

APPENDIX A

Subsurface Operations

Section 1. General

A-1. Type facilities.

- a. This appendix explains how guerrillas may use natural caves or construct underground facilities in the course of their operations. These may be used for command and control centers, logistical staging areas, hospitals, or even fortifications.
- b. The larger underground facilities may be complex. Caves may have many large chambers connected by passageways, while tunnel systems may have many large rooms joined by interconnecting tunnels. Underground facilities may be wired for electricity and communications and may even have pumping stations for supplying air to lower levels.

A-2. Tunnel uses.

Tunnels may be dug with zigzags and sumps to lessen the effects of small arms fire, explosives, and gas inside them. Some tunnels and rooms, or passageways and chambers, may contain concealed exits to allow guerrillas to hide or escape if the complex or cave is penetrated while others may be booby-trapped to kill intruders. Tunnels and caves are difficult to detect from the air or ground, and their construction may make them impossible to destroy with conventional ammunition. Tunnel entrances are normally covered by fire from another point in the complex.

- a. Guerrillas may use tunnels in penetration operations to gain access to restricted areas. In built-up areas they may infiltrate through sewers, or tunnel from the basement of a nearby building, or subway tunnel, or sewer to their target. When they are below the target, they may either construct an exit and penetrate the target from below or fill the tunnel with explosives and blow up the target.
- b. Tunnels may also be dug in the basements of safehouses for use as escape routes if a house is compromised.
- c. Tunnels are used for approach and escape. They are used to obtain access to caves and underground bunkers for use as firing positions and protection against indirect fires. They are also used as a common method of storing food and materials in underground caches. Some tunnel complexes are large enough to house underground hospitals and base camps.

Section II. Tunneling

A-3. Categories.

Tunnels vary from the simple to the complex. They are categorized as hiding holes, access and escape routes, underground base areas, fortified base camps, and bunkers.

- a. **Hiding holes.** There are three basic types of holes used by guerrillas. They are classified more by their location than by their construction. Methods of construction and dimensions can be expected to vary, depending on the area of operations.
 - (1) **Bamboo hole.** This is easily and quickly camouflaged (Figure A-1). The entrances to the holes differ as do the techniques of camouflage. Most of the entrances are within the edge of a bamboo clump or dense thicket or just outside the edge. The hole cover, or trapdoor, contains camouflage material. Some have pieces of cut bamboo or other vegetation affixed to the top of the door. The edges of the door fit snugly into the structure of the entrance. Other entrances may be covered by spreading materials over them.

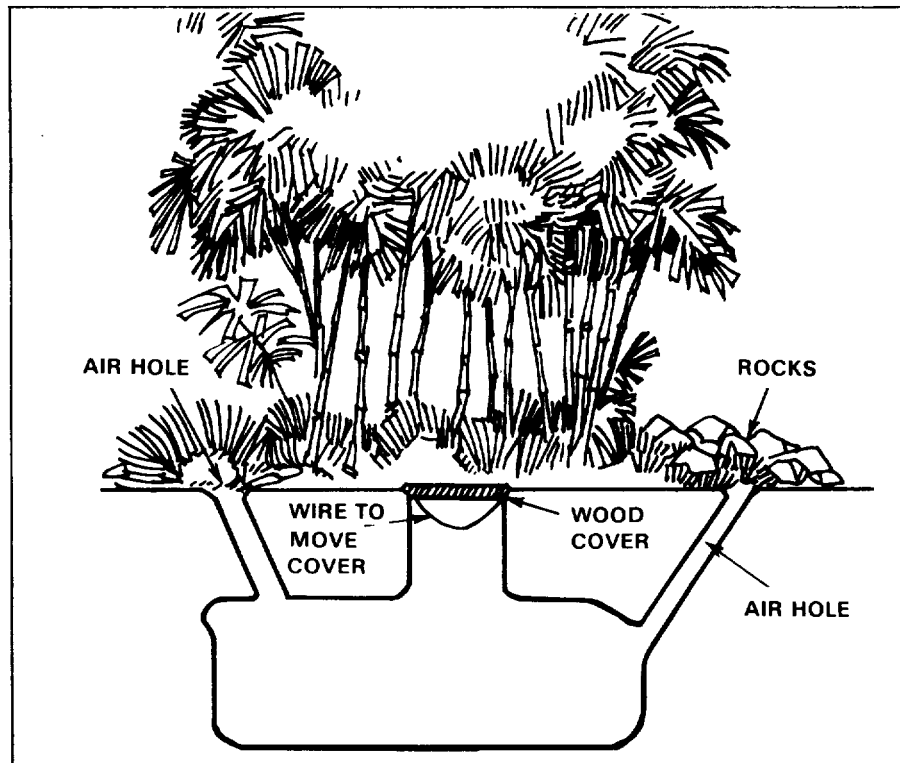


Figure A-1. Under bamboo hole.

(2) Air hole.

- (a) Another characteristic common to small tunnels is the air hole, which is normally made from a hollow piece of bamboo or pipe 3 to 4 inches in diameter and inserted into the tunnel and camouflaged on the surface.
- (b) The air hole is the only telltale indicator in a beach hole or tunnel. It differs from the bamboo hole in that it is constructed in sand or dirt and constructed from cut timbers (Figure A-2). It does not depend on roots to add rigidity to the roof. The entrance is hard to locate as it is often buried under a foot of loose sand or dirt; however, it can be found by first finding the breathing tubes. Some air holes are a continuation of the supports that hold up local buildings. Other air holes may be exposed by pulling up plants that grow nearby.

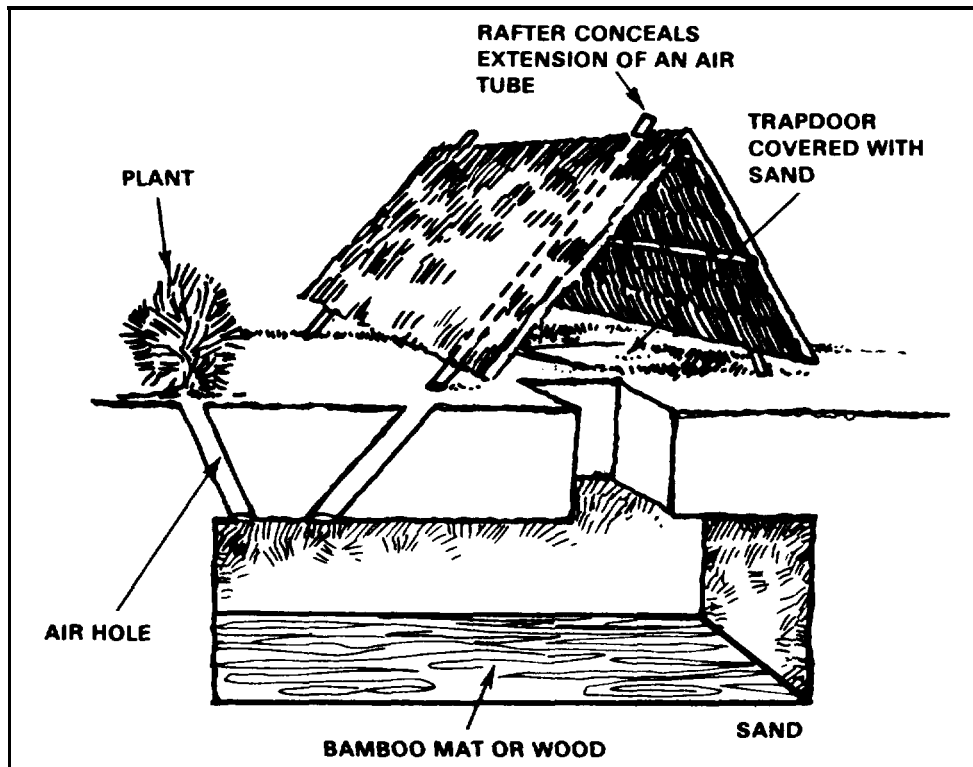


Figure A-2. Beach hole.

- (3) **Water entrance hole.** This hole or tunnel (Figure A-3) is located near a small stream or beside an old bomb crater filled with water. These holes have no door and depend on natural growth to hide the entrance. Sometimes the entrance is completely submerged.

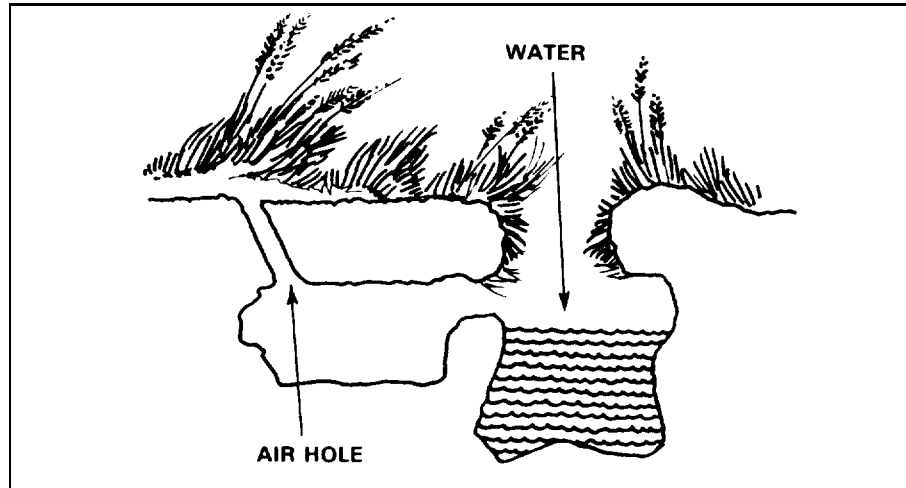


Figure A-3. Water entrance hole.

- b. **Access and escape routes.** Guerrillas use tunnels to infiltrate or exfiltrate an area. They may lead to villages, roads, or highly fortified bunker systems (Figure A-4).

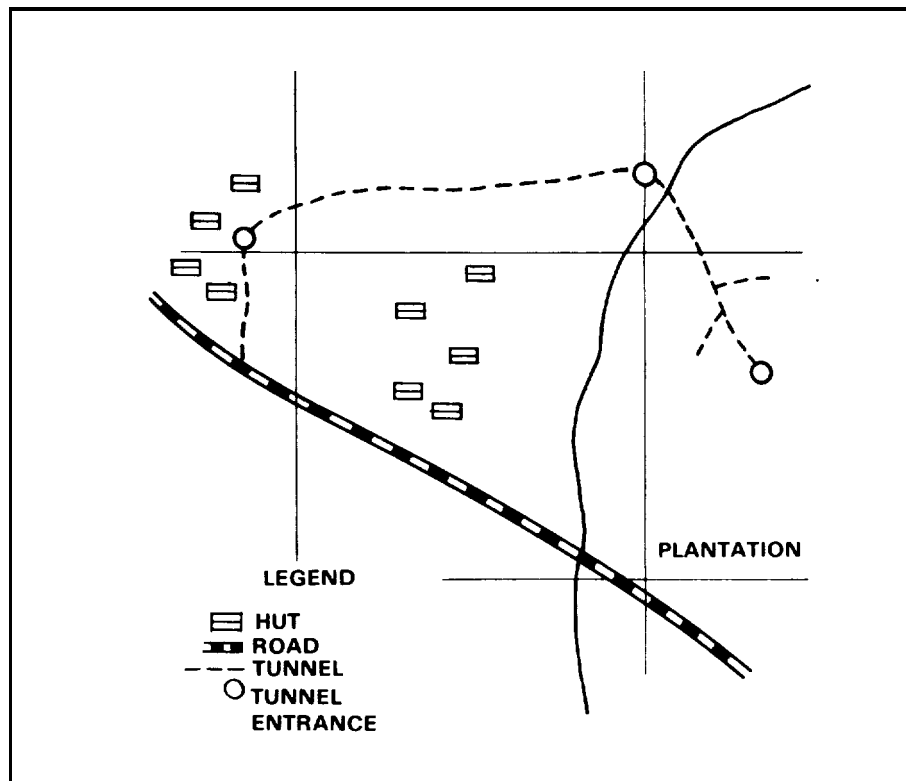


Figure A-4. Access and escape routes.

- c. **Base area.** This may house a command post, ordnance shop, or hospital. This type of tunnel system is not-as common as the ones found in a fortified village or used as access or escape routes. It is normally deep in guerrilla-controlled areas. This type of tunnel complex may have several rooms, such as a 4- by 6-foot area or a large 10-foot-square area with a 15-foot ceiling. They may also include electric lighting or other comfort features (Figure A-5).

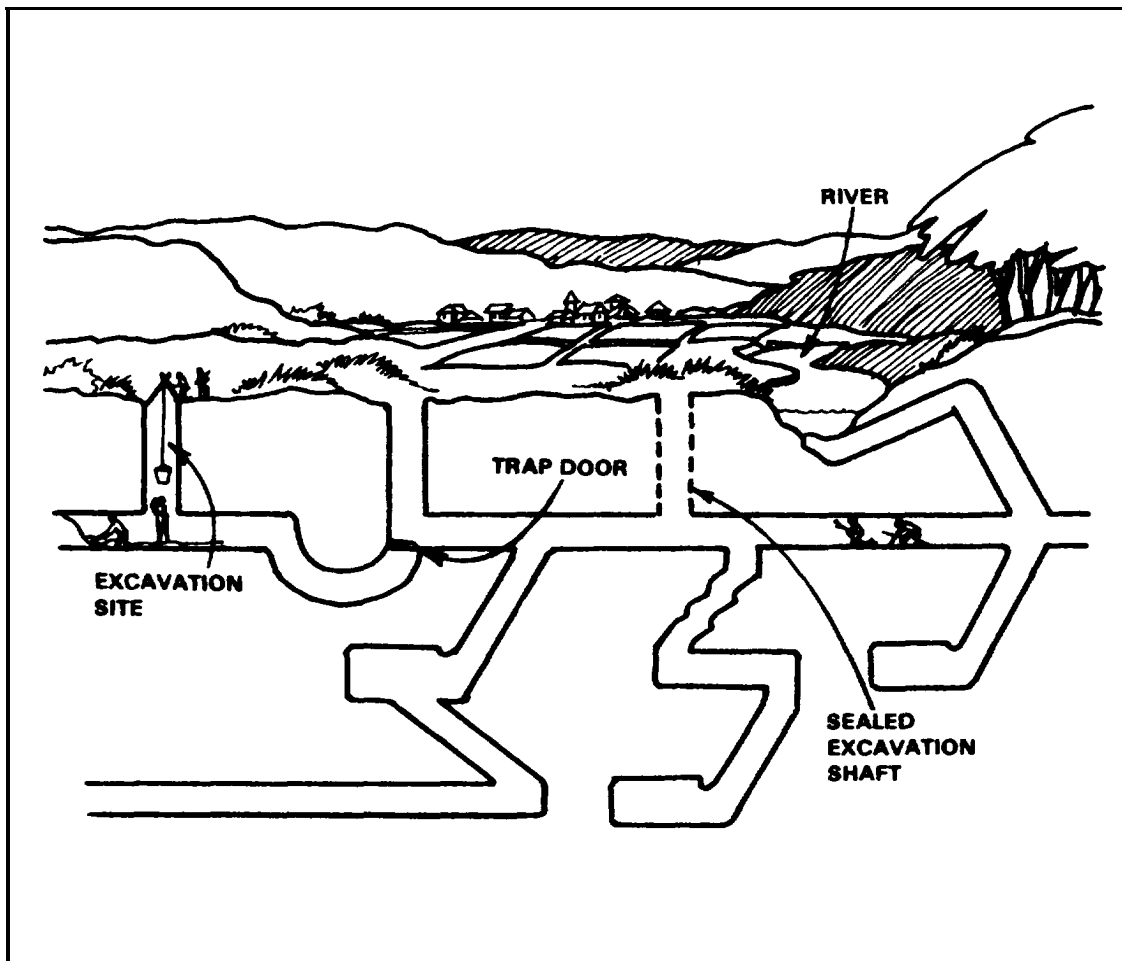


Figure A-5. Underground base area.

- d. **Base camps.** These are usually fortified positions. They may consist of a central bunker, 18 inches above ground, and tunnels 100 to 150 meters long, connecting outer bunkers to the central bunker. All bunkers have overhead cover and camouflaged firing apertures. They are positioned to provide mutual support and deny observation of the entire complex from any one location on the ground (Figure A-6).

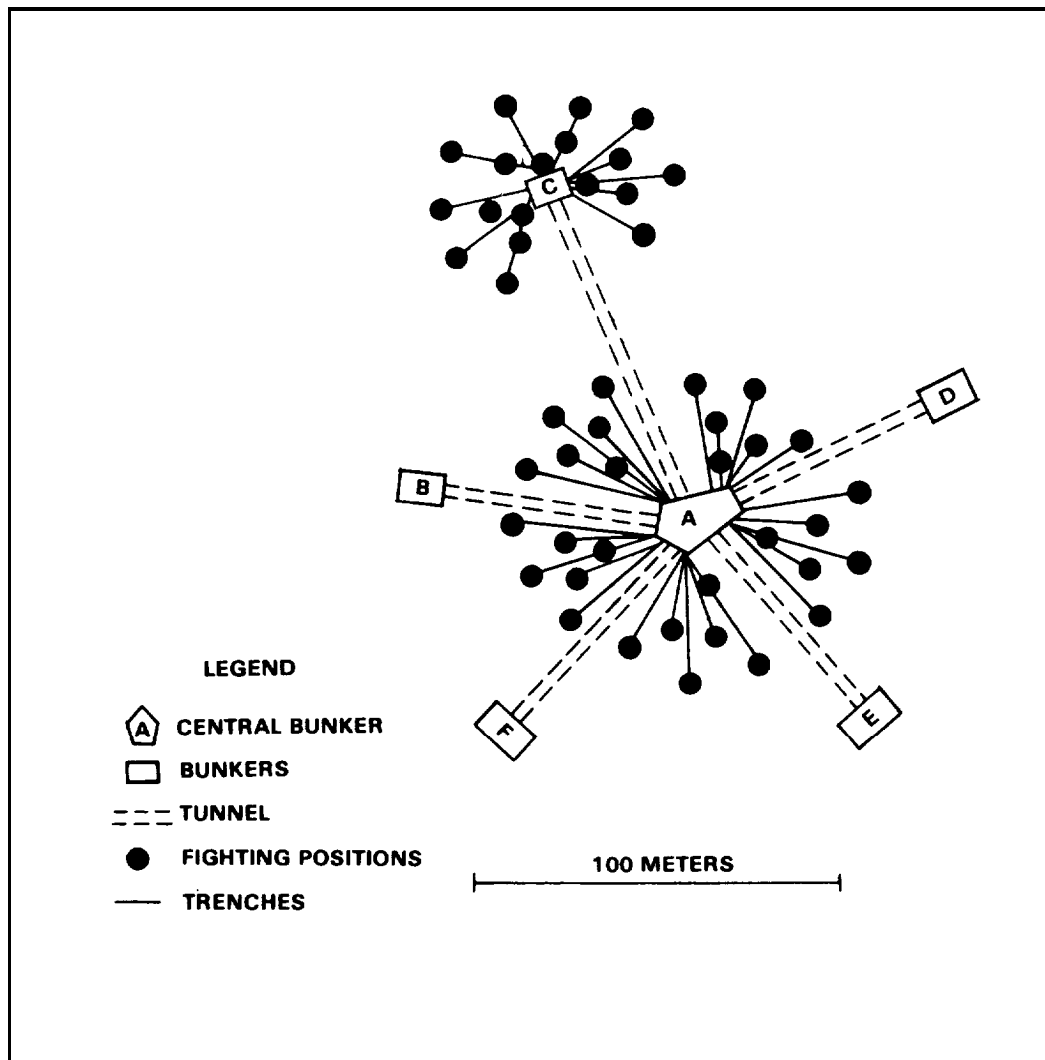


Figure A-6. Fortified base camps.

- e. **Bunkers.** Entrances are often in a house under a bed or table, and have an outside exit. In many cases, bunkers are constructed with walls up to 3 feet thick. The floor is below ground level. The roof is normally constructed of logs covered with dirt, mud, or rock from 3 to 6 feet thick. Sometimes, small logs (driven 3 to 6 feet into the ground and extending upward to roof level) serve to reinforce the walls. In some cases, the bunker maybe constructed entirely of concrete. Most often, bunkers have one overt entrance and one or more covert exits. The primary use of bunkers is to provide cover and concealment. Firing apertures are just above ground (Figure A-7).

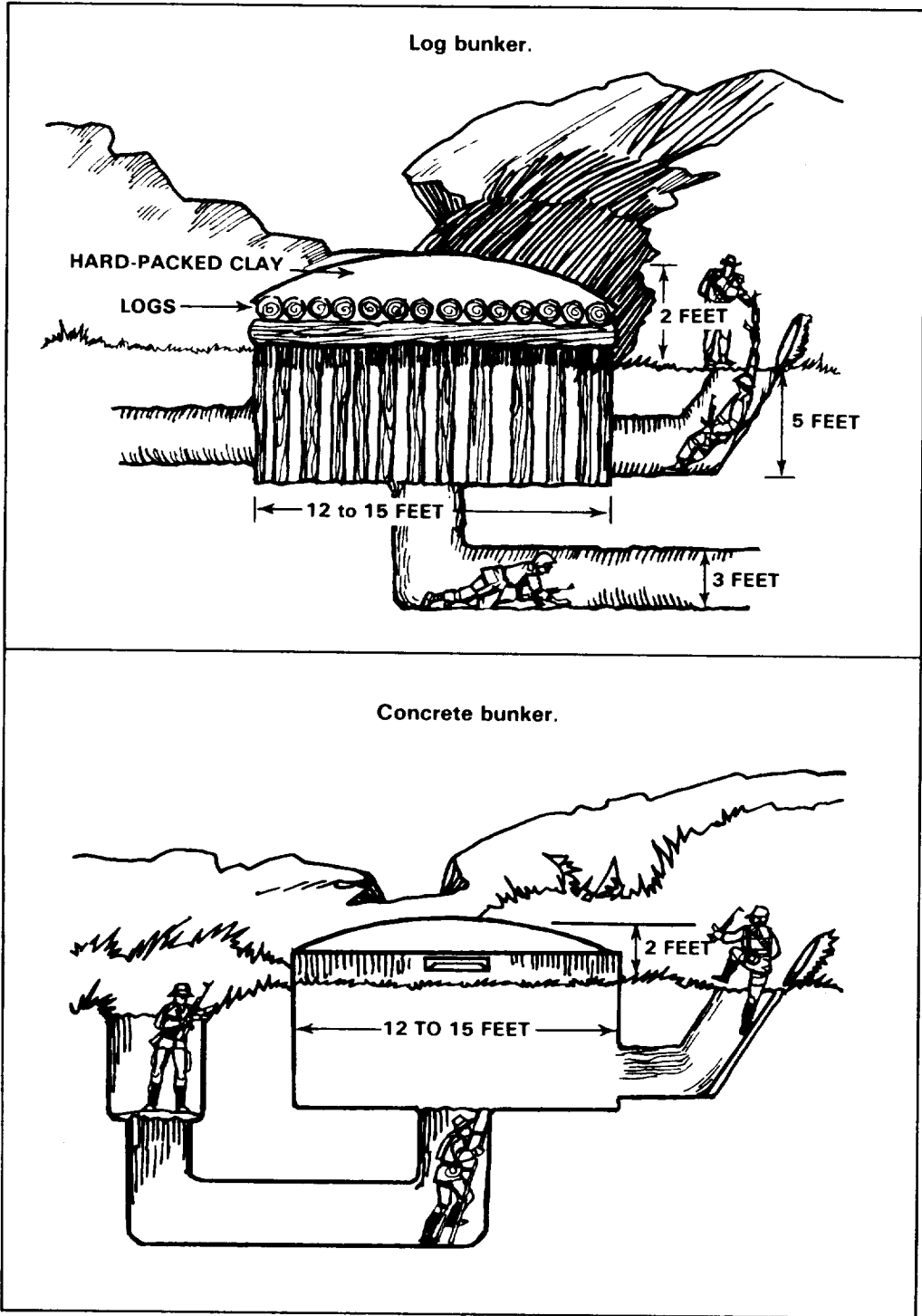


Figure A-7. Bunkers.

A-4. Construction methods.

- a. One feature common to almost all tunnel complexes is the method of excavation. The laborers are divided into a number of work units and assigned tunnel sections. The units are placed approximately 20 meters along the axis of the planned tunnel. Each unit then digs a well or shaft to the desired depth where a working area is enlarged. From this point, the units begin digging toward each other. As the tunnel grows, the workers are formed in a line to pass the soil out the excavation shaft. The soil is spread evenly over the ground or a road, or under the forest canopy to prevent detection. Once the main tunnel has been excavated, the shaft is filled and camouflaged.
- b. As the tunnel becomes more extensive, lower levels may be constructed to provide additional room and better protection. The degree of sophistication is dependent upon the purpose of the tunnel and frequency of its use. Most of the tunnels constructed by guerrilla forces are hiding places or escape routes; therefore, they may be extensive in length, but not complex in design.
- c. Whether their construction is complex or not, care is taken to provide security throughout the tunnels. False corridors are constructed, as are trapdoors and false walls. A U-shaped design is often formed to give the impression that the corridor is a deadend when actually a trapdoor leads to the way out.
- d. Most tunnel systems require substantial planning before actual construction. The systems are never haphazard. The tunnel is reinforced by reveting or other means. One common method used to reinforce tunnels is to coat walls with mud 3 to 6 inches thick and build fires throughout the system to bake the mud, turning it into a ceramic texture.
- e. Tunnel systems are usually not constructed in a straight line. They will follow a zigzag or serpentine course. This type of construction is used to protect the occupants from small arms fire in the event that tunnel systems are detected and breached.
- f. Tools for digging are simple. A bucket and pick or shovel are the main tools. Common methods of illumination include carbide lamps, flashlights, candles, and in larger complexes, small, fuel-driven generators for electric lighting.
- g. Secrecy of location is considered of utmost importance. All means are taken to camouflage and conceal tunnel entrances. Often, tunnels are hidden in tombs, walls, floors, or under water.
- h. Extensive use of booby traps and mines should be expected in and around tunnel complexes. Some common booby traps are mortar and artillery duds rigged for command detonation. These may be buried or suspended in trees in the immediate vicinity. Hand

grenades and homemade bombs are used to booby-trapdoors and hatches. Poisonous snakes may be placed in tunnels to inflict casualties.

A-5. Detection of tunnels.

- a. The first step in detecting or locating tunnels is to reduce a large geographical area of interest to a smaller area of probable locations. This can be accomplished by studying general indications of probable tunnel locations.
- b. Some indicators that tunnels are being employed by guerrilla forces are:
 - (1) Movement of guerrillas in a specific direction after being spotted by aircraft.
 - (2) Sniper fire occurring from areas where there are no obvious avenues of withdrawal.
 - (3) Vegetable gardens far from places of habitation.
 - (4) Operations where guerrillas inflict casualties at relatively long range and disappear without making close contact or being detected by friendly forces.
 - (5) The smell of burning wood or food cooking in an area lacking habitation.
- c. Conventional air photography produces results if the appearance of the surface and vegetation are changed from normal. This requires skilled personnel to interpret photos. In a jungle environment, air photography may be prohibited because dense vegetation, such as double or triple canopy jungle, obscures the ground.
- d. Once determined that a specific area may contain a tunnel system, there are several indicators that are helpful in detecting tunnels. Visual inspections often disclose the general area of a tunnel, but not its precise location. The key to finding a tunnel system is the application of common sense to the situation. A platoon or company should be assigned a small search area, never larger than a 1000-meter grid square for a company. These small areas are picked based on intelligence reports or past actions of the guerrilla force. The unit searches every square meter of the area. Some visual indicators usually found are:
 - (1) Worn places on trees that the guerrilla uses as handholds.
 - (2) A small trail, much like a game trail, through the brush into a clump of small trees.
 - (3) Cut trees, although not a sure sign.

- (4) Limbs tied near tree top to conceal the use of a tunnel from aircraft.
 - (5) Slight depression in or around a group of small trees.
 - (6) Air holes, a sure indicator.
 - (7) A lone individual, especially a female, in the area.
 - (8) Fresh cooked food with no one attending the site.
 - (9) Fresh human feces in an area.
- e. All these indicators are good. However, in different areas they may vary. The places to look for indicators are in the corners of hedgerows, in the corners of village huts, and in the secluded corners of trails and streams. The enemy often hides in these places so he can see while not being seen. Additionally, hiding in these places allows those who put the finishing touches on the camouflage to escape undetected. The guerrilla is aware of the danger of establishing a pattern. However, he must have a location that provides him with observation as well as concealment. So look for observation posts that allow him to move into or out of an area undetected.
- f. Occasionally, the specific location of a tunnel can be obtained by interrogating the local populace, or prisoners of war (PW) who may have occupied, or helped in digging, the system. Because of the method of constructing a tunnel system, that of using an excavation shaft to reach the level of the tunnel and then closing this shaft once the tunnel is completed, the individual may not be able to locate an entrance or exit unless he has seen or used the completed tunnel.

A-6. Tunnel search operations.

- a. Entering an area where a tunnel complex is located requires a methodical approach. Security to the flanks and rear is imperative.
- b. The size of the objective area of operations determines the strength of the unit assigned the search mission. Basically, the unit, company, or platoon is task-organized for tunnel operations.
- c. A company is divided into three elements: security, search, and reserve. (The headquarters element remains with the security element.)
 - (1) Security — one platoon plus headquarters element to cordon search area.
 - (2) Search — one platoon to search immediate area for tunnels. The search element is subdivided into search and security teams.

- (3) Reserve – one platoon to assist in cordon and reinforce as necessary.
- d. A platoon is divided into three elements:
 - (1) Security – one squad plus headquarters element to cordon area.
 - (2) Search – one squad to search area for tunnels. The search element is subdivided into search and security teams.
 - (3) Reserve – one squad to assist in cordon and reinforce as necessary.
- e. The techniques of deliberate search are centered around the rifle squad. Each squad is divided into a security and a search team.
- f. A slow, methodical search is conducted in the area of operations. Once assigned a search area, the squad systematically searches every square meter. The security element move toward the limits of the search area. Once a hole (tunnel) is discovered, the security element surrounds the area while the search team prepares to destroy or neutralize the hole (tunnel).

A-7. Special equipment.

The unit may require the following special items to perform tunnel operations:

- a. Mine detector — used to detect ammunition and weapon caches.
- b. Grenades – fragmentary, chemical (CS) gas, chemical (HC) smoke, white phosphorus (WP), and concussion types. Grenades should not be used after friendly forces have entered a tunnel.
- c. Demolitions — used to destroy tunnel system. Because of the complexity of charges needed to destroy some tunnel complexes, an engineer team should support the search unit. Also, the large amount of demolitions required for some operations may present unique logistical problems, especially in a jungle environment.
- d. Air generator — used to force smoke into tunnel complex.
- e. Flashlights — to search tunnels.
- f. Weapons — caliber .45 pistol should be used inside tunnels. The pistol has good stopping power and is effective at close range.
- g. Loudspeaker — used to call enemy from tunnels.

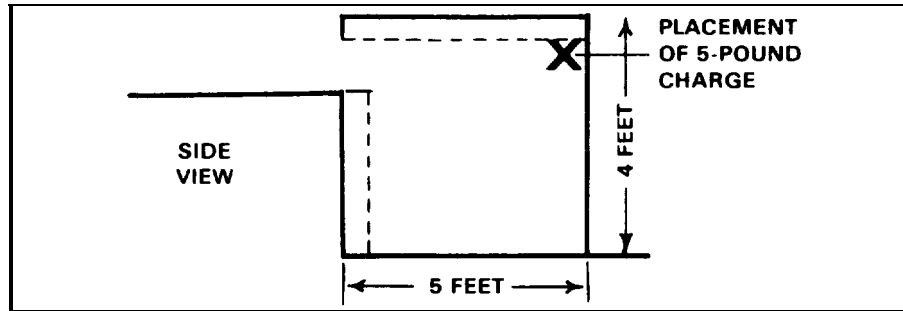
Section III. Destroying Underground Facilities

A-8. Four-step process.

- a. The destruction of a tunnel is a four-step process, beginning (1) with a soldier firing one or two magazines from a rifle into the tunnel entrance. This has a tendency to discourage the enemy from staying close to the entrance.
- b. After gaining the attention of the guerrillas, they are told to vacate the hole or tunnel or be killed. They may give up without a fight, saving not only the efforts of killing, but of excavating the hole or tunnel for weapons and documents.
- c. If this fails, breaching operations are used(2). A grenade is placed on the entrance cover to gain access. The entrance cover is removed in this manner to minimize the effects of any attached booby traps.
- d. Once the entrance cover is destroyed, the following measures are used (depending on the mission):
 - (1) Insert grenades (3), fragmentary or concussion, to kill the guerrillas. Ensure that the grenades are cooked-off prior to throwing them in the hole or tunnel.
 - (2) Insert a combination of HC smoke and CS chemical grenades. This serves two purposes: HC smoke may reveal the locations of other entrances or exits, and CS may force the guerrillas to evacuate the hole or tunnel. Captured guerrillas become a source of intelligence in finding other holes or tunnels.
- e. The last step (4) is the entry of soldiers to ensure that all weapons and documents are recovered and all enemy dead, wounded, and living are removed. The hole or tunnel is thoroughly searched for small compartments built to hide weapons and ammunition. If a tunnel complex proves to be extensive with bunkers and large rooms, it is cleared systematically. Bunkers are destroyed or occupied to prevent the enemy from reoccupying them through another tunnel. **Do not clear more bunkers than friendly forces can hold.**
- f. Deliberate search techniques emphasize where to look for the enemy (locations that provide him with observation, cover, concealment, and an escape route). When the soldier learns what to look for (a game trail, worn and cut trees, an air hole, human feces, a depression, fresh food, a lone individual), any of these indicators is likely to trigger a mental alert that the enemy is not far away. After the tunnel is searched, it is destroyed with explosives.

A-9. Neutralization-demolition procedures.

- a. **Tunnels.** Since each tunnel system differs in size and construction, a different quantity and placement of explosives is needed for each type.
 - (1) The use of block explosives to destroy a tunnel system has a disadvantage: all the explosive power is concentrated at one point. Thus, the destruction is localized, and often portions of the tunnel are unaffected. However, a large (10-to 12-pound) block of explosive tamped against the ceiling may cause an entire tunnel to collapse.
 - (2) Advantages of block-type explosives are the ease of emplacement, ease of procurement, and feasibility of aerial resupply. Also, block or satchel charges are effective in the destruction of bunkers, sunken living quarters, and underground rooms. Cratering charges are also effective for underground rooms. Short tunnels can be destroyed effectively by block explosives.
 - (3) The shaped charge in tunnel destruction is successful when used in specific circumstances. A shaped charge placed underground in the middle of a tunnel complex, and aimed downward, destroys an area of the tunnel complex around and above the charge. Also, a shaped charge placed in a deep complex and aimed upward results in extensive destruction.
 - (4) Another effective method of tunnel destruction utilizes bangalore torpedos placed throughout the tunnel length (regardless of depth). The constant length of explosives throughout the tunnel ensures complete destruction. The bangalore (5 feet long) is adaptable to the twists and turns in tunnels. Each tunnel where it can be pushed through). A disadvantage of bangalore torpedoes is the logistical problem arising from their size and weight. There may be a problem with resupply if large quantities are used to completely destroy a tunnel system.
- b. **Bunkers.** Underground living quarters, bunkers, and underground hideaways can be destroyed by block or satchel charges placed strategically inside the room. The following are examples of structures and the size and placement of charges.
 - (1) Bunkers dug into the ground and covered by dense brush (average size 4 by 8 by 4 feet) can be destroyed with 3 pounds of explosives placed next to a wall.
 - (2) This bunker (8 by 5 by 4 feet) can be destroyed by placing a 5-pound charge against the roof toward the side of the strongest beam (Figure A-8).



- (3) This 4-inch-thick concrete wall bunker (6 by 6 by 5 feet) can be destroyed by placing 8 to 9 pounds of explosives at the point where the tunnel enters the bunker, and will also destroy a portion of the tunnel (Figure A-9).

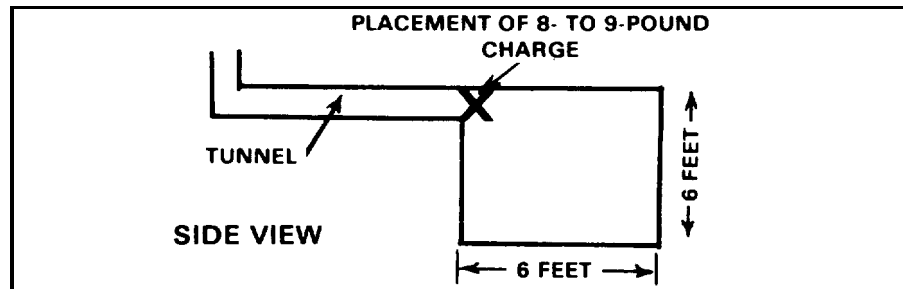


Figure A-9. Reinforced underground bunker.

- (4) This bunker depicts an underground hospital capable of holding 10 to 12 persons. It is about 10 feet below the surface. Usually 15 feet long by 8 feet wide by 6 feet high, it is constructed of cement and steel I-beams. The room is completely destroyed by interlacing three bangalore torpedoes in the I-beam rafters (Figure A-10).

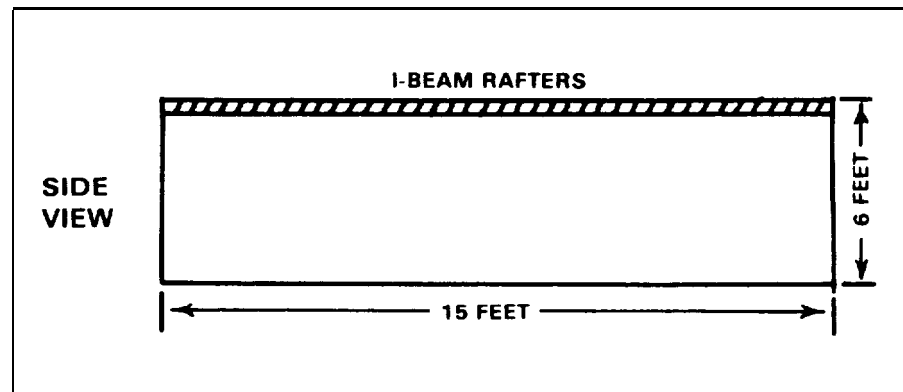


Figure A-10. Underground hospital.

- (5) This bunker design requires 10 to 12 pounds of explosives to destroy it (Figure A-11).

