈性爆藥主要在於針對門上接近鉸鏈部分實施破壞。

(1) Lay out a length of double-sided contact tape with the topside adhesive exposed. Place the necessary number of strands of detonation cord down the center of the double sided tape, pressing them firmly in place. Military

detonation cord has 50 grains of explosives per foot and there are 7,000 grains in a pound. Most residential doors are 80 inches tall and commercial doors are 84 inches tall. This must be considered when calculating the quantities of explosives, overpressure and MSDs. For hollow-core doors, use a single strand. For particle-filled doors, use two strands, and for solid wood doors use three. If the type doors encountered are unknown, use three strands. One of the strands must be cut about a foot longer than the others and should extend past the end of the double-sided tape. This forms a pigtail where the initiating system is attached once the charge is in place.

(1)將雙面膠依需要長度黏在門上，並露出上方黏著面，在黏著面依需求黏上所需導爆索數量，並以按壓方式確保其確實固定，軍用導爆索每英呎中含有 50 喱之爆藥，一磅為 7000 喱。大部分民宅的門高 80 英吋，另商業場所門高 84 英吋，當計算爆破能量時，必須考量過大之爆壓及最小安全距離。對於中空門，運用一條爆藥條實施破壞，對部分填塞門，運用兩條爆藥條實施破壞，對於實木門，運用三條爆藥條實施破壞，當碰到形勢未知之門，則運用三條爆藥條實施破壞，針對運用超過三條以上爆藥實施破壞時，其中一條導爆索一定要比其他兩條長度超過一英呎，並在超過雙面膠的兩邊端點形成一個豬尾結，此處為當爆藥設置完成後，用於連結起爆系統之位置。

(2) Cover the strands of detonation cord and all the exposed portions of the double-sided tape with either sturdy single-sided tape or another length of double-sided tape. Roll the charge, starting at the pigtail, with the double-sided tape surface that is to be placed against the door on the inside.

(2)以強力膠帶或另外一段雙面膠將導爆索條及露出膠著面之雙面膠完成包覆，自爆藥豬尾結處。將在包覆在雙面膠裡面的爆藥自豬尾結處捲並沿雙面膠表面將爆藥捲起。

(3) At the breach site, place the charge straight up and down against the door tightly. If the charge is too long, angle it to best fit the door or use the excess to defeat the possibility of a door return at the top of the door. Sometimes but not always visible from the outside by exposed bolts. If it is too short, place it so it covers at least half of the door's height. Prime and fire the charge from the bottom.

(3)於障礙排除地點，將爆藥與門直上直下的緊密放置，如果爆藥太長，將多餘處彎折為適於門的形狀或將過量的爆藥破壞在可能的狀況下灣折返回門的頂部，有時從門的外部可看見外露的螺栓，當爆藥太短時，於設置爆藥時，至少要讓爆藥涵蓋門一半以上的高度，並自爆藥的底部實施接續與起爆。

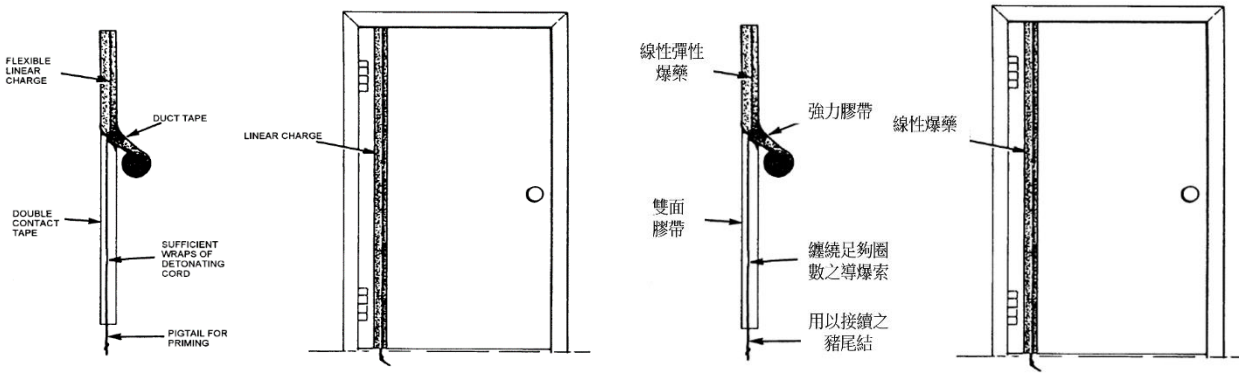


Figure 8-26. Placement of the flexible linear charge.

圖 8-26. 線性彈性爆藥設置示意

d. Doorknob Charge.

A doorknob charge is easy to make and highly effective against wooden or light metal doors. Charges for use against wooden doors can be made with detonation cord. If the charge is to breach a light metal door, either detonation cord (three lengths) or 225 grain/foot flexible linear shaped charge (FLSC) should be used.

d.門把爆藥

門把爆藥為一種易於製作且用於破壞木質或輕型金屬門時具有高度效果，用於破壞木質門時，可用導爆索製作門把

爆藥，然針對輕質金屬門可用三倍長度之導爆索，或是運用常用之每呎含 225 喱爆藥的線性彈性爆藥。

(1) Cut the appropriate amount of detonation cord for the charge. Use a 30-inch length for a hollow-core door. For a particle-filled door, use one 30-inch length and one 18-inch length. For a solid-core wooden door or a light metal door, use one 30-inch length and two 18-inch lengths.

(1)切取適當長度之導爆索，針對中空門需 30 英吋導爆索，對部分填滿門需分別運用 30 英吋及一根 18 英吋導爆索，針對實木門或輕型金屬則需分別運用 30 英吋及 2 根需 18 英吋導爆索。

(2) Cut the charge holder from a piece of stiff cardboard.

(2)切除一塊厚紙板作為爆藥托板。

(3) Place double-sided tape on the face of the charge holder in the shape of a large “C”. Place the detonation cord on top of the double-sided tape, also in the shape of a large “C” along the edge of the charge holder. Leave a 12-inch pigtail for priming (Figure 8-27).

(3)於爆藥托板以 C 型方式黏上雙面膠，並沿爆藥托板邊緣黏上雙面膠，並依雙面膠黏上 C 型之導爆索，另外預留 12 英吋之導爆索並以豬尾結作為接續(如圖 8-27)。

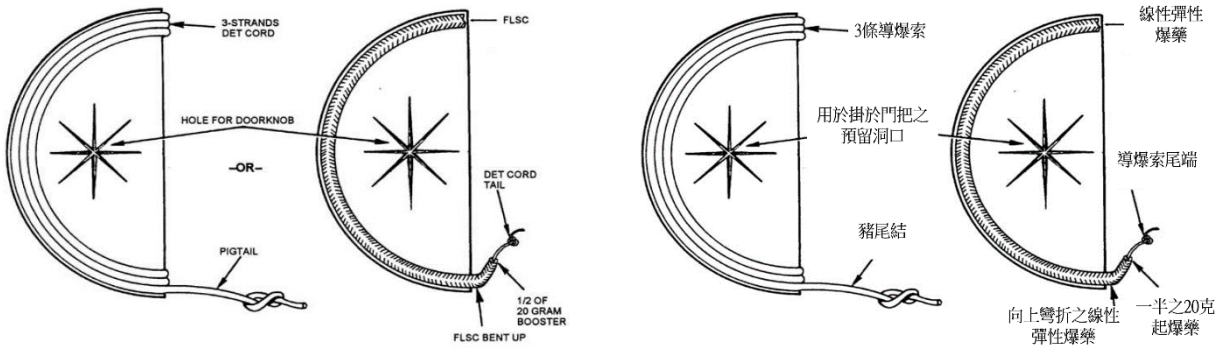


Figure 8-27. Doorknob charge.

圖 8-27 門把破壞爆藥

(4) If using FLSC, cut a length 21 inches long. Tape the FLSC to the outside of the charge holder, leaving a 3-inch tail for priming. Bend the tail upward. Tie a Sliding Uli knot to a 12-inch length of detonation cord and tie an overhand knot on each end of the knot. Tape the slider and detonation cord combination to the tail end of the FLSC and on the inside of the “V” shape to insure detonation.

(4)當運用線性彈性爆藥時，需切取21英吋長之導爆索，並在爆藥托板外緣黏上爆藥，將導爆索尾部向上彎曲，將可滑動之單結與12英吋長的導爆索接續，並在結的兩底端均綁上一個反手結，將滑動繩結與導爆索與線性彈性爆藥之尾部黏在一起，並以將爆藥向內彎曲成V型，以確保爆破效果。

(5) Hang the charge on the doorknob or locking mechanism. Secure the FLSC charge in place with the double-sided tape, and the “Det cord” charge with “100 mph” tape. The detonation cord must be held firmly against the door’s surface.

(5)將爆藥吊於門把或機械鎖定裝置上，確保線性彈性爆藥與雙面膠確實黏著，另確認以強力膠帶將導爆索黏著，放置時必須確保導爆索確實靠在門的表面。

e. Rubber Strip Charge.

The rubber strip charge (Figures 8-28 and 8-29) can be used to open a solid wood door with multiple locking devices or a metal door. It defeats the locking mechanism and dislodges the door from the frame. It can also be used to defeat windows with a physical security system. Place the charge on the target between locking devices and doorjamb. Ensure that the rubber strip covers the area where the locking bolts are located. For a metal door with standard locking devices, place the charge in the center of the door, parallel with the locking mechanism. When

detonated it will buckle and or bend the door, pulling the locking mechanisms from their catches.

e.橡膠條爆藥

橡膠條爆藥(如圖 8-28 及 8-29)可用於破壞由多重鎖定裝置實木門或金屬門，此類爆藥可破壞門鎖，並可將門自門框移動出來，亦可用於破壞運用固體安全系統實施固定之窗戶，將爆藥置於鎖定裝置至門框間。確保橡膠條包覆所有有螺栓的地方，對具有標準鎖制裝置的金屬門，將爆藥置於們的中央位置並與鎖制機構平行，當實施爆破時，爆藥將會使門挫曲或彎曲，使其鎖制機構自固定端拉出。

WARNING

Net explosive weight should not exceed 8 ounces for a complete charge.

警告

針對各單處使用之爆藥重量不應超過 8 盎司

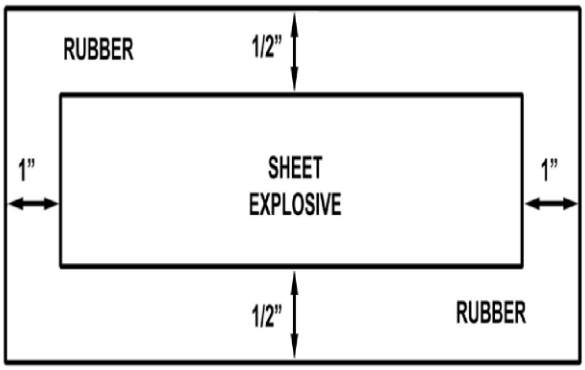


Figure 8-28. Rubber strip charge (top view).

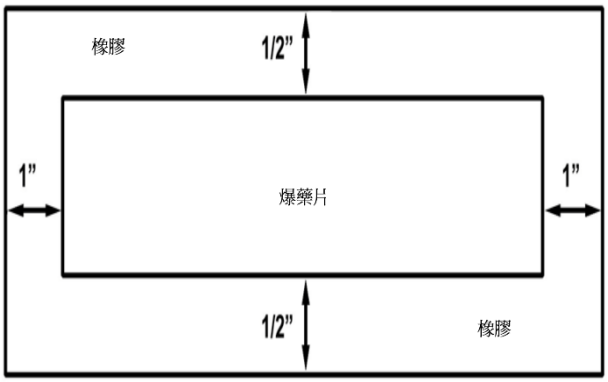


圖 8-28. 橡膠條爆藥(俯視圖)

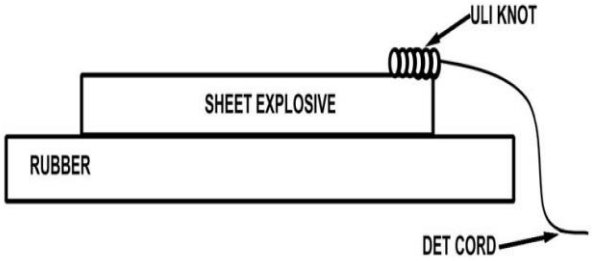


Figure 8-29. Rubber strip charge (side view).

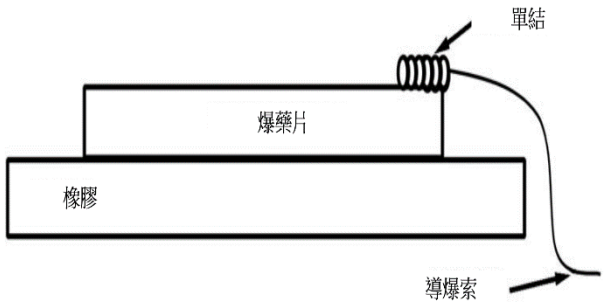


圖 8-29. 橡膠條爆藥(側視圖)

WARNING

Friendly troops must be clear of the area 90 degrees from the target.The doorknob will be blown away from the door with considerable force

警告

爆炸時，門把將會被相當的力量拋出，故友軍部隊必須於爆破前，於爆破目標 90 度以內之範圍撤離

f. Chain-Link Ladder Charge.

The chain-link ladder charge (Figure 8-30) is designed to create a man-sized hole in a chain-link fence. The charges run lengthwise along the detonation cord on sliding uli knots. Once in the desired location, secure in place with tape. Determine where charge is to be emplaced on the fence. To ensure that the full impact is received by the fence, place the charge next to a fence post so that the fence will not “give.” Secure the top of the charge to the breach location on the fence. Simply hang the large hook into a link of the fence. Secure the charge at the bottom of the fence using surgical tubing and a small hook.

f.鏈結梯型爆藥

橡膠條爆藥(如圖 8-30)為設計用於鐵絲網圍籬破壞人型通道，爆藥設置時為將導藥以縱向之方向，沿著由可滑動單結所連結之導爆索進行敷設，並在預期的位置以膠帶實施固定，應在確保預破壞之圍籬能全部接收爆破的衝擊力之位置，決定

爆藥設定位置後，將爆藥置於圍籬旁邊之放置點，以至於圍籬將不會將爆藥彈出，簡單的將一個大勾吊在圍籬上，並以一個小勾及橡皮拉力器勾住圍籬下方，以固定爆藥。

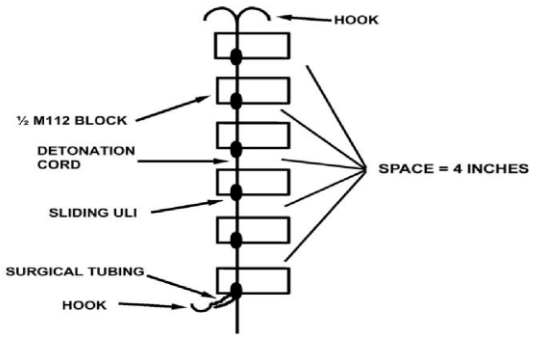


Figure 8-30. Chain-link ladder charge.

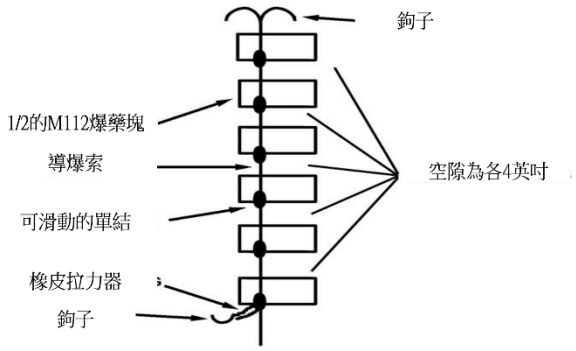


圖 8-30. 鏈結梯型爆藥.

NOTES:

1. Use six-wrap uli knots constructed of detonation cord.

2. Only slight pressure is required to secure the charge; too much tension may cause the fence to buckle and result in poor cutting of the fence.

備註:

1.導爆索須以纏繞六圈的單結與導爆索實施接著。

2.固定爆藥時，僅需輕微按壓，太大的張力可能會造成圍籬挫曲並造成圍籬不良之切口。

NOTE: Table 8-7 provides a summary of the different charges discussed in this chapter.

備註:表 8-7 提供本章所探討不同種類爆藥的概述

CHARGE	OBSTACLE	EXPLOSIVES NEEDED	ADVANTAGES	DISADVANTAGES
Wall Breach Charge (Satchel Charge or U-Shaped Charge)	Breaches through wood, masonry, or brick, and reinf concrete walls	- Detonation cord - C4 or TNT	- Easy and quick to make - Quick to place on target	- Does not destroy rebar - High overpressure - Appropriate attach-ment methods needed - Fragmentation
Silhouette Charge	Wooden doors; creates man-sized hole. Selected walls (plywood, Sheet-rock, CMU)	- Detonation cord	- Minimal shrapnel - Easy to make - Makes entry hole to exact specifications	- Bulky; not easily carried
General Purpose Charge	Door knobs, mild steel chain, locks, or equipment	- C4 - Detonation cord	- Small, lightweight - Easy to make - Very versatile	- Other locking mechanisms may make charge ineffective
Rubber Strip Charge	Wood or metal doors; dislodges doors from the frame, windows with a physical security system	- Sheet Explosive - Detonation cord	- Small, easy to carry - Uses small amount of explosives - Quick to place on target	
Flexible Linear Charge	Wooden doors; widows cuts door along the length off the charge.	Detonation cord	- Small, lightweight - Quick to place on target - Several can be carried by one man - Will defeat most doors regardless of locking systems	- Proper two-sided adhesive required
Doorknob Charge	Doorknobs on wood or light metal doors	Detonation cord or flexible linear shaped charge	- Small, lightweight - Easily transported - Quick to place on door	- Other locking mechanisms may make charge ineffective
Chain-link Ladder Charge	Rapidly creates a hole in chain-link fence large enough to run through	- C4 - Detonation Cord	- Cuts chain link quickly and efficiently	- Man must stand to emplace it
NOTE: All doorknobs and prop-sticks will become secondary missiles; any charge placed on metal may create shrapnel.				

Table 8-7. Summary of breaching charges.

爆藥種類	障礙類型	所需炸藥	好處	壞處
破牆爆藥 書包爆藥 U 型爆藥	木、石、磚造及鋼筋混凝土牆	導爆索 C4 或 TNT	1.製造快速方便 2/設置快速	1.無法破壞鋼筋 2.高爆壓 3.需要以合適方式放置 4.有破片
輪廓爆藥	1.於木門製造人型缺口 2.特製牆(膠合木、石板及混凝體磚牆體)	導爆索	1.碎片小 2.易於製作 3.依確切的尺寸開設缺口	易挫曲不易攜型
一般用途爆藥	門把、鐵鍊、門鎖及裝備	導爆索 或 C4	1.體積小、輕量 2.易於製作 3.用途廣泛	對於部分鎖定機構可能無法破壞
橡膠條爆藥	1.木質或金屬門 2.與框架產生位移的門 3.由其他實體物品固定的窗戶	導爆索 或炸藥片	1.體積小、易於攜型 2.爆藥用量小 3.設置快速	
彈性線性爆藥	木質門、沿爆藥長度方向在門上形成缺口	導爆索	1.體積小、輕量 2.設置快速 3.多種可由單人攜行之型式 4.不論以何種鎖定機構固定之門，大多可完成破壞	需要適用的雙面黏着劑
門把爆藥	裝置於木質或輕金屬門之門把	導爆索 或彈性線性爆藥	1.體積小、輕量 2.易於攜行 3.快速設置於門上	其他種類的鎖定機構可能會使此種爆破失效
鏈結梯形爆藥	可於鐵絲網圍籬快速開闢足以穿越之洞口	導爆索 或 C4	對切除鐵鍊快速且有效	人員必須以站姿實施設置
備註:所有的門把之支撐物體於爆破時可能都會變成次級武器，任何對金屬物體進行爆破的行為都會形成金屬破片				

表 8-7.各類破障爆藥概述