TC 25-8
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Headquarters
Department Of The Army
Washington, DC, 16 November 1992

Training Range

1. Change TC 25-8, 25 Feburary 1992

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Training Circular 25-8

Headquarters
Department of the Army
Washington, DC, 25 February 1992

TRAINING RANGES

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*This publication supersedes FM 25-7, 16 September 1985.

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INTRODUCTION

The basic mission of the US Army is to fight and win in combat. Training soldiers, leaders, and units is the vital ingredient that ensures the readiness of the force to accomplish this mission. To be effective, training must provide soldiers with opportunities to practice their skills in the field. Conditions should be tough and realistic as well as physically and mentally challenging. Recently, the Army has created a family of training ranges designed to develop and improve soldier and team proficiency and competence in the use of sophisticated weaponry. Individual soldier proficiency and collective training ranges that realistically portray combat conditions help mold the team into an effective fighting unit.

Today's ranges are equipped with computer-controlled equipment. This equipment enables trainers to develop scenarios and to control targetry and battlefield simulation devices so that soldiers can practice wartime mission tasks in a stressful battlefield environment. Computerized systems also provide soldiers with feedback on their performance. This enables them to recognize their errors and correct them. At the same time, it recognizes positive actions. This reinforces correct procedures and fosters soldiers' confidence. After-action reviews conducted by unit leaders, using data recorded during training, provide information for critiquing unit performance. Accurate feedback helps soldiers learn procedures and techniques on the training range that will save lives and achieve success on the battlefield.

Although training ranges have been greatly upgraded and improved to support the modern force, much still remains to do. The Army is developing more lethal weapons capable of delivering greater firepower over greater distances. As these weapons are introduced during the next decade and into the twenty-first century, range planners and designers must be prepared. Training ranges are needed that let soldiers use their weapons fully either through live-fire, subcaliber devices, or laser and simulation technology. In an era of intense resource competition, each defense dollar spent to develop and upgrade training ranges must deliver the maximum return in effective training and, ultimately, combat readiness. The challenges are great. With greater firepower and maneuver capability, the requirement for range land increases. However, the availability of training land is decreasing as land development expands. The impact on endangered species, soil erosion, and tidal and nontidal wetlands and the contamination of impact areas become increasing concerns.

One successful approach is developing ranges capable of supporting training for several purposes, weapons, or combined arms. For example, training on an automated field-fire (AFF) range and an automated record-fire (ARF) range can be provided on a single modified record-fire (MRF) range. Using an MFR results in considerable savings in additional land over construction of two separate ranges. Another option is using laser devices or simulators on multipurpose ranges. Range planners should be innovative in seeking alternatives to fulfilling training requirements. At the same time, they must consider the need for ranges to support surge training requirements on short notice in the event of mobilization. In short, range development projects require careful, deliberate planning by a team of trainers, engineers, safety specialists, and resource managers. Command interest and support are essential to each step of the development process. Accurate, complete justification ensures that resource expenditures provide an optimum return.

PREFACE

This training circular provides information on new standard ranges developed since the last revision. DA Pam 385-XX provides instructions and criteria for developing surface danger zones (SDZs) for weapons fired on Army and Marine Corps ranges that were previously included in AR-385-series safety regulations. Together with AR 210-21, this circular provides guidance for developing and operating Army and Marine Corps ranges. It is designed to be a working guide for trainers, range and mobilization planners, engineers, coordinators, and range project review boards at all levels of the Active Army, Army National Guard, and Army Reserve. It is a primary guide for installation and MACOM range development plans and for developing the Army master range plan (AMRP).

The proponent for TC 25-8 is the US Army Training Support Center (ATSC). Submit comments and recommendations on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, US Army Training Support Center, ATTN: ATIC-RTSR, Fort Eustis, Virginia, 23604-5166.

Unless this publication states otherwise, masculine nouns and pronouns refer to both men and women.

TABLES

CHAPTER 1

MODERN RANGES

range—(NATO) An area reserved and normally equipped for practice in weapons delivery and/or shooting at targets. Also called "target range."

JCS Pub 1-02

INTRODUCTION

Early in the 1980s the Army began modernizing its combat force using technological advances to increase the lethality of its weapon systems. Weapons were developed that shoot projectiles over greater distances with larger bursting areas. Tanks and other fighting vehicles were improved to cover more ground at faster speeds and deliver more firepower to the battle area. Attack helicopters added another dimension to the modern battlefield as part of the combined arms effort.

While these advances were being introduced, the resources available to support training did not keep pace. There has been no concerted effort to modernize ranges in conjunction with the weapon systems they support since World War II. In fact, as weapon capabilities improved, an almost simultaneous degradation of resources and opportunities for training occurred. As real estate became more valuable, land development led to populated areas in proximity to training areas and firing ranges. This situation restricted maneuver and constrained live firing as noise abatement became a political issue in local communities. What resulted was an inventory of highly technical modern weaponry with a significant increase in potential combat power. At the same time, inadequate training opportunities prevented soldiers from developing the expertise to exploit the full built-in lethality of their weapons. Thus, the combat power of modern weapon systems was not fully utilized because soldiers were not trained to get the most from them.

THE RANGE MODERNIZATION PROGRAM

Based on the imbalance between weapons capabilities and operator proficiency, the Army took action to —

- Increase training resources.
- Improve training quality.
- Provide greater opportunities for realistic training.
- Develop standards to qualify soldiers in weapons operation.

Army doctrine requires combined arms teamwork and synchronization. Units must prepare in peace to conduct combined arms operations in war. Proficiency in combined arms results from regular practice in combat missions and tasks. It starts with the development of individual skills. Individual skills, in turn, serve as a basis for building unit proficiency at crew, squad, section, platoon, and company team levels through collective training. Finally, the combined arms team and its combat support integrate into task organizations for brigade-level training.

Modernization of Army ranges under the Army Range and Training Land Program (RTLP) was initiated to support this doctrine. Ranges were designed and constructed for soldiers to develop skills in individual weapons and weapon systems. They also support unit training to standards established in Army Training and Evaluation Program (ARTEP) mission training plans (MTPs). Multiuse ranges were introduced to reduce the costs of construction and operation. They permit several levels of training with a variety of weapons on the same range. Many of these ranges support collective training for small units and, in some cases, opportunities for combined arms training of brigade slices in force-on-force maneuver exercises.

State-of-the-art electronic and computer technology was employed to equip ranges with target remote control and target-holding mechanisms. Battle-effects simulation devices were also employed. These devices can be programmed to depict battlefield conditions realistically under a variety of offensive and defensive scenarios. Computers record hits and misses, enabling trainers to analyze performance and provide

corrective instruction. They also help trainers to analyze overall performance and conduct accurate after-action reviews. These and other training devices developed during the decade create stressful, challenging conditions to train soldiers as they will tight. Chapter 6 of this circular provides detailed information on Army standard ranges.

Standardization of ranges has been a goal of the RTLP since its inception. Standardization–

- Establishes a family of ranges, each designed to provide training of one or more well-defined requirements. This eliminates a proliferation of ranges for one-of-a-kind training.
- Bases range size and configuration on the types and strengths of the units that the range will support. The quantity of tiring positions and target emplacements can be tailored to user needs, thereby making the most effective use of the range.
- Provides precise training to meet stand--ardized weapons qualification and sustainment training requirements. This assesses combat readiness and prepares individuals and units for advanced training.
- Fosters development of standard procedures that lead to a common understanding of force employment.
- Provides accurate knowledge of throughput capabilities of ranges for mobilization planning. This lets mobilization planners determine the maximum number of ranges needed to meet training requirements.

Standard design manuals have been prepared for modernized and standardized ranges included in the RTLP. These manuals provide layouts of tiring positions, lanes, and target arrangements. They serve as guidelines for range planners, architects, and construction contractors. However, flexibility is retained because range development projects must be individually adapted to local throughput, terrain, surface danger zone placement, and environment. These conditions may dictate variances in the number of lanes and targets and in the general configuration of ranges from one location to another.

The RTLP has established state-of-the-art automated ranges throughout the Army, both in the continental United States and overseas. The program includes Active Army, Reserve Component, and Army National Guard installations. Ranges vary. Automated field-fire ranges provide entry-level familiarization with the M16A1/A2. Highly sophisticated multipurpose range complexes (MPRCs) support collective training at the platoon level. In some cases, they support company-level combined arms live-fire exercises (CALFEXs) where the MPRC can be augmented with adjacent ranges and maneuver areas and with additional targetry. Requirements for construction of over 500 ranges have been identified. Department of the Army, Deputy Chief of Staff for Operations and Plans (DCSOPS), centrally manages this program. DCSOPS coordinates the following activities of the US Army Training and Doctrine Command, Corps of Engineers, Materiel Command, and other MACOMs concerning training ranges:

- Prioritizing.
- Scheduling.
- Planning.
- Funding.
- Constructing.
- Achieving operational readiness.

FUTURE OUTLOOK

Weapons systems currently planned or under development, such as the M1A2 tank, the future infantry fighting vehicle (FIFV), and the light helicopter (LH), will require greater land resources to contain expanded SDZs. Costs of ordnance used for training and qualifying will increase. Increased operational tempos (OPTEMPOs) will also incur greater costs. Greater reliance on weapon system training simulators, embedded training devices, and other non-live-fire tactical engagement simulation systems can avoid or offset many of these costs. Planning for range development and range upgrades must anticipate the impact of new weapon systems and training devices.

Ranges are expected to evolve along two parallel tracks: live-fire and simulated tactical engagements using nonfiring systems such as the multiple integrated laser engagement system (MILES). Although the emphasis on multiple uses for ranges will continue, constraints on land and dollar resources will limit future construction of large range complexes. Long-range, direct-fire gunnery training will concentrate in areas capable of containing projectiles in existing SDZs or with land available to expand SDZs. Where expansion is not possible, other

answers must be found, such as shared use of ranges or use of nonfiring means.

Targetry control and scoring will improve further. Enhanced computer-controlled targetry will provide more latitude to program training scenarios. It will permit event- rather than time-driven target activations. Voice-recognition systems linked with range control computers will permit trainers and instructors to play a direct role in activating targets to keep pace with the evolving battle situation. Range instrumentation systems incorporating position location technology will identify units and track their relative location to targets. Improved hit sensors, thermal imagery, and round discriminators will provide more accurate scoring and feedback on shooter performance. Through-sight video systems will confirm gun-laying accuracy and provide additional performance feedback. Battlefield effects will be enhanced as targets are equipped with "shootback" simulators. Casualty assessment systems will be introduced to determine the effects of indirect fire. Holographic systems that display target imagery to armored vehicle commanders and gunners during tactical movement exercises will provide added realism. Observer-controllers equipped with electronic clipboards containing training and evaluation outlines (T&EOs) will give more effective training performance feedback and evaluation.

Modern weapon systems will continue to increase in lethality, maneuverability, speed, and versatility. Fire-control and target engagement subsystems have increased accuracy as well as day-night and all-weather capabilities. Training in the effective employment of these weapons must keep pace with new developments as they are introduced into the Army inventory. Emphasis must be on training dedicated personnel to operate and maintain sophisticated ranges and equipment. Resource restraints require imagination and innovation from trainers, range planners, and system developers to ensure that the current high level of combat readiness is sustained through relevant training facilities.

CHAPTER 2

TRAINING AREAS AND CENTERS

INTRODUCTION

Army training teaches, sustains, and maintains individual and collective skills. Ranges and training areas are grouped progressively by level of training—from individual soldier qualification skills, through integrated live-fire and maneuver unit training to large-scale force-on-force exercises using training devices.

Three types of training areas lead to progressively higher levels of proficiency local training areas (LTAs), major training areas (MTAs), and combat training centers (CTCs). Home-station training is conducted on facilities under an installation's direct purview, usually limited by contiguous boundaries. LTA and MTA training conducted on the same piece of real estate is considered home-station training. Home-station training areas and ranges at Army schools use a combination of ranges and training devices or simulators to develop soldier and crew proficiency and to exercise small-unit mission-essential task list (METL) tasks.

In addition, overseas locations frequently arrange for maneuver rights areas (MRAs) with local jurisdictions and landowners. This provides opportunities for periodic maneuver training on land not directly controlled by the Army.

Local and major training areas support operational unit collective training through a combination of standardized ranges that have built-in versatility to accommodate a variety of weapons and weapon systems. Stationary and moving targets, remotely controlled and supplemented with battlefield weapons effects simulators, provide opportunities to train to fight under challenging conditions using target arrays that accurately portray threat forces. Combat training centers offer tough, stressful, full-scale exercises for maneuver battalions and command and control headquarters. These exercises focus on missions and tasks that enable the unit to improve performance, capitalize on its strengths, and exploit enemy vulnerabilities in follow-on training.

LOCAL TRAINING AREAS

Active Component (AC), CONUS

Typically, home-station training for individual weapons proficiency and unit collective training to battalion ARTEP level occurs in the LTA. LTA facilities allow familiarization, qualification, and sustainment training with minimum impact on OPTEMPO resources for travel to and from other types of training areas. Training facilities are focused on individual through platoon weapons proficiency and battalion ARTEP maneuver requirements. LTAs provide a means to apply lessons learned from CTC training experiences to sustain combat readiness up to platoon live-fire and company maneuver. Scaled ranges, tactical engagement simulation systems such as MILES, and other weapon system training simulators reduce the need for extensive land areas to train and to contain weapon system SDZs.

Overseas and Reserve Component (RC)

Training land and range availability at overseas installations and communities usually precludes LTA training as described for the CONUS AC above. RC centers, armories, and weekend training sites (WETSs) typically face the same constraints. Nonetheless, these installations, communities, centers, armories, and WETSs are LTAs. Training proceeds to the extent available resources will support it. (This training typically includes individual and limited collective weapons proficiency and small-unit maneuver training.)

MAJOR TRAINING AREAS

An MTA usually has enough range and training land resources to support—

- Collective live-tire proficiency.
- Combined arms live-fire exercises.
- Annual battalion ARTEP evaluations.

MTAs are usually geographically separate from LTAs. They support units from more than one LTA; for example:

- CONUS – Yakima Firing Center, Washington; Hunter-Liggett, California.

- OCONUS – Grafenwoehr, Wildflecken, and Hohenfels Training Areas, Germany; Pohakaloa Training Area, Hawaii.

Units conducting training at MTAs concentrate on large-unit collective fire (platoon through battalion) and maneuver (battalion or brigade) training according to doctrinal strategies and standards. MTA training builds on the training proficiency achieved at LTAs. An MTA provides training to sustain lessons learned from CTC experiences that LTAs cannot tactically or doctrinally accommodate. At some locations physical size of contiguous boundaries supports individual weapons proficiency and both small- and large-unit collective training simultaneously for tenant activities (for example, Ft Hood, Texas).

COMBAT TRAINING CENTERS

The Army has designated four CTCs as premier training centers for large-unit fire and maneuver training. Computer-controlled instrumentation systems are an integral part of the CTCs. These systems support training feedback to units. Data gathered during maneuver exercises provides a source for unit sustainment of training lessons learned. The data is used to improve doctrine, training, organization, materiel, and leadership. The four CTCs are —

- National Training Center (NTC), Fort Irwin, California.
- Combat Maneuver Training Center (CMTC), Grafenwoehr (live fire) and Hohenfels (maneuver) Training Areas, Germany.
- Joint Readiness Training Center (JRTC) (provisional), Fort Chaffee, Arkansas.
- Battle Command Training Program (BCTP), Ft Leavenworth, Kansas.

The Battle Command Training Program consists of a series of simulation exercises that support training for division through echelons above corps battle staffs in employing and synchronizing maneuver units and combat service support units. The BCTP can be electronically linked with units training at other tactical CTCs.

Tactical CTCs focus on brigade task force training using a combination of live-fire ranges and maneuver training land. The Army's training goal is for every AC and round-out RC battalion to experience the rigorous and realistic training environment offered at the tactical CTCs during a commander's tour. Organic to tactical CTCs are –

- A dedicated opposing force unit.
- Assigned observer-controllers.
- State-of-the-art instrumentation not available at MTA and LTA sites.

CTCs need enough land to doctrinally accommodate fire and maneuver training using multiple scenarios over varied terrain. This allows for potential rehabilitation of the land and precludes overfamiliarization with the terrain, which detracts from training realism.

TRAINING AREA FUNCTIONAL USES

Local Training Areas

The force modernization program of the 1980s has dramatically affected the use of ranges to support both live-fire and device-based training. A significant increase in the demand for time to spend on collective training at major training areas has occurred. As a result, greater reliance must be placed on the use of local training areas to conduct individual training and the initial stages of collective training. LTAs include cantonment areas at installations as well as RC centers and armories. The close proximity of LTAs to troop billeting areas allows easy access to ranges, thereby decreasing or eliminating travel time and expenses. Range baffling systems (see Appendix E) should be considered for small-arms ranges where space is not available for impact areas. While elaborate facilities are not required, commanders may consider establishing a simulation center. The center could consist of–

- 1:30 or 1:60 (1:5 or 1:10) scaled ranges for crew gunnery practice.
- A conduct-of-fire trainer for fire control exercises.
- A battle simulation room to maintain staff proficiency.

Tactical engagements can be simulated using MILES to overcome the space limitations on live firing. Training at LTAs is important to achieve and maintain soldier and crew proficiency and to prepare for more advanced collective training at both MTAs and CTCs.

Major Training Areas

An MTA provides capabilities to train Active Army and RC units for large-scale collective unit training using live-fire or MILES during day and night exercises. The primary focus of an MTA is to provide a regional location where units from LTAs can build on their home-station training. Ranges and training land available at MTAs provide training that cannot normally be achieved at an LTA.

MTA ranges allow firing of supporting weapons including close-air support. The ranges also allow integration of combat support and service support functions in a battlefield environment. Tactical engagement simulation should be incorporated at all levels. The collocation of an MPRC, a multipurpose training range (MPTR), and an infantry squad battle course (ISBC) immediately adjacent to each other is desirable for an MTA. This accommodates CALFEX and other forms of combined arms training using a wide variety of weapon systems and units of the Active and Reserve Components. Collocating these facilities affords the land area and target arrays required to train company through battalion engagements. Although primarily designed for M1A1 Abrams tank and M1/M2 Bradley Fighting Vehicle training, all armor and fighting vehicle weapon systems can be trained on the MPRC-heavy (MPRC-H). Air defense, field artillery, and attack helicopters can be included in combined arms scenarios. The MPRC-light (MPRC-L) predominantly supports up to company-size light infantry, airborne, and air assault forces as well as platoon-size heavy forces.

MTA maneuver areas provide enough land area to train multiple battalion or brigade ARTEPs to doctrinal strategies and standards. MTA maneuver areas also allow for limited force-on-force capability. Lessons learned from unit battalion CTC experience can be exercised at an MTA and are highly recommended before a CTC rotation.

Combat Training Centers

Combat training centers provide an advanced collective training experience for combat, combat support (CS), and combat service support (CSS) units of the AC and RC. AC and RC maneuver battalions and their CS/CSS slice are programmed to receive CTC training at least once during a commander's tour of duty. Computer-controlled instrumentation systems form an integral part of CTCs to support training feedback to units. In contrast to MTAs, CTCs are provided with a dedicated opposing force (OPFOR) specifically trained in threat tactics, observer-controllers (OCs), and instrumentation. During force-on-force engagements, a sophisticated instrumentation system is employed to collect, report, and store real-time location and engagement event data from MILES-equipped participants. This information is used to prepare after-action reviews (AARs) and postexercise take-home packages (THPs) using automated audio, video, and computer-generated media. An AAR provides an objective evaluation of a unit's performance. A THP lets the unit replay a training exercise at an LTA or MTA, focusing on areas that need improvement to attain force readiness. Arrays of automated, radio-controlled targets are distributed over a 5 km X 10 km area for the two live-fire ranges. On the offensive live-fire range, the battalion task force employs maneuver and live-fire weapon systems to attack a defending force represented by an appropriate target array. On the defensive range, the battalion task force engages a target array programmed to represent an advancing motorized rifle regiment.

National Training Center. The NTC, Fort Irwin, California, established in 1982, has become the model for the Army CTC program. CONUS-based heavy-maneuver battalions experience a grueling force-on-force engagement against an OPFOR. The OPFOR is organized and trained to replicate a notional threat motorized rifle regiment. During rotations to the NTC, battalion task forces also train on offensive and defensive live-fire ranges. They use all organic and supporting direct- and indirect-fire weapon systems, including artillery and US Air Force close-air support.

Joint Readiness Training Center. Training of contingency forces (light infantry, ranger, airborne, air assault, and special operations) in joint operations is provided at the JRTC. A prototype of the JRTC presently operates at Fort Chaffee, Arkansas. Scenarios include forced and nonforced entry and special operations missions. These scenarios are conducted in conjunction with elements of the US Air Force Tactical Air Command (TAC) and the Military Airlift Command (MAC). The JRTC supports tactical engagements against an OPFOR using MILES in day and night exercises. Capabilities planned for the JRTC include an entire range of exercises designed to develop unit proficiency and readiness for low- and mid-intensity conflicts

worldwide. Planned exercises include military operations on urban terrain (MOUT), small-boat operations, river-crossing operations, and offensive air support. Current instrumentation will be replaced with an improved system to support a two-battalion task force brigade with its normal CS/CSS slice.

Combat Maneuver Training Center. USAREUR combat forces conduct combined arms, force-on-force training at the CMTC. Due to training land constraints, CMTC maneuver and live-fire training is conducted at two separate locations. Maneuver training takes place at Hohenfels Training Area (HTA), Federal Republic of Germany (FRG). CMTC training at the HTA emphasizes use of tactical engagement simulations with instrumented MILES. Close-combat (heavy) battalions and divisional and regimental cavalry squadrons perform five-day training rotations at the CMTC annually. A permanent OPFOR is equipped to portray major elements of a motorized rifle regiment and trained in threat tactics and doctrine. The OPFOR provides opportunities for realistic maneuver exercises with offensive and defensive scenarios. An instrumentation system supports exercise control and permits real-time position location and engagement event data collection. This data is used to conduct AARs and prepare THPs. Live-fire training takes place at Grafenwoehr Training Area (GTA), FRG. CMTC training at the GTA provides MPRC-H, MPTR, ISBC, and MOUT training ranges. Exercise data from both the HTA and the GTA provides source material for unit sustainment training at LTAs and MTAs. It also provides lessons learned in developing and applying doctrine and tactical force employment methods.

CHAPTER 3

RANGE REQUIREMENTS

INTRODUCTION

Training ranges are a major element in keeping the Army ready to accomplish its global mission. They also represent a considerable investment in time, land, money, and other resources. Therefore, decisions to initiate range development projects must be based on clearly defined requirements for individual soldier, collective, or combined arms training. Once a range training need is established, the next question is whether the need can be satisfied only by creating a new range. Other alternatives may exist. For example –

- The required range may be available at another installation.
- An existing specialized range might be converted to support multiple training requirements.
- A simulation, subcaliber training device, or reduced-scale range representing a full-size combat course might be used.

This chapter provides guidance on assessing needs for range development. AR 210-21 establishes the requirement for this assessment and lists many of the factors that require serious consideration. Throughput is a paramount factor in deciding whether to undertake a major expenditure for range construction or upgrading. Throughput is defined as the number of personnel, crews, or units requiring a particular type of training, or as the total number of soldiers, crews, or units a given range is capable of supporting during a specific period. These numbers are used to weigh alternatives and determine how many firing points, lanes, or ranges are needed to satisfy a training requirement. Throughput calculations should include both peacetime and projected mobilization requirements. This chapter presents formulae for calculating throughput and examples for applying the formulae to different weapon systems under varying circumstances. It also provides a matrix of notional range requirements applicable to division installations and TRADOC school installations.

Tables designed to help unit trainers select appropriate ranges for scheduled training are provided in Appendix A.

DETERMINING TRAINING REQUIREMENTS

FM 25-100 is a primary reference for determining peacetime training requirements. As described in the field manual, battle focus enables unit leaders to develop a list of mission-essential tasks performed in combat. The METL derives from the unit's war plans and external directives. It links the unit's collective mission-essential tasks with the individual tasks that support them. It is also a checklist for identifying requirements for collective training of these tasks.

Applicable Army Training and Evaluation Program mission training plans identify conditions and standards for collective training tasks. MTPs show the relationship between wartime missions, collective tasks, battle drills, and individual tasks. They give examples and guidance for developing situational training exercises (STXs) based on mission requirements. MTPs provide training criteria for critical wartime mission tasks. For additional sources of collective and individual training objectives, see –

- DA Pam 350-38.
- Soldier's manuals.
- Applicable weapon systems gunnery manuals.
- Mobilization plans.
- Force modernization plans.
- General defense plans.
- Army regulations.

MTPs list critical wartime missions of units from platoon through battalion level. ARTEP 7-8-MTP, for example, defines critical wartime missions for infantry rifle platoons as —

- Movement to contact.
- Attack.
- Raid.
- Ambush.
- Defend.

- Retrograde.
- Reconnaissance and security.

The MTP identifies individual and collective tasks for each mission that the unit must execute to standards described in the training and evaluation outlines.

Unit leaders use matrices provided in the MTPs to determine training requirements. They can identify collective tasks that support the unit's wartime mission at platoon level and individual tasks that support the collective tasks.

Table 3-1 shows critical platoon wartime missions and supporting collective tasks extracted from ARTEP 7-8-MTP. An "X" in a column indicates a collective task that supports the mission listed at the top of the column, for which a T&EO is provided. This listing does not show all collective tasks included in the MTP.

Table 3-2 links the collective tasks to individual tasks. An "X" in a column indicates the individual tasks normally required to accomplish the collective task.

Table 3-1. Missions and collective tasks

COLLECTIVE TASK	MISSIONS						
	Movement to Contact	Attack	Raid	Ambush	Reconnaissance and Security	Defend	Retrograde
ASSAULT	X	X	X			X	X
PERFORM HASTY AMBUSH	X	X	X	X		X	X
DEFEND	X					X	X
CLEAR BUILDING	X	X	X				
SCREEN					X		

Table 3-2. Collective and individual tasks

INDIVIDUAL TASK	COLLECTIVE TASKS				
	Assault	Perform Hasty Assault	Defend	Clear Building	Screen
ENGAGE TARGETS W/M16A1/M16A2	X	X	X	X	X
ENGAGE TARGETS W/M249/M60/A2	X	X	X	X	
ENGAGE TARGETS W/CAL .45/M9	X	X	X	X	
ENGAGE TARGETS W/M203	X	X	X	X	

To train individual weapon skills, ranges are required to conduct zero, sustainment, and qualification firing. The ranges shown in Table 3-3 will support weapon skills training for the individual tasks identified in Table 3-2.

After achieving required proficiency in individual tasks, soldiers are ready for collective task training. STXs can be used to train a single collective task, or a group of related battle drills and collective tasks, to standards in the appropriate T&EOs. STXs can be performed in either a live-fire or a non-live-fire mode using MILES.

Based on the wartime attack mission from ARTEP 7-8-MTP, an STX can be created by incorporating T&EOs for the following collective tasks:

- Prepare for combat.
- Perform passage of lines.
- Move tactically.
- Reconnoiter area.
- Assault.
- Consolidate/reorganize.

An infantry platoon can accomplish these tasks using any of the following collective training ranges:

- Infantry platoon battle course (IPBC).
- Multipurpose training range (MPTR).
- Multipurpose range complex (MPRC).

Figure 3-1 illustrates a notional attack STX.

Table 3-3. Individual tasks and training ranges

TRAINING RANGE	INDIVIDUAL TASKS			
	Engage Target w/M16A1/M16A2	Engage Target w/M249/M60/M2	Engage Target w/Cal .45/M9	Engage Target w/M203
10M ZERO		X		
25M ZERO	X			
AFF/ARF/MRF*	X			
MG TRANSITION**		X		
MPMG***		X		
GRENADE LAUNCHER				X
CPQC****			X	

*Automated field fire/automated record fire/modified record fire

**Machine gun

***Multipurpose machine gun

****Combat Pistol Qualification Course

ASSESSING RANGE NEEDS

DA Pam 350-38 provides a common set of weapon system qualification standards and suggested training strategies to attain and sustain them. It establishes training readiness condition (TRC) levels with prescribed standards and training resources. For each weapon system the pamphlet outlines the number of rounds allocated per training event and the frequency of events for each TRC level. For example, soldiers in TRC Level A, assigned the M16A1/A2 rifle, must qualify twice annually, whereas TRC Level B soldiers qualify once a year. TRC Level A tank units have ammunition allocated for two gunnery qualification cycles. A third cycle is recommended using ammunition conserved in previous cycles.

To assess range needs, match the METL, individual and collective task training objectives, and associated training range requirements against the suitable TRC

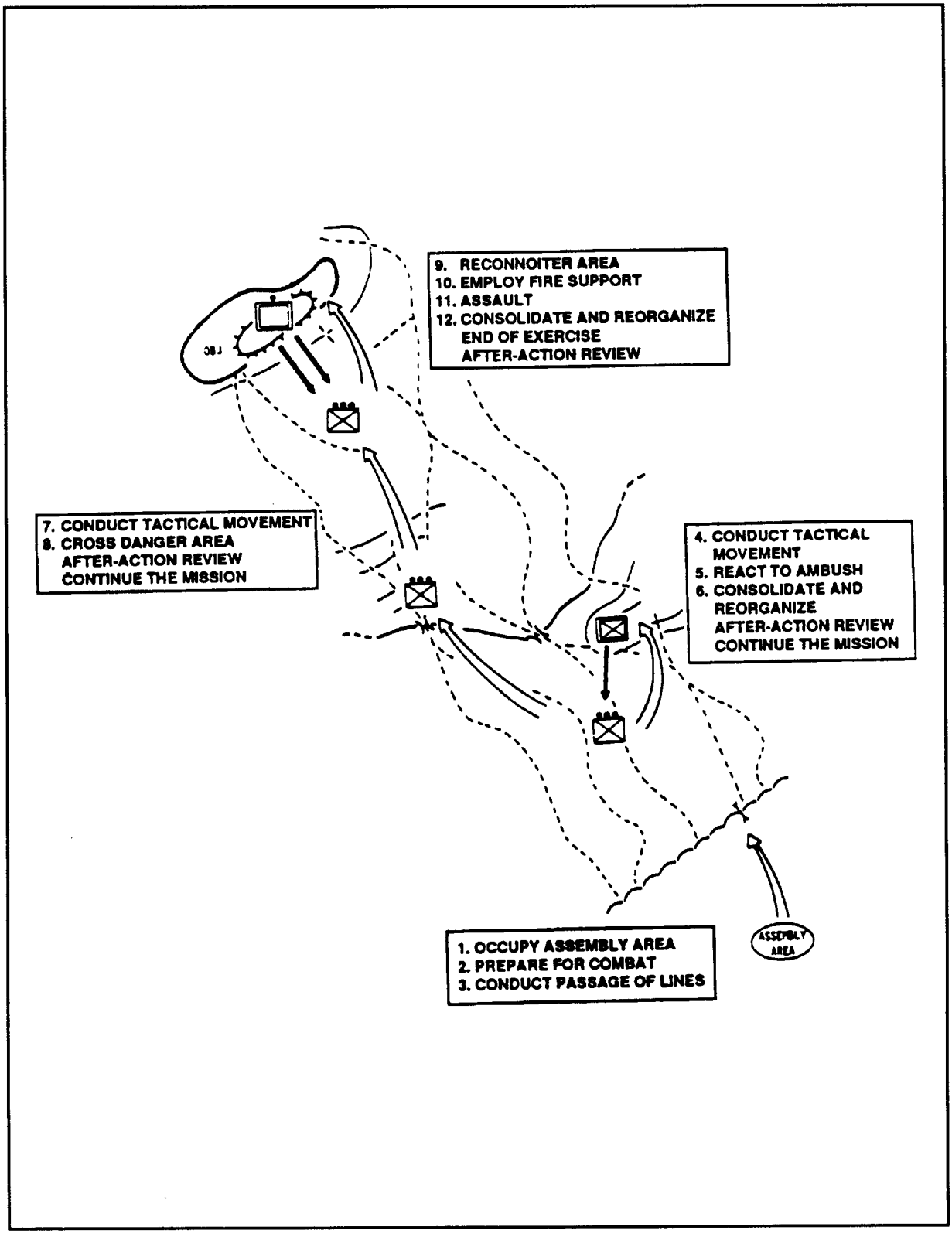


Figure 3-1. STX attack—infantry platoon

level for each weapon system. For individual training (zeroing, qualification, and sustainment) TRC Level A soldiers with the M16A1/A2 are supplied enough rounds to fire twice annually. For collective training (ARTEP live-fire exercise, CALFEX, FTX) TRC Level A soldiers with the M16A1/A2 are supplied both ball and blank rounds. Frequency requirements for each event are given in DA Pam 350-38.

Range selection by using units is affected by–

- The number of troops and weapon systems at the installation.
- Individual range throughput capacity.
- External training support requirement; for example, those of the Reserve Component.
- Availability of standardized remoted target system (RETS) ranges able to support all of the gunnery tables and tasks outlined in weapon system field manuals.
- Types of non-RETS ranges and targetry available.
- Overlapping SDZs, which may reduce or restrict range availability and use.
- Environmental restrictions.
- Availability of training devices, simulations, and subcaliber munitions for use in lieu of direct-fire gunnery.
- Installation scheduling priorities.

Training should involve standardized state-of-the-art ranges and targetry to enhance training realism and reduce training time.

Factors to consider when assessing range needs include–

- Unit METLs.
- Weapon system quantities.
- Gunnery qualification frequencies.
- TRC standards.
- Availability and throughput capacity of existing ranges.

This assessment may result in a determination that a new range or an upgrade of an existing range is required.

RANGE AVAILABILITY

Determine range availability by subtracting the total number of days that the range is not available for training from 365 days. Subtract scheduled maintenance, holidays, weekends, and inclement weather days from 365 calendar days to determine range availability. Unscheduled maintenance further reduces range availability. Master training schedules for tenant AC and regional RC units may also have a significant impact and must be considered by range managers. For example, when tenant units are involved in large-scale training exercises (REFORGER, Team Spirit, CTC rotation etc) away from home station, range managers should consider the exercise period as nonavailable days. Table 3-4 indicates typical range availability for RETS ranges,

> **NOTE:** The Army baseline goal for annual training days, discounting legal 3-day holidays, weekends, and other training holidays, is 242 days.

SCHEDULING AND UTILIZATION

The Army's goal is to schedule existing ranges to be used 80 percent of the days available for training. Use of existing facilities is critical to the requirements identification and needs assessment phase discussed in Chapter 3, AR 210-21. The Army's utilization goal for ranges and training land is 90 percent of scheduled days.

When calculating range usage requirements for a specific unit, consider —

- The number of training elements (soldiers, crews, squads, etc) assigned to the unit.
- The number of lanes available on the range.
- The average time required for one training element to-complete a course of firing.

For example, experienced soldiers in an infantry company will have a high level of marksmanship proficiency. They will complete the course of firing with greater efficiency than basic trainees or soldiers in other types of units. The analysis described below estimates both day and night firing to require 30 minutes per soldier. This estimate is based on fewer rounds being fired at night (30 versus 40 for day firing) and the distances fired being shorter (25 and 50 meters versus 50 to 300 meters for day firing). However, in actual practice it may be found that night firing takes much longer, depending on the proficiency of the soldiers involved. These determinations must be made on an individual basis. There is no single set of numbers that apply to all installations under all conditions. However, it is possible to

Table 3-4. Range availability (days)

	MPRC-L	MPRC-H	MPTR	AFF	ARF
SCHEDULED MAINTENANCE	44	59	0	22	25
UNSCHEDULED MAINTENANCE	9	17	56	16	11
HOLIDAYS*	10	10	10	10	10
ADVERSE WEATHER	0	0	0	5	6
TOTAL NON-AVAILABLE DAYS	63	86	66	53	52
AVAILABLE DAYS	302	279	299	312	313
AVERAGE HOURS USED PER DAY	18	22	20	9	9

*TRADOC school installations may include additional days.

develop statistical averages to use for individual unit or installation populations.

Calculate the time required to cycle one 200-soldier company through an MRF range as follows:

NUMBER OF HOURS: H

NUMBER OF LANES: 16

NUMBER OF SOLDIERS IN COMPANY: 200

TIME REQUIRED FOR ONE SOLDIER TO COMPLETE FIRING: .5 HOUR

NUMBER OF SOLDIERS PER HOUR 16/.5 = 32

H = 200/32 = 6.25 HOURS PER COMPANY

Calculate the total time required for zeroing, practice and sustainment tiring, and qualification firing by one company during the course of a year as follows:

Zeroing

NUMBER OF HOURS: H

NUMBER OF LANES: 16

NUMBER OF SOLDIERS IN COMPANY: 200

TIME REQUIRED FOR ONE SOLDIER TO COMPLETE FIRING: .5 HOUR

FREQUENCY OF ZEROING PER YEAR (DAY ONLY): 2

H = 2(200/32) = 12.5 HOURS PER COMPANY PER YEAR

Practice/sustainment

NUMBER OF HOURS: H

NUMBER OF LANES: 16

TIME REQUIRED FOR ONE SOLDIER TO COMPLETE FIRING: 3 HOUR

NUMBER OF SOLDIERS IN COMPANY: 200

FREQUENCY OF PRACTICE/SUSTAIMENT FIRING PER YEAR: 2 DAY AND 2 NIGHT

H = 2(200/32) = 12.5 DAY AND 12.5 NIGHT HOURS PER COMPANY PER YEAR

Qualification:

SAME FACTORS AS FOR PRACTICE/SUSTAINMENT

H = 12.5 DAY AND 12.5 NIGHT HOURS PER YEAR

Total time required for a single company to conduct M16A1/A2 tiring per year:

ZEROING	12.5 DAY HOURS	
PRACTICE/ SUSTAINMENT	12.5 DAY HOURS	12.5 NIGHT HOURS
QUALIFICATION	12.5 DAY HOURS	12.5 NIGHT HOURS
TOTAL	37.5 DAY HOURS	25.0 NIGHT HOURS

Given an average 8-hour training day, the annual range usage requirement for M16A1/A2 training for one company is 4.7 days and 3.1 nights.

The process shown above can be used to calculate usage requirements for other weapon systems, training requirements, and training elements.

QUANTIFYING RANGE REQUIREMENTS

DA Pam 350-38 identifies weapon system training requirements, frequency of range events, and ammunition resources allocated to training. Using the formulae in the throughput calculations paragraph below, installation range personnel can quantify the number of days required to conduct training. They can use this information to determine the number of ranges needed to support training requirements.

- For example, a TRC Level A mechanized infantry company must qualify its soldiers semiannually with the M16A1/A2 rifle. To meet this requirement, the unit conducts zeroing, practice, and day and night record firing. Two types of ranges will support this firing
- 25m zero range.
- 16-lane RETS modified record-fire range.

A mechanized infantry division includes five mechanized infantry battalions with six companies each. Based on single-company annual usage requirements of 4.7 days and 3.1 nights, a single battalion's annual usage requirements are computed as follows:

DAY: 4.7 DAYS X 6 COMPANIES = 28.2 DAYS

NIGHT 3.1 NIGHTS X 6 COMPANIES = 18.6 NIGHIS

Total divisional annual usage requirements are computed as follows:

DAY: 28.2 DAYS X 5 BATTALIONS = 141 DAYS

NIGHT: .6 NIGHTS X 5 BATTALIONS = 93 NIGHTS

An installation's entire M16A1/A2 range usage requirements are determined by totalling the firing requirements of–

Combat units (infantry, armor, field artillery, engineer, air defense, aviation, divisional cavalry squadron).

- Combat support and combat service support units.
- Garrison support personnel.
- Reserve Component units.
- ROTC detachments.
- Others requiring range support.

A comparison of the resulting figure with the range availability figure determines if there is enough range to support the usage requirement. If the usage requirement exceeds availability, a shortfall in availability exists that may indicate the need for an additional range.

In another example, a J-series tank company with 14 tank crews, TRC Level A, must qualify its crews semiannually on Gunnery Table VIII-A&B. Before firing for qualification, the unit practices on Table VII-A&B. Both the multipurpose range complex and the multipurpose training range will support this training requirement.

Based on tank gunnery time requirements shown in Table 3-5 later in this chapter, the time required to cycle 14 tank crews through an MPRC or MPTR is 17.3 hours for Table VII-A&B and 17.7 hours for Table VIII-A&B.

Obtain usage requirements for a single battalion consisting of four tank companies as follows:

TABLE VII-A&B: 17.3 HOURS X 4 COMPANIES = 69.2 HOURS X 2 ITERATIONS = 138.4 HOURS

TABLE VIII-A&B 17.7 HOURS X 4 COMPANIES = 70.8 HOURS X 2 ITERATIONS = 141.6 HOURS

Obtain total divisional usage requirements for five battalions

TABLE VII-A&B 138.4 HOURS X 5 BATTALIONS = 692 HOURS

TABLE VIII-A&B 141.6 HOURS X 5 BATTALIONS = 708 HOURS

The total usage requirement is 70 days for both tables, based on an average of 20 hours per day available for training on MPTRs and MPRCs.

Range control personnel can determine the remaining tank gunnery usage requirements (Tables IX, X, XI, and XII) and all Bradley gunnery requirements for both Active and Reserve Components that will be fired on the MPRC or MPTR. Once again, the projected number of available training days must be established and balanced against the number of required range usage days. If the required usage days exceed the number of range availability days, a shortfall exists.

THROUGHPUT CALCULATIONS

Throughput refers to the total number of soldiers or units (crews, sections, squads, platoons, etc) that are trained in a given period of time. The throughput capacity of a range is the number of soldiers or units that can process through the range in a given period of time. For example, a rifle range might have a throughput capacity of one company averaging 200 soldiers over a period of eight hours. This capacity would support at least one day-firing and one night-firing cycle per day. Assuming the range is available 297 days per year, the range would have an annual throughput capacity of 297 companies, or 59,400 soldiers, for day and night firing.

Calculation of throughput capacity is based on the type of training, the time required for a single individual or unit to complete a training event or series of events, and the period of time (day, week, month, year) which applies. Throughput calculations for some types of ranges may also include the number of soldiers or units that can train simultaneously.

For example, the daily throughput capacity of an MRF range with 16 lanes is developed as follows:

THROUGHPUT CAPACITY: TC

NUMBER OF LANES: 16

TIME REQUIRED FOR ONE SOLDIER TO COMPLETE FIRING: 30 MINUTES (.5 HOUR)

TIME AVAILABLE FOR TRAINING: 8 HOURS PER DAY

DAYS AVAILABLE FOR TRAINING: 300 (ESTIMATED)

NUMBER OF SOLDIERS PER HOUR: 16/.5 = 32

TC = 32 SOLDIERS X 8 HOURS = 256 SOLDIERS PER DAY X 300 DAYS = 76,800 SOLDIERS PER YEAR

Throughput requirements are based on the type of training required and the number of soldiers or units that require it. In computing annual throughput requirements, the frequency or number of iterations of training required is also included in the calculation.

For example, annual M16A1/A2 training for infantrymen consists of–

- Two iterations of daytime zeroing with the weapon.
- Two day and two night iterations of practice/sustainment firing.
- Two day and two night iterations of qualification firing.

The total throughput requirement for a mechanized infantry division is developed as follows:

THROUGHPUT REQUIREMENT: TR

NUMBER OF SOLDIERS IN COMPANY: 200

NUMBER OF COMPANIES 30

NUMBER OF ITERATIONS REQUIRED: 6 DAY
4 NIGHT

TR = 200 SOLDIERS X 6 ITERATIONS = 1200 SOLDIERS, DAY

200 SOLDIERS X 4 ITERATIONS = 800 SOLDIERS, NIGHT

TOTAL 2000 SOLDIERS X 30 COMPANIES = 60,000 SOLDIERS PER YEAR

Comparing TC to TR (76,800 versus 60,000) reveals an excess capacity of 16,800 soldiers per year.

ARMORED VEHICLE GUNNERY REQUIREMENTS

Tables 3-5 through 3-7 can be used to develop throughput requirements for tiring gunnery Tables V through XII (tank battalions) and Tables VI through XII (mechanized battalions). Calculate the time required for a unit to fire a gunnery table by using the following formula:

H = N(M/60), WHERE—

H is the number of hours required to complete the gunnery table.

N is the number of vehicle crews required to fire the table.

M is the number of minutes required for one crew to complete day and night firing events (divide by 60 to convert minutes to hours).

For example, the time required for a tank company consisting of 14 tank crews to complete Tank Table VIII-A&B (day and night) is —

N = 14 CREWS

M = 76 MINUTES (FROM TABLE 3-5)

H = 14(76/60) = 17.7 HOURS (17 HOURS AND 44 MINUTES)

Determine the number of days required for training by dividing H hours by the number of hours that the range is available for daily training. In the example above if the Table VIII range is available 16 hours per day, the number of days required for a company to complete firing would be —

H/16 = 17.7/16 = 1.1 DAYS (1 DAY, 1 HOUR 36 MINUTES)

This can be expressed in a complete formula as —

D = N(M/60)/A, WHERE —

D is the number of days required to complete the table.

A is the amount of time that the range is available on a daily basis.

Throughput capacity for an MPRC or MPTR, where only one training element can complete a gunnery table at a time, is developed as follows:

THROUGHPUT CAPACITY: TC

NUMBER OF LANES: 1

TIME REQUIRED FOR ONE TRAINING ELEMENT TO COMPLETE TABLE:
T (FROM TABLE 3-5)

TIME AVAILABLE FOR TRAINING: 20 HOURS PER DAY (AVERAGE)

DAYS AVAILABLE FOR TRAINING: 293 (AVERAGE)

NUMBER OF TRAINING ELEMENTS PER DAY N (CREWS, SECTIONS, OR PLATOONS)

TC = 1 X ((T/60) X 20) X 293

For example, the average gunnery table requires 85 minutes to complete; therefore:

TC = 1((85/60) X 20) X 293 = 8301 CREWS, SECTIONS, OR PLATOONS PER YEAR.

Develop the tank gunnery training throughput requirement for an armored division comprising 30 tank companies with 14 crews per company as follows:

For crews:

THROUGHPUT REQUIREMENT: TR

NUMBER OF CREWS: 420

NUMBER OF CREW TABLES: 4

NUMBER OF ITERATIONS: 2

TR = 420 CREWS X 4 TABLES X 2 ITERATIONS = 3360 CREWS PER YEAR

For sections:

NUMBER OF SECTIONS: 210

NUMBER OF SECTION TABLES: 2

NUMBER OF ITERATIONS: 2

TR = 210 SECTIONS X 2 TABLES X 2 ITERATIONS = 840 SECTIONS PER YEAR

For platoons:

NUMBER OF PLATOONS: 120

NUMBER OF PLATOON TABLES: 2

NUMBER OF ITERATIONS: 2

TR = 120 PLATOONS X 2 TABLES X 2 ITERATIONS = 480 PLATOONS PER YEAR

Total tank gunnery training:

TR = 3360 CREWS + 840 SECTIONS + 480 PLATOONS = 4680 TRAINING ELEMENTS PER YEAR.

Comparing TR to TC (8301 versus 4680) indicates an excess capacity of 3621 training elements per year. Much of this excess capacity is used to meet Bradley Fighting Vehicle gunnery training requirements of the division mechanized battalions. The throughput requirement for these battalions is developed in the same manner.

Table 3-5 displays the average amount of time required for individual crews, sections, or platoons to complete firing all engagements on Tank Tables V-A&B through XII-A&B, offensive and defensive, respectively. Time data includes the time allowed for each engagement, 5 minutes between engagements, and 10 minutes for the element to clear the range before the next element starts downrange.

Table 3-6 displays the average time required to complete Bradley Fighting Vehicle Tables V-A&B through VIII-A&B and squad firing exercises, using the same time between engagements used in Table 3-5. These times are not consistent worldwide. They should be adjusted for local conditions including the level of range automation and the distance traveled downrange between engagements.

Bradley Tables IX, XI, and XII involve gunnery tasks associated with mission operations. Day and night engagements are conducted in one or more operations, as determined by the unit commander. Time lines for day and night engagements of these operations follow:

MOVEMENT TO CONTACT:	3.8 HOURS
ATTACK:	3.7 HOURS
RAID:	3.4 HOURS
AMBUSH:	3.3 HOURS
RECONNAISSANCE AND SECURITY:	3.6 HOURS
DEFENSE	3.4 HOURS
RETROGRADE:	3.4HOURS
AVERAGE	3.5 HOURS

Table 3-7 displays the average time required for day and night firing on BFV Tables IX, XI, and XII.

Scout sections perform Tables IX-A&B and X-A&B. Timing for these tables depends on terrain, weather, and distance between engagements. The estimated time for completion of these tables is eight hours for Table IX-A&B and eight hours for Table X-A&B.

RANGE SELECTION

Refer to Appendix A for tables showing the types of ranges needed to conduct specific training events for selected weapon systems.

NOTIONAL RANGE REQUIREMENTS

Table 3-8 provides guidelines for determining the number of standardized and modernized ranges needed to support AC divisional and separate brigade posts. It also gives guidelines for RC high-density training centers for peacetime home-station individual and collective live-fire training. Specific requirements for individual posts will vary depending on the combination of ranges available and the alternative weapons training that can be used (refer to Table A-1, Appendix A). Table 3-8 is only a guide. It is not an authorization for construction of any range listed.

The last column addresses TRADOC school installations—

- Initial-entry training (IET).
- Advanced individual training (AIT).
- Noncommissioned officer courses.

Table 3-5. Tank gunnery tables—time requirements (in minutes)

Table	Crew	Section	Platoon
TABLE V-A&B	95		
TABLE VI-A&B	104		
TABLE VII-A&B	74		
TABLE VIII-A&B	76		
TABLE IX-A&B (OFF & DEF)		86	
TABLE X-A&B (OFF & DEF)		74	
TABLE XI-A&B (OFF & DEF)			100
TABLE XII-A&B (OFF & DEF)			75

Table 3-6. BFV team/squad gunnery tables (armor-piercing only) and exercises—time requirements (in minutes)

Table	Team/Squad
TABLE V-A&B	68
TABLE VI-A&B	69
TABLE VII-A&B	69
TABLE VIII-A&B	81
INFANTRY SQUAD COMBAT EXERCISE (DAY & NIGHT)	34
SQUAD FIRING PORT EXERCISE STATIONARY & MOVING (DAY & NIGHT)	32

- Basic and advanced officer courses.

Table 3-7. BFV section/platoon gunnery tables—time requirements (in hours)

Table	Section	Platoon
TABLE IX (DAY & NIGHT)	3.5	
TABLE XI (DAY & NIGHT)		3.5
TABLE XII (DAY & NIGHT)		3.5

Range requirements should be based on the specific school's programs of instruction; for example—

- M16A1 basic rifle marksmanship program for IET.
- Bradley gunnery training for infantry AIT.
- Tank gunnery training for basic and advanced armor courses.

Specific range requirements should be developed based on a school's combined student and cadre training requirements. In addition, throughput requirements should be closely linked to time and schedule requirements.

Table 3-8. Notional range requirements

RANGE No*	RANGE TYPE	FIRING UNIT SIZE	MAXIMUM POSITION POINTS OR LANES PER RANGE	ARMY RANGE OBJECTIVES	DIVISION**		
					ARMOR	MECH	IN
6-1	CPQC/MPFQC	CO	15	Required	1	1	1
6-2	Multipurpose Indoor Range	CO	Throughput-Dependent	Optional			
6-3	Basic 25-Meter (Zero)	CO	110	Required	2	2	2
6-4	Automated Field Fire	CO	32	See Note	***	***	***
6-5	Automated Record Fire	CO	16	See Note			
6-6	Modified Record Fire	CO	16	See Note	2	2	2
6-7	Sniper Field Fire	PLT	4	Optional	1	1	1
6-8	Night Fire (Small Arms)	CO	35	Optional	1	1	1
6-9	Known Distance	CO	55	Optional			
6-10	Machine Gun, 10-Meter	CO	20	Required	2	2	2
6-11	Multipurpose Machine Gun Transition	CO	10	Required	2	2	2
6-12	Multipurpose Gunnery Range	CO	6	TBD	1	1	1
6-13	Hand Grenade Familiarization Course	CO	4	Required	1	1	1
6-14	Hand Grenade Qualification Course	CO	6	Required	1	1	1
6-15	Grenade Launcher	CO	4	Required	1	1	1
6-16	Recoilless Rifle	CO	8	Optional	1	1	1
6-17	Light Antitank Weapon	CO	8	Optional	1	1	1
6-18	Scaled Range (1:30/1:60)	CO	4	Optional	1	1	1
6-19	Scaled Gunnery Range (1:5/1:10)	CO	4	Optional	1	1	1
6-20	Stationary Gunnery	CO	14	Optional	2	2	1
6-21	Antiarmor Tracking and Live Fire	CO	20	Required	1	1	1
6-22	Light Demolition	CO		Required	1	1	1
6-23	Infiltration Course	CO	2	Optional	1	1	1
6-24	Bayonet Assault Course	CO	4	Optional	1	1	1
6-25	Target Detection (Nonfiring)	CO	50	Optional	1	1	1
6-26	MOUT Assault Course (MAC)	CO	8	Required	1	1	1
6-27	Gunship Harmonization	CO	1	Optional	1	1	1
6-28	Flame Operations Range	CO		Optional	1	1	1
6-29	Mortar, Scaled	CO	6	Optional	1	1	1
6-30	Mortar	CO	6	Required	1	1	1
6-31	Field Artillery, 1:10 Scaled	BTRY	Optional	Optional	1	1	1
6-32	Field Artillery, Indirect-Fire	BTRY	Optional	Required	1	1	1
6-33	Multipurpose Training Range	CO	2 Trails	Required	2	2	1
6-34	Combat Engineer Vehicle	CO		Required			
6-35	Air Defense Firing	BTRY		Optional	0	0	0
6-36	Helicopter Gunnery	CO	8	Required	1	1	1
6-37	Fire and Movement	CO	Throughput-Dependent	Optional	1	1	1
6-38	Squad Defense Range	CO	5	Optional	1	1	1
6-39	Infantry Squad Battle Course	SQUAD		Required	1	1	1
6-40	Infantry Platoon Battle Course	PLT		Optional	1	1	1
6-41	MPRC-H+	PLT		Required	1	1	
6-42	MPRC-L+	PLT		Required			1
6-43	Platoon Defense Against Aircraft	BTRY		Optional	0	0	0
6-44	MOUT CTF++	CO/BN	16/32	Required	1	1	1

Table 3-8. Notional range requirements (cont)

*Range numbers correspond to those in Chapter 6.

**Notional quantities by range type depend on annual training frequency. The most current DA Pam 350-38 prescribes training frequency.

***AFFs and ARFs are recommended for TRADOC school installations. MRFs are recommended at unit-based installations to conserve resources.

+Type and configuration of MPRC selected depend on which units are supported (armor/mechanized division = MPRC-H; LID, air assault division = MPRC-L).

++AC division installations typically need a MOUT complex consisting of a 32-building CTF with MOUT assault course to meet throughput and METL training requirements. AC separate brigade, semiactive installations supporting RC annual training and weekend training typically need a MOUT complex consisting of a 16-building CTF with MOUT assault course.

CHAPTER 4

RANGE DEVELOPMENT

INTRODUCTION

This chapter gives procedures for implementing the range modernization and standardization policies in AR 210-21. Its scope includes both RETS and non-RETS ranges developed under Military Construction, Army (MCA) and non-MCA programs. It provides a nontechnical view of the formal range design and construction process and describes the quality assurance features built into all phases of the Range Modernization Program.

PLANNING

Planning the development of an Army training range at installation level must be a comprehensive, well-coordinated, systematic process. The first step is to determine facility needs based on training and unit throughput requirements as discussed in Chapter 3. The next step – range planning and siting (the predesign phase) – consists of project initiation, site analysis and selection, and preliminary documentation.

Planners must consider the entire spectrum of resources available to support the development of training areas. Project planning must follow the Army's budget process to ensure enough funds are allocated for construction and maintenance. Installation resource managers are familiar with the planning, programming, budgeting, and execution system (PPBES) and will provide valuable assistance to project development planners.

The installation master plan must consider current and future neighboring land use when identifying suitable land for range layout and maneuver training. Maneuver areas should be large enough to accommodate units that will use them, and they should be configured for those units. Force structure, weapon systems, and AirLand Battle doctrine as well as the METL developed per FM 25-100 should be considered. TC 25-1 will assist in determining maneuver land and range requirements, respectively.

Planners evaluate throughput requirements based on annual scheduling data, existing throughput capacity based on range or training land annual availability, and actual use. Requirements are valid in those cases where throughput requirements exceed the capacity of existing facilities.

Environmental impact, occupational health medicine, and industrial hygiene aspects of range construction and operations must also be taken into account. New contaminated impact land-use areas will not be created unless an exception to policy has been approved per ARs 200-1 and 210-20. Weapons firing impact areas must be large enough to meet requirements for current weapon systems and those programmed for imminent fielding. Consideration should be given to the effect of impact areas and SDZs on current ranges and maneuver areas; this avoids reducing the availability or capability of existing training areas. Planning should also address airspace requirements for combined arms training.

Planners must maximize the siting of facilities and equipment storage not only to meet the needs of the proposed training, but also mutually to support nearby existing or planned land use. For example, grouping small-arms ranges with close-in training facilities (obstacle, infiltration, or NBC course) reduces the need for separate support facilities (latrines, instruction buildings, parking areas, etc). Planners must also consider fuel consumption when selecting maneuver areas and range locations. Fuel is a critical resource; therefore, maneuver areas and ranges should be located as close as practical to cantonment and bivouac areas to minimize travel and still provide expansion capabilities.

The use of subcaliber ranges and training devices or simulators should be maximized to save full caliber ammunition for essential qualification and sustainment firing.

Operations and maintenance concepts must be planned to achieve both manpower and other costs savings. Civilian contractors may be used to operate and maintain high-density, multipurpose ranges per AR 5-20. Implementation of the roll-on, roll-off concept maximizes training time for firing crews and units by reducing troop operating and maintenance activities.

Planners should use validated automated systems, data bases, and analytical models to reduce the manpower needed for developing comprehensive plans and justifying resources. Documentation should include detailed information on the size, condition, and capacity of land, as well as the ranges and training facilities available locally or at other accessible training areas. Safety restrictions, environmental considerations, and terrain profiles for proposed range locations should also be included. Much of this information is included in the catalog of installation firing ranges required by the local range regulation. Land condition and capability data can be obtained from the Directorate of Engineering and Housing (DEH) Natural Resources Office based on land condition trend analysis using the Integrated Training Area Management (ITAM) Program. The ITAM program includes the geographic resources analysis support sytem (GRASS) and the geographic information system (GIS). Information on the ITAM program and system is available from USACERL, Champaign, Illinois.

Current training strategies and doctrine developed by TRADOC and the service schools and standardized for Armywide use (see Chapter 3), detailed information on types of units, personnel, frequency, and specific weapon systems (TC 25-l), and assigned mission (FM 25-100 and ARTEPs) provide the basis for the planning phase. Both pre- and postmobilization training requirements must be considered as well to determine the actual and estimated range throughput. Use Standards in Training Commission (STRAC) guidance as a baseline to determine altenatives to construction or land acquisition.

Information on when a new weapon system will arrive and the training facilities it will require is contained in DA Pam 5-25, AMIM, and SFA, published by HQUSACE. SFA assessments of the facility impact of weapons development and fielding is a "living process." It is accomplished through logistics management for all major and directed acquisition programs per AR 700-127. Unlike the AMIM, SFA data is continuously updated as weapon system development matures in coordination with the materiel system PEO/PM and TRADOC System Manager.

Engineering expertise is provided by–

- The divisional engineer staff officer.
- The local DEH or National Guard FMO.
- The Corps of Engineers geographical division or district engineer.
- The USACE RTLP Mandatory Center of Expertise (RTLP-MCX).
- COE laboratories.

The DEH integrates training facilities requirements into the installation master plan, standardized designs of range components, and SFAs. Requests for engineering assistance from COE laboratories (RTLP-MCX) should be forwarded through the DA Program Coordinator for ranges (ATIC-RTS) to the USACE Program Coordinator, RTLP (CEMP-EA) for HQDA OCE tasking and resourcing, either as cost-reimbursable or program-funded work.

Range safety expertise is provided by the installation safety officer. This expertise is also available at each MACOM safety office. The technical advisor for range safety (HQ TRADOC Command Safety Office) is available to provide additional assistance. Special-use airspace matters are processed and coordinated under the provisions of AR 95-2. In addition to the installation air traffic and airspace (ATA) officer and the DA regional representative (DARR) to the FAA, policy and strategy guidance can be obtained from the US Army Aeronautical Services Office (USAASO), Cameron Station, Alexandria, VA 22314-5050.

Health and safety risk assessment and design review assistance may be obtained from the installation medical activity and safety office respectively. Additional assistance is available from–

- US Army Environmental Hygiene Agency, ATTN: HSHB-ML, Aberdeen Proving Ground, MD 21010-5422.
- US Army Toxic and Hazardous Materials, ATTN: CETHA-TS-S, Edgewood Area, Building E4460, Aberdeen Proving Ground, MD 21010-5401.

MILCON projects (both live-fire range construction and land acquisition) are long-lead requirements (five to seven years) mandated by law. Planners will consider all viable alternatives. When evaluating alternatives or determining if existing training facilities can support new weapons systems or missions, planners should consider the following:

- Number and types of training facilities available.
- Use rates.

- Current and projected throughput requirements.
- Ammunition authorized.
- Serviceability or remaining life span of facilities.
- User density.
- Current authorized use and potential for new or multiple uses.
- Adequacy to meet training standards.
- Life cycle and current O&M costs.
- Environmental impacts, including restrictions to protect water resources, wildlife, soils, plant life, and historical and archeological sites, and ways to mitigate environmental noise impact.
- Contamination of existing impact areas and the potential for creating new contaminated impact areas.
- Land-use impact and compatibility, including current and future use of installation and adjoining land.

Evaluation of alternatives is not limited to the adequacy or availability of existing facilities. Other alternatives include training devices (limited range or training practice munitions), simulation, and waivers or modifications to training requirements. These alternatives require the trainer to assess needs early during the formulation of actual training requirements. Devices, simulation, and requirements changes are especially viable when available land is insufficient or otherwise constrained. Early, continuous coordination with force development staff offices at all levels of command is essential.

For additional assistance, contact –

- The major Army command (MACOM).
- US Army Training Support Center (USATSC), ATTN: ATIC-RTSR, Fort Eustis, VA.
- US Army Corps of Engineers (HQUSACE), ATTN: CEMP-EA, Washington, DC.
- Range-Mandatory Center of Expertise (RNG-MCS), US Army Engineer Division, Huntsville, ATTN: CEHND-ED-PM, Huntsville, AL.

PROJECT INITIATION

Project initiation includes –

- Acknowledging training requirement.
- Identifying training facility needs based on adequacy and availability of existing facilities.
- Considering alternatives to facility modification or new construction.
- Developing a project milestone schedule.
- Collecting resource data.

Effective project initiation is a coordinated effort of planners, made up of representatives from –

- The Directorate of Plans, Training, and Mobilization (DPTM)/G3 (trainers, range officers, force developers).
- The Directorate of Engineering and Housing (facility engineers; installation master planners; environmental, natural, and cultural resource managers).
- Major using units.
- Installation Resource Management Office.
- Security and safety agencies.

Representatives from the Directorate of Reserve Components (DRC), Staff Judge Advocate (SJA), and Public Affairs Office (PAO) may also participate as required.

Planners –

- Review training requirements.
- Consider alternatives to facility modification or new construction.
- Evaluate resources available to support development of a training range.
- Determine the specific type of range required, including weapon systems and ammunition.
- Consider construction impact on both the installation master plan and range development plans (RDPs).

Land

Land must be identified that accommodates the range layout, the surface danger zone of applicable weapon systems, and impact area requirements. An environmental analysis determines the impact of range construction and operations.

Facilities and Equipment

Resources must not only meet the needs of the proposed range but also support nearby existing or planned ranges. For example: grouping several

small-arms ranges together with an obstacle, infiltration, or NBC course would save land and money by reducing common support facilities (latrines, instruction buildings, parking areas, etc).

Training Schedules

Range construction projects may have impact on training schedules for nearby ranges. Coordination with scheduling activities of the DPTM/G-3 should take place early in the planning process.

OPTEMPO

Planners must consider the impact of a range on OPTEMPO when selecting a location. Travel time and fuel are critical resources; therefore, ranges should be located as close as possible to cantonment and bivouac areas.

Training Aids, Devices, Simulators, Simulations, and Subcaliber Ranges

Use of these devices should be maximized to save full-caliber ammunition for essential qualification and sustainment firing. Quantities of RETS targetry equipment and dual radio-controlled targetry should be identified.

Operations and Maintenance

Efficient use of manpower and resources for operations and maintenance should be planned. Civilian contractors may operate and maintain high-density, multipurpose ranges according to AR 5-20. The roll-on, roll-off concept maximizes training time for firing crews and units by reducing troop operating and maintenance activities.

Budget

Range planning must follow the Army's budget process to be sure that enough funds are allocated for construction and maintenance. Installation resource managers, who are familiar with the planning, programming, budgeting, and execution system (PPBES), provide valuable help to range development planners.

Host Nations

Range projects in overseas areas require coordination with and involvement of host nation officials throughout the development process. Specific requirements will vary from nation to nation.

Alternatives and Justification

The Master Planning Board (MPB) approves decisions of installation planners to build new range facilities. Before deciding to build, planners must examine alternatives and be able to justify a new range. Alternatives to a new range include —

- Sharing use of an existing facility at another installation.
- Converting an older or specialized range to a multipurpose range.
- Using training aids, devices, simulators, and simulations (TADSS) or additional portable targetry on existing facilities.

When deciding whether to share use of an existing range at another installation, commanders and planners need to consider —

- Availability of the other range, based on existing priorities and use.
- Distance and cost of travel to the alternate range.
- Frequency of firing required to meet weapons training standards.
- Possible limitations on the use of ammunition required for training.
- Obsolescence of equipment, facilities, or range design.
- Existing or potential restrictions and waivers on range use.

Factors bearing on justification of a new facility include —

- The overall range facility needs required to meet unit training requirements and throughput levels as described in Chapter 3.
- Fielding needs required to meet unit training requirements and throughput levels as described in Chapter 3.
- A change in the installation mission or force structure requiring an increased capability to conduct training.
- Existing capability of standard ranges to meet home-station (peacetime) and mobilization training requirements. For example, modernization of one range could both satisfy training needs and allow the installation to close other ranges, freeing land for other training needs.

The creation and use of multipurpose training ranges ensures better management of range training activities, training facilities, and land. One well-planned multipurpose range can take the place of several single-purpose ranges.

SITE ANALYSIS AND SELECTION

Once the decision to develop a range at an installation is made and approved by the approving authority according to AR 210-21, the siting process begins. The steps in the procedure are –

- Analyze training task requirements.
- Determine the type of range needed.
- Identify candidate sites.
- Analyze sites.
- Select the best site.

Site planning is crucial to successful training facility planning and development. Site planning must comply with requirements outlined in AR 200-1, AR 200-2, AR 210-20, TC 25-1, and this training circular.

Location and Parameters

As a range planner, the trainer works with the installation DEH (including environmental, natural, and cultural resource managers) and safety officials to provide guidance on how siting decisions affect training. A new or renovated range may have environmental impact (especially noise) on the installation and nearby communities. Planners should try to minimize the impact, but they must maintain a balance between environmental concerns and training requirements. For example, keeping maximum natural vegetation promotes realism and reduces environmental damage. Information on planting programs that enhance cover and concealment for training realism is available from the US Army Construction Engineering Research Laboratory (USACERL), Champaign, IL.

Planners must also consider the location of the proposed range in relation to the rest of the installation. The site should not isolate useful maneuver terrain, cut off impact areas, or make clearance operations difficult. If the proposed range will require frequent maintenance, the site should provide easy access for maintenance when adjacent ranges are active. Unusable terrain should be incorporated into impact areas. Moreover, the range should have a potential for growth and improvement to accommodate new weapon systems and technology. The key to efficient operations is a site that is easily accessible to using units. Planners need to consider overall training requirements and the flow to and from specific ranges when determining individual site locations. Training areas, such as small-arms ranges and bayonet courses, should be placed close to garrison areas. Tracked-vehicle ranges may be located further away from unit housing. When these ranges are remote from garrison areas, planners should consider overnight parking and bivouac facilities.

Terrain

Terrain can have a major effect on firing direct-fire weapon systems. It influences possible target locations since targets placed without regard to terrain can limit target visibility. This affects a soldier's ability to fire on moving targets. However, used correctly, terrain can help to improve a soldier's ability to hit a fleeting target. Terrain features that influence target location are –

- Topography.
- Soil characteristics.
- Surface composition.
- Hydrology.
- Vegetation.
- Man-made obstacles.

These features also directly affect range maintenance and the environmental impact of construction and operations.

A terrain profile of the proposed range should be developed and used to conduct feasibility estimates, review safety requirements, and determine target locations. The Geographic Resources Analysis Support System (GRASS) data base, developed by USACERL as part of the Integrated Training Area Management (ITAM) Program, is particularly suited to support this effort.

Range sites must be carefully selected to ensure that terrain fosters maximum use of weapon systems. Planners should attempt to develop ranges in areas with different types of terrain to promote weapon-firing skills under varying conditions. The site should slope downward from the firing points to the target area. This allows for drainage and may help contain projectiles within the SDZs. A downward slope also aids visibility, target acquisition, and projectile attenuation. Fire-and-movement ranges should have

both natural and man-made cover and concealment islands. Vegetation should be removed only if needed to provide a clear view of targets. Planners must balance the need for realism with unit training objectives. A land maintenance plan provides for regrading revegetation, and erosion control to maintain training realism and reduce long-term maintenance costs.

Water areas contribute to training and increase combat realism. Reflections and temperature variations over or near water create unique conditions that can only be learned about through experience. However, unexploded (dud) ammunition embedded in shallow water could hamper future land clearing and decontamination operations. In addition, lead can leach into ground water systems. If lasers are used on a range, the reflection of laser beams on water is a potential hazard. Water areas should be sited to provide good drainage for runoff, and appropriate erosion-control measures should be included in the range design. Range sites should support training operations during periods of reduced visibility and during-whatever weather conditions prevail locally.

Range Impact Area Requirements

Impact area requirements vary with training requirements and with SDZs. New contaminated impact areas will not be created unless an exception to policy is approved per ARs 200-1,210-20, and 210-21. Conveniently located hill masses or other natural terrain features may significantly reduce real estate requirements for SDZs. Ranges should be sited so that they do not restrict maneuver areas. Refer to AR 385-63 for the requirements to reduce SDZs. Impact area requirements are based on —

- The number and type of ranges required.
- The SDZ for each type of weapon.
- The use of common impact areas, if possible.

Dismounted Gun-Target Line

The gun-target line (GTL), also referred to as the line of fire, is an imaginary line drawn from a weapon system to a target. For efficient small-arms range operations, it is best to orient the GTL to the northeast in the Northern Hemisphere. This places light on the face of the target for the longest part of the day. Orient small-arms marksmanship ranges so that soldiers are not required to fire into the rising or setting sun. However, direction of fire is not as important as accessibility, security, and safety.

Consider terrain configuration when orienting the GTL in order to reduce the area covered by the SDZ. If a site is on rough terrain, the GTL should be perpendicular to high ground. Since small-arms ranges are usually on flat terrain, the GTL should be horizontal or slightly below horizontal. Range planners must avoid sites requiring the GTL for direct-fire, line-of-site weapon systems to pass over public roads or navigable waters. If firing over installation roads is unavoidable, it is mandatory that these firing areas be marked with appropriate signs and separate warnings and closed during firing periods. Indirect artillery firing over public access areas must comply with procedures in DA Pam 385-XX.

Vehicle-Mounted Gun-Target Line

Planning GTLs for vehicle-mounted weapon systems presents a greater challenge. Vehicular weapon systems such as tanks or Bradley Fighting Vehicles require that GTLs be planned for multiple targets from stationary firing points and for single and multiple targets from a moving tank or BFV.

Firing on the move requires planners to analyze a series of GTLs from various firing points along the path of the moving vehicle or within designated "firing boxes." Multiple tiring scenarios for combat vehicle ranges that include both stationary and moving firing vehicles and stationary and moving targets require a series of GTLs with their respective SDZs superimposed over common terrain.

Set safety requirements for moving-vehicle firing exercises by laying out a course with sequential firing points perpendicular to the target area. This arrangement may require several kilometers for forward travel when training with high-speed vehicles.

The net result is a range that needs more depth than one with the vehicle firing from a freed point. A course on which a vehicle is required to change direction frequently more closely represents tactical conditions. It also increases land requirements since it requires wide SDZs. Refer to DA Pam 385-XX for procedural guidance on this type of GTL and SDZ planning.

SDZ Requirements

In the most economical layout for a range complex the impact areas of SDZs overlap, but the maneuver or firing areas themselves do not. This reduces the overall acreage needed for the range system, which conserves land and minimizes contaminated impact

areas. Some ranges should be sited close together, such as 25-meter zero ranges and record-tire ranges. Other ranges, however, are incompatible for contiguous siting. For example, field artillery firing points should not be located next to rifle ranges since the field artillery noise detracts from rifle marksmanship training. Refer to Appendix E for a discussion of using baffles to reduce SDZ requirements in areas where limited land restricts availability of impact areas.

Extent of Construction

Terrain configuration will influence the extent of construction and the cost required to transform land into a usable range. Contour profile, soil content, trafficability, and requirements all affect the extent of moving and other clearing work needed. Sites requiring minimal earthwork to create level trails, visible targets, and good drainage are preferred.

Target Area for Collective Training Facilities

Once the range layout is approved, planners must design and develop the target area. Target areas on ranges used for soldier and collective training should provide realistic training and meet gunnery qualification requirements.

Targets

Target arrays must –

- Reflect current threat doctrine.
- Meet size, quantity, and distance requirements of gunnery manuals.
- Make logical use of terrain for target arrangement.
- Provide a combination of fire and maneuver when necessary to meet training requirements.

Appendix B describes targets and target equipment. Appendix D provides information on programming scenarios used with RETS- equipped ranges.

Visibility. Firing points must be located so that the maximum number of targets can be engaged by weapon systems. Planners must position targets within safe limits and be sure they are visible from firing points, positions, or lanes. Simulation of combat situations is important. When threat forces are portrayed on a range, targets will appear in groups that may be visible to personnel in several tiring positions at the same time. If visual obstacles are used, they should be placed to allow for reasonable target exposure time. The key is to provide an environment in which correct gunnery techniques can be exercised using realistic battlefield obstacles and target speeds.

Accessibility. Complex target-elevating mechanisms are maintained most economically in central maintenance facilities that are equipped for the task. Vehicle routes are needed for access to target-elevating mechanisms so that they can be removed from the range for maintenance.

Distance. Targets should be placed at distances from firing points that match guidance in appropriate training documents, taking advantage of visibility, cover, and concealment. Visual landmarks at the target location, such as vegetation, stumps, or shell holes, help soldiers estimate distance to a target. Small-arms targets are placed 10 to 1000 meters from firing points. On large direct-fire ranges, such as antiarmor or tank gunnery ranges, most targets are placed 500 to 2000 meters from firing points. Appropriate gunnery manuals, Chapter 6 of this training circular, and US Army Engineer Division, Huntsville (USAEDH) 1110-series design manuals (CEHNDM) provide guidance and/or specific distance requirements for target placement by the type of range.

Protection. Stationary target-elevating mechanisms and moving target carriers need protection from damage. Target emplacements prepared during the construction process protect target mechanisms. Natural terrain can also provide additional protection. This reduces the expense of the extensive earth-moving operations needed to construct large protective berms.

Gun-Target Engagement Sequence. Develop and plot gun-target engagement sequence capability to ensure that all weapons fired can be contained within the designated impact area without endangering personnel or creating a hazard to property or facilities. When it is obvious that firing from a given position could result in a projectile going beyond an SDZ, relocate the target location, the firing position, or both; or take other action to ensure safety. Although primarily used on multipurpose range complexes (MPRCs), a gun-target engagement sequence matrix is a valuable tool that helps determine target array options on any range. The matrix lists all targets that can be engaged from each firing position and the distance to each target. It identifies the primary

targets for each scenario. An example of a gun-target engagement sequence matrix is illustrated in Figure 6-32, Chapter 6.

PRELIMINARY DOCUMENTATION

After the site selection process is complete, the range-planning team prepares a preliminary range site layout. The layout shows a draft diagram (rough sketch format) of the site outline, downrange area, firing line and maneuver boxes, and support facilities. The team prepares perimeter descriptions and layout maps following guidance in AR 210-20, AR 210-30, and AR 415-20. Perimeter descriptions and layout maps show the proposed range area with all existing or planned facilities. A precise site description may also be needed for environmental impact assessments and statements per AR 200-1 and AR 24)0-2. The planning team coordinates all requirements incorporated into the development project, such as construction, equipment, facilities, and safety, with the installation —

- DEH.
- Safety office.
- Public affairs office.
- Other appropriate staff offices.

Perimeter descriptions and layout maps portray the proposed training area with all existing and planned facilities. Planners assist in preparing the project summary. A preliminary construction layout is included in the project summary to show the proposed training area in relation to troop housing areas, road networks, existing ranges, and maneuver areas. Layouts will use the most current mapping data available and may require supplementation with aerial photographs to help identify unusable terrain that may permit reducing SDZs.

PROJECT SUMMARY

Once the target area is designed and developed, it is added to the preliminary layout and project summary. Trainers assist engineers in preparing the project summary. A preliminary construction layout is included in the project summary to show the proposed range in relation to troop housing areas, road networks, existing ranges, and maneuver areas. All layouts should be keyed to United States Geological Survey (USGS) maps and supplemented with aerial photographs to help identify terrain that may permit reducing SDZs.

The project summary includes general information concerning design and construction. Materials specified for use must conform to local construction policies. Grading must be held to a minimum. Normally, it is used only to provide adequate drainage, increase target visibility, prevent ricochets, and meet other engineering requirements. A program for seeding, sodding, and other soil erosion control measures should be established to reduce maintenance costs and enhance operations. Compaction requirements (embankment, drainage, and general cleanup) must meet minimum Corps of Engineers (COE) standards. The next step is approval of the project summary by the Installation Master Planning Board (IMPB).

PROJECT DEVELOPMENT BROCHURE

After approval of the preliminary construction layout and project summary, a project development brochure (PDB) is prepared according to TM 5-800-3. The PDB includes a formal request for a military construction appropriation on a DD Form 1390 or 1391. A complete set of programming documents is developed and presented through channels to the Office of the Secretary of Defense (OSD), the Office of Management and Budget (OMB), and subsequently to the Congress for authorization and funds appropriation. When completed, the DD Form 1390 or 1391 is included as an attachment to the PDB. If land acquisition is required as a part of the range development project, a separate DD Form 1390 or 1391 must be developed to request an appropriation. The two requests may be submitted together.

Engineers also develop a complete set of programming documents, which are presented to Congress annually for authorization and funds appropriation. The project design must be at the concept completion stage, that is, at least 35 percent complete, before the request for authorization is presented to Congress. The entire process takes approximately five years. The project design must be at the concept completion state, that is, at least 35 percent complete for OSD or OMB approval. The design must be at least 95 percent complete before the request for authorization can be presented to Congress. The 35 percent and 95 percent designs are developed after receipt of HQUSACE Directive Code 2 and Code 6 approval, respectively (per AR 415-20); these designs are funded by HQUSACE. When Congress

authorizes and appropriates the funding, range construction begins.

The PDB includes a set of documents which describe the project in detail:

- Functional requirements summary
  - Range objective.
  - Space or land usage requirement.
  - Facilities description.
  - Summary of future changes and impacts.
- Facilities requirements sketch.
- Documentation checklist:
  - Cost estimates.
  - Telecommunications system coordination with the supporting signal command.
  - Economic analysis of alternatives.
  - Installation staff coordination.
  - Required completion date.
  - Site development plan.
  - Architectural and structural documentation, including an evaluation of existing facilities (if any) and the availability of a standard design or site-adaptable designs.
  - Mechanical, electrical, and utility systems.
  - National Environmental Policy Act (NEPA).
- Technical data checklist
  - Construction phasing requirements.
  - Equipment in place and justification.
  - Fire protection.
- Attached documents:
  - DD Forms 1390 (Military Construction Program) and 1391 (Military Construction Project Data) with cost estimate and project justification.
  - Site location map with proposed and existing SDZs.

TM 5-800-3 outlines PDB preparation and submittal procedures. Instructions for preparing DD Forms 1390 and 1391 are in AR 415-15. Predesign preliminary documentation is now complete. The facility engineer (master planner) and district engineer begin formal documentation of the design and construction phase of the range development process by preparing the concept design and submitting project cost estimates for funding.

PROGRAMMING RESOURCES

Range planning must follow the Army Planning, Programming, Budgeting, and Execution System to ensure that appropriate and sufficient funds are authorized for range construction, equipment, operations, and maintenance. Resource managers must participate in planning to ensure that budgeting procedures are followed, milestones are established, and required actions are completed in a timely manner. AR 1-1 establishes and describes the PPBES. AR 415-15 and AR 415-35 detail procedures for requesting funds for Military Construction, Army (MCA) projects. It is helpful to understand the relationship between the PPBES and the major events in the MCA process. Under the PPBES, program and budget resources are allocated to projects described by management decision packages (MDEPs). The PPBES architecture distributes MDEPs among five management areas:

- Missions of tables of organization and equipment (TOE) units.
- Acquisition, fielding, and sustainment of systems.
- Activities of the support and mobilization base.
- Operations of Army installations.
- Special functional areas; for example, program and budget packages that cut across two or more other management areas.

MDEPs have two components:

- The budget increment package (BIP), covering the prior year, current year, and budget year.
- The MACOM program objective memorandums (POMs), covering five program years. Military construction requirements to support an MDEP area are identified in the POM under the MCA appropriation.

MCA program events are normally accomplished over a period of five to six years:

- The guidance year, when Army guidance documents and HQDA current policies are provided. Included is program dollar guidance for each MACOM MCA program.
- The design year immediately follows the guidance year.
- The budget year follows the design year. It is the year in which the Army defends the

Military Construction Program before OSD, OMB, and Congress. It is also the year during which final design of an MCA program must be substantially completed.

- The program year (or program execution year) is the year in which funds become available for construction. It is the first year for executing the Military Construction Program. Depending on its size and complexity, the program may require more than one program execution year. Multipurpose range complexes, for example, normally require two years to complete construction.

The PPBES and MCA budget and program years coincide. However, a project conducted under the Military Construction Program that starts planning during the current fiscal year must pass through the milestone events of both the guidance year and the design year before it reaches the budget and program years. For example, an MPRC project for which planning starts today may not be operational until up to six years from now. Table 4-1 depicts the major events, activities, and time lines for MCA range project development.

FUNDS

There are three basic funds used for constructing, equipping, operating, and maintaining ranges. They are Military Construction, Army (MCA), Other Procurement, Army (OPA), and Operation and Maintenance, Army (OMA). At the installation level, OMA funds are handled through various operating function accounts. Funds for engineering operations include the K-account for maintenance and repair work not exceeding $1,000,000 and the L-account for new construction work that does not exceed $200,000. Installation resource managers are familiar with the various funding procedures and provide valuable assistance to planners and trainers in preparing requests for funds.

Military Construction, Army

MCA funds are used for major construction projects that exceed the L-account limit of $200,000 for new work. MCA funds are also used for maintenance and repair work that exceeds the K-account limit of $1,000,000. MCA funds are used for MCA design projects and for construction of ranges, access roads, and support facilities. Congress authorizes and appropriates MCA funds. They are included in the Appropriation Act signed by the President of the United States. Related to the regular MCA program is the Minor Military Construction, Army (MMCA) Program. The MMCA program provides a means of funding construction projects costing less than the maximum amount specified bylaw for minor military construction (10 USC 2805). Currently, MMCA project costs are in the $200,000 to $1,000,000 range. MMCA funds may be used for unspecified minor military construction that cannot be delayed for inclusion in a future MCA program request without adversely affecting the military mission. AR 415-35 provides MMCA project approval criteria and procedures.

Other Procurement, Army

OPA funds are used to procure and install targetry equipment, training devices, threat simulators, and instrumentation that have a cost greater than $15,000 per unit. OPA base-level commercial equipment (OPA-BCE) funds are generally used to purchase range supplies, equipment, target devices, and mechanisms not centrally managed or purchased by the Army. The US Army Armament, Munitions, and Chemical Command (AMCCOM) procures RETS equipment centrally using OPA funds included in the MDEP for RETS fielding. OPA funds may also be used to purchase some equipment through the Productivity Capital Investment Program (PCIP). AR 5-4 provides detailed instructions for requesting PCIP approval.

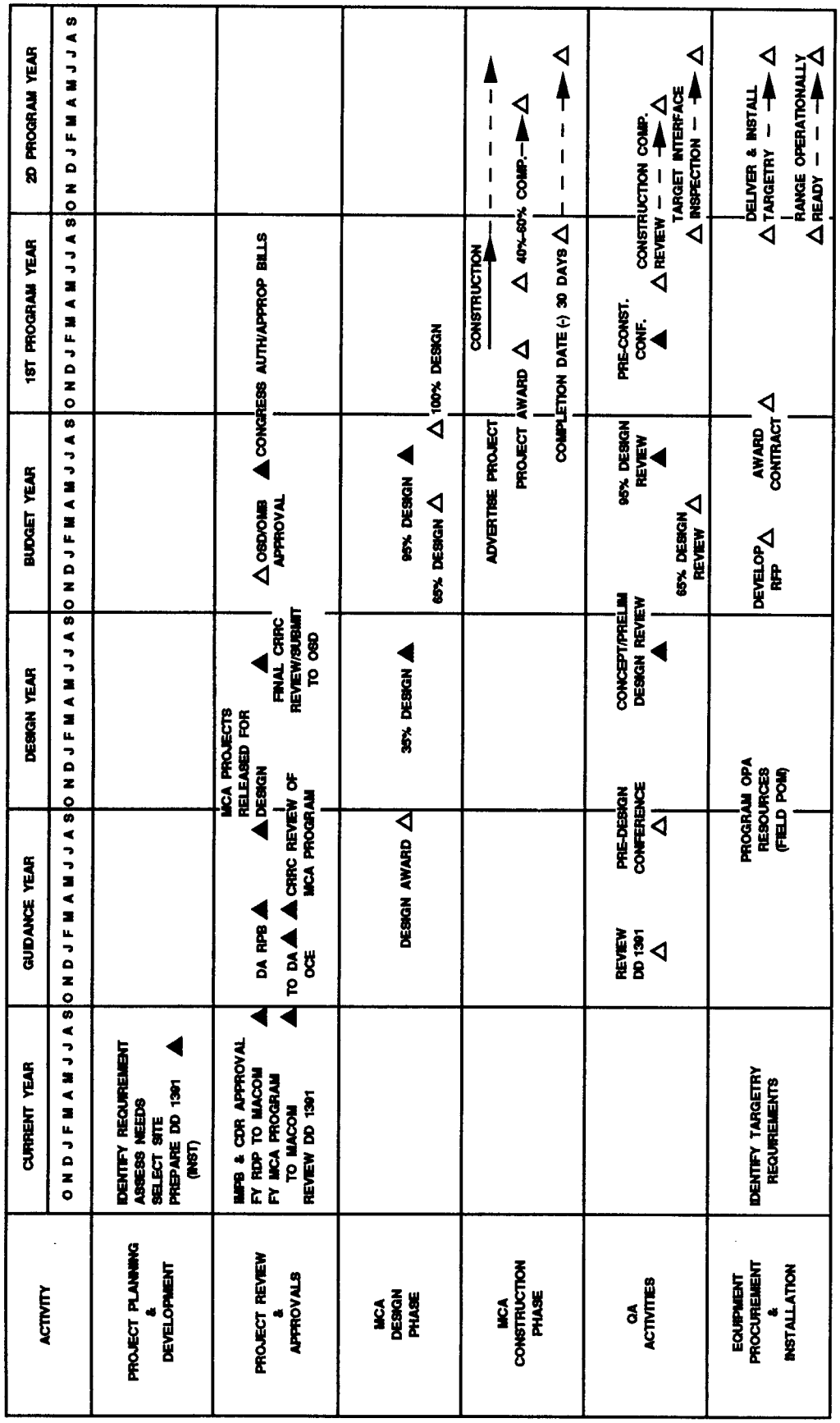
Operation and Maintenance, Army

OMA funds are used for normal operation and maintenance of existing ranges. OMA L-account funds may be used for construction of ranges with new work estimated to cost less than $100,000. OMA K-account funds may be used for maintenance and repair work that does not exceed $1,000,000. Both the K- and L-accounts could be used to fund a project that includes both new work and maintenance and repair work, so long as the combined limit of $1,200,000 is not exceeded. OMA funds may also be used to purchase targetry equipment with a cost of less than $15,000 per unit.

RC Funds

The National Guard and Army Reserve have separate funds for their training range needs. RC funds are used to construct, develop, and modify ranges, training sites, armories, and weekend training sites. RC OMA funds are known as Operation and

Table 4-1. MCA range project development events



Maintenance, Army National Guard (OMARNG) and Operation and Maintenance, Army Reserve (OMAR). These funds are used for routine operation and maintenance of existing ranges, minor range construction, and purchase of targets and training devices. When OMA funds are used for range construction, any requirements for RETS targetry equipment must be submitted through the MACOM to USATSC (ATIC-RTS) for inclusion in the Army Master Range Plan.

BUDGETING STRATEGIES

Budgeting strategies for range construction and maintenance vary as much as the funds available. The type of fund used for a project determines the procedures required. Planners, trainers, and engineers must work closely with installation resource managers to ensure proper procedures are followed.

After identifying a need for a new or renovated range, the user submits a request on a work order to the installation DEH. The DEH determines if the request is valid. If it is valid and the estimated cost of new work is $200,000 or less, the request remains as a work order. It is then submitted to the New Work Planning Board (NWPB). Once approved by the NWPB, the project is placed on the annual engineer plan at the installation. Construction proceeds using installation OMA funds. Time required for construction depends on priorities established by the installation commander, but it should normally not exceed one year.

If the cost of new work exceeds $200,000, the request is put on a DD Form 1391. This form is submitted to the Installation Master Planning Board. If approved by the IMPB, the project is consolidated in the five-year MCA program, which lists all major construction projects at an installation. Since this program is not restricted to range projects, these projects must compete with all other installation MCA requirements for priority. The five-year MCA program is submitted annually to the MACOM.

Each MACOM consolidates its MCA priority list and submits it to HQDA Office of the Assistant Chief of Engineers (OACE). MACOM engineers serve as the focal point and coordinators for range program development before submission of the list to HQDA OACE.

The MACOM list of prioritized range projects is the basis for the AMRP. This plan is used by the HQDA (DAMO-TRS) representative to provide range prioritization guidance to the HQDA Construction Requirement Review Committee (CRRC). AR 210-21 describes the process for developing the AMRP.

The CRRC provides recommendations to the Assistant Secretary of the Army (Installations, Logistics, and Environment) for MCA projects. The CRRC also advises the HQDA Program Budget Committee on MCA programming and prioritization in POM building years. The POM documents the Army program. It is submitted to OSD for review. AR 415-15 describes the MCA program development flow.

OMA or OPA funds for targets and equipment must be programmed at the right time so that equipment delivery coincides with range completion. The directorate responsible for installation ranges must include requirements for targetry and devices in command operating budgets submitted for the appropriate program year. Refer to Table 4-1 for help in determining the fiscal year during which a specific range project is programmed. Resource management officials can help determine the appropriate funds for purchasing targets and equipment.

Occasionally, a new range may be built for testing and evaluation of weapon systems, equipment, or training concepts. MCA funds might be used initially to equip the range with new targets. Subsequent range maintenance and procurement of new targets, however, may require OMA and OPA funding.

PRODUCTIVITY CAPITAL INVESTMENT PROGRAM

The Productivity Capital Investment Program provides readily available funds for projects that increase productivity, reduce costs, and improve operations. To qualify, projects must pay for themselves through savings or cost avoidance within a specific period of time. Table 4-2 lists the four capital investment subprograms. Savings from these programs are retained at the installation. Savings and cost avoidance must be auditable. Refer to AR 5-4 for complete details on PCIP subprograms.

WEAPON SYSTEM INFORMATION

Support for developing weapon systems must be planned in advance. Two sources of information provided at the installation level describe the weapon system, its technical characteristics, and its implications for the facility.

Table 4-2. PCIP subprograms

Program Title	Project Costs ($)	Amortization	Appropriation	Approval Authority
QUICK RETURN ON INVESTMENT PROGRAM (QRIP)	3,000 to 100,000	2 years or less	OPA	MACOM
OMA QRIP	3,000 to 100,000	2 years or less	OMA	MACOM
PRODUCTIVITY-ENHANCING CAPITAL INVESTMENT PROGRAM (PECIP)	3,000 to 100,000	4 years or less	Multi-appropriation	MACOM
OFFICE OF THE SECRETARY OF DEFENSE PRODUCTIVITY INVESTMENT FUNDING (OSD-PIF)	100,000 or more	4 years or less	Multi-appropriation	OSD

Army Modernization Information Memorandum (AMIM) (DA Pam 5-25)

The AMIM specifies when divisions or brigades will receive new weapon systems, training and doctrine requirements, and supply and maintenance requirements. The AMIM should specify the training facilities needed to support these new or modernized systems. The AMIM also specifies resource requirements for force modernization. The AMIM is updated on a biennial basis; the process is described in DA Pam 5-25.

Support Facility Annex (SFA)

The SFA is an annex to the Integrated Logistics Support Plan for selected major and directed acquisition programs published by HQUSACE. The SFA provides a general description and characteristics and identifies facility implications associated with material fielding. The SFA also includes training facility considerations. It is continuously updated as the weapon system matures in the material acquisition process. SFAs are developed in coordination with the materiel system program evaluation office project manager and TRADOC system manager. They are available to installations and MACOMs via the programming, administration, and execution (PAX) system under the facility planning system utility.

PROJECT DESIGN AND CONSTRUCTION

The design portion of MCA project development normally includes three phases: concept and preliminary design, final design, and construction bid package. Depending on design complexity and other factors, some agencies elect to add a 65 percent design review phase.

Concept and Preliminary Design

On receipt from HQUSACE of Directive Code 2 (authorization for the concept and preliminary design of a new MCA project), the design agency district engineer (DE) for MCA-funded projects (the facility management officer [FMO] for NGB-funded projects) initiates action to get engineering support. A commercial architectural engineering (AE) firm usually supplies this support. Depending on the work load, DEs may elect to use in-house resources for design. Using the latest approved DD Form 1391, the appropriate design manual, and input from the using agency, the AE firm develops the concept and preliminary design package. This package contains approximately 35 percent of the total design. It should include –

- Site topographic data.
- Target emplacements.
- Firing points.
- Roads, trails, and building layouts.
- Electrical and data distribution systems.

- Design analysis and guide specifications.
- A construction cost estimate as of the 35 percent design stage.

The cost of the package should not exceed 25 percent of total design cost. When complete, the package is distributed to the DA Program Manager for the Range Modernization Program (USATSC [ATIC-RTS]), the MACOM, the USAEDH Range Mandatory Center of Expertise, and the using agency for review and comments.

Final Design

After satisfactory resolution of all concept and preliminary design issues and receipt of Directive Code 6 authorization from HQUSACE to proceed with the final design, the agency directs the AE firm to produce the final design package. This package includes a complete, detailed design of all facilities with specifications and the final construction cost estimate. The package is distributed to the reviewing agencies listed above for review and comment. After comments have been received from reviewers, the design agency determines the need for holding a final review conference. An intermediate review at the 65 percent design stage is an option. This review is recommended for large, complex ranges.

Bid Package

Issues concerning the final design are resolved and incorporated into the drawings and specifications. These revised drawings and specifications along with other bid documents make up the final bid package. This package is not usually sent out for general review.

Range Construction

The construction portion of the project development process normally starts with the awarding of a contract by competitive bids to a construction contractor. Range construction may also employ troop labor. This can reduce construction costs and provide training opportunities for engineer units. Construction periods for specific projects vary from one to two years, depending on the complexity and size of the range. DE representatives monitor the MCA construction process; usually an AE firm monitors NGB-funded projects. When construction is satisfactorily completed and accepted, the range is turned over to the installation to await RETS target equipment installation.

Installation of RETS target equipment is the responsibility of AMCCOM. It is performed by an equipment contractor. The installation period may range from 30 days (for a standard 16-lane infantry range) to 60-90 days (for a full-size MPRC). Once equipment installation is complete and the equipment is certified by acceptance tests, the total range is signed over to the installation, which is responsible for operating and maintaining the facility.

QUALITY ASSURANCE PROGRAM

The Range Modernization Quality Assurance (QA) Program monitors the range development process from initial planning through target equipment installation and operation. This assures that training facilities constructed throughout the world are as similar as possible in order to train and qualify all military personnel to the same standards. Also, electrical and data interfaces that support operation of target equipment must be planned and installed correctly. The DA Program Manager directs the QA program.

Range Planning

The QA program begins at the earliest stages of range planning with the furnishing of design manuals that provide guidance on siting, facility requirements, and preparation of DD Forms 1390 and 1391. On request and subject to availability of funds, the DA Program Manager makes range assistance visits to –

- Analyze the requesting installation's overall training requirements.
- Determine the existence and adequacy of present facilities.
- Provide recommendations on new or upgraded facilities needed to meet shortfalls.

Additional assistance is available for individual range projects to help resolve training, engineering, and environmental questions such as range type, number of lanes, safety fans, SDZs, noise impact, land use conflicts, etc.

Design Stages

After the services of an AE firm have been acquired, a preconcert design conference should be held. This conference is attended by the DA Program Manager, USAEDH, AMCCOM, the MACOM, the installation, the DE or FMO design agency, and the AE firm. Items to be addressed include –

- Training requirements for the type of range under design.
- Evaluation of site conditions.
- Review of target equipment interface details.
- Special design considerations resulting from lessons learned during development of other range projects.

These areas are addressed again during the concept and final design reviews.

Construction Stages

After the construction contract has been awarded, a preconstruction conference is held. This conference is attended by the DA Program Manager, USAEDH, AMCCOM, the MACOM, the installation, the construction contractor, the DE or FMO construction agency, and the architectural engineer. Details of the construction drawings are reviewed with the contractor to assure proper interpretation of the design. Specific critical items concerning target equipment protection and interface requirements are pointed out. When construction has progressed to 60-70 percent of critical equipment interface items being complete, a construction compliance review (CCR) is scheduled. As a minimum, one of each type of targetry emplacement must be complete. A QA team visits the site to conduct the review. This team includes —

- The DA Program Manager.
- USAEDH.
- AMCCOM.
- The MACOM.
- Representatives of the construction agency, installation, construction contractor, and (where appropriate) the AE firm.

The primary purpose of the review is to ensure that equipment and materials furnished by the contractor meet contract specifications and that the range is constructed according to the contract and acceptable standards. Items reviewed include —

- Data and power cables.
- Target emplacements.
- Cable junction boxes.
- Tower junction boxes.
- Roadbed ballast for moving targets.

Conducting reviews at this stage allows adequate time for the contractor to make corrections or adjustments before completing construction.

When construction is complete, the DA Program Manager, USAEDH, AMCCOM, the MACOM, and the target installation contractor conduct a target interface inspection (TII). Other agencies may observe this inspection as necesary. The inspection is needed to determine if all equipment interfaces have been satisfactorily completed and if they will support target equipment installation and operations. After completion of this inspection and resolution of any deficiencies, the project is approved for the installation of targetry equipment. AMCCOM oversees the installation carried out by the equipment contractor. The final check and operational testing of the installed equipment is conducted under the direction of AMCCOM, the installation, the DE or FMO, and the equipment installation contractor. Upon successful demonstration that the equipment is operationally ready, the project is considered complete, and the range is turned over to the installation for operation and maintenance.

NEW EQUIPMENT TRAINING

The MACOM provides new equipment training (NET) for operation and maintenance of RETS equipment. Installations and MACOMs coordinate directly with AMCCOM, ATTN: AMSMC-MAO, Rock Island, IL 61299-6000, to schedule training requirements.

CHAPTER 5

RANGE OPERATIONS

INTRODUCTION

Installation or community commanders will establish range-control and safety programs according to AR 210-21 and AR 385-63. They will appoint range-control personnel to supervise all weapons fining on the installation and enforce safety and operational requirements. The command safety manager monitors the effectiveness of the installation range safety program. This chapter describes the range-control organization and its responsibilities for scheduling ranges and maintaining positive control over range activities. It describes procedures to follow during live-fire and lasing operations. Refer to Appendix C for a checklist to use during these operations.

THE RANGE ORGANIZATION

The installation or community range management function is organized as prescribed in AR 5-3. This function is normally assigned to a division or divisions of the Directorate for Plans, Training, and Mobilization or G-3. If all of the installation range and training functions were consolidated under a single division, it would be titled the Range, Training, and Training Support Division; however, the functions are typically assigned to separate training and range divisions. If a range division is not warranted, a training support division performs range functions and acts as a point of contact (POC) between the installation and USATSC.

The Range Division plans, controls, and supervises all weapons firing on the installation. AR 5-3 lists the specific duties of a range division. Among these are —

- Directing and enforcing range and training safety regulations pertaining to firing on ranges.
- Planning, scheduling, and operating the installation's ranges.
- Planning, scheduling, and supervising use of facilities, training areas (including restricted airspace), and supporting weapons.
- Developing, publishing, maintaining and enforcing range and training area regulations, standing operating procedures (SOPs), airspace procedures, and firing bulletins.
- Requisitioning, storing, and issuing targets, target materials, and equipment.
- Ensuring that ranges are maintained and capable of meeting training tasks.

The DPTM/G-3 Training Division plans, coordinates, and supervises the installation military training program. Many of its duties are directly related to the range program. Among these are —

- Implementing and supervising training programs that increase training effectiveness through substitution, simulation, and miniaturization.
- Planning and coordinating implementation of competitive marksmanship programs.
- Implementing, supervising, and evaluating soldier and collective training for garrison units.
- Supervising and managing battlefield simulation war games.
- Preparing the installation range development plan.

Another DPTM/G-3 division with duties that relate to the range program is the Mobilization Division. This division develops plans for range and training area requirements during mobilization. This division should also assist the Range Division in developing the installation's land use requirements study (LURS) for postmobilization training requirements (see TC 25-l).

DA Pam 570-551 gives staffing guidance for a DPTM/G-3 range organization. Local appraisal determines the specific personnel requirements of a range organization. Table 5-1 shows the type of personnel that may be required.

RANGE CONTROL AND SCHEDULING

Coordination and integration of installation training and firing activities requires effective range control and scheduling procedures. These procedures must be augmented with communications resources to ensure safe, efficient live-firing

activities. Range control begins with development and publication of the installation range regulation. This regulation prescribes policies and procedures for conducting range activities consistent with safety and environmental regulations. AR 210-21 describes the subjects that the range regulation should address. SOPs applicable to individual facilities within the installation training complex augment the regulation. The minimum content requirements for an SOP are described in AR 210-21.

A major feature of an effective range control program is the range scheduling system. Scheduling systems are based on range throughput capacities, usage rates, limitations or restrictions applicable to individual ranges, and special training needs identified by unit commanders. A critical scheduling consideration is the potential for conflicts. If shooters on one range fire into a second range, the second range must not be scheduled for use at the same time. By the same token, if the second range is scheduled, then the first range must not be scheduled

Table 5-1. Notional range staffing guide (DA Pam 570-551)

	Military Positions				Position	Number	Civilian Positions	
Line	Title	Br	Code	Grade	Delineation	of Positions	Title	Code
1	RANGE OFFICER	–	54A	MAJ/ CPT	M			
2	OPERATIONS OFFICER	–	54A	CPT/LT	M			
3	RANGE SERGEANT	NC	a	E8/E7	M			
4	OPERATIONS SERGEANT	NC	11B30	E6	M			
5	TRAINING NCO	NC	11B30/ 11B20	E6/E5	M			
6	DEMOLITION SPECIALIST	–	12B20	E5	M	b		
7	COMPUTER MACHINE OPERATOR	–	74D10	E4	C	c	COMPUTER OPERATOR	GS-0332
8	FIELD RADIO REPAIRER	–	31E20	E4	C	a	ELECTRONICS MECHANIC	WB-2314
9	GENERAL WHEELED VEHICLE MECHANIC	–	63B10	E4	C	d	HVY MOBILE EQUIP MECHANIC	WB-5803
10	ELECTRICIAN	–	51R20	E4	C	d	ELECTRICIAN	WB-2805
11	SUPPLY SPECIALIST	–	76Y10	E4	C		SUPPLY CLERK	GS-2005
12	CLERK-TYPIST	–	71L10	E4	C		CLERK-TYPIST	GS-0322
13	OPERATIONS SPECIALIST	–	11B10	E3	C		LABORER	WB-3502
14	SUPPLY CLERK	–	76Y10	E3	C		SUPPLY CLERK	GS-2005

[a] – MOS should be appropriate to the predominant branch served. For example:

- Infantry.....11B50/11B40
- Armor.....19E40/19K40
- Air Defense Artillery.....16Z50/16H40
- Field Artillery.....13Y50/13E40

[b] – These positions may be required at installations or activities that do not have a TOE explosive ordnance disposal detachment.

[c] – These positions are required at all installations and activities that have a Table VIII requirement for tank firing.

[d] – Staffing of these positions is limited to organizational quick-fix maintenance. All repairs will be made by the DS or GS maintenance activity, the Director of Engineering and Housing, or the Director of Communications and Electronics.

for that time. Plots of surface danger zones (described in DA Pam 385-XX) are the primary determinant of potential conflicts. They play an important part in the scheduling process. Vertical danger zones should also be computed and considered when scheduling ranges to accommodate the ballistic trajectory and ricochet characteristics of weapons and ammunition that will be used. The scheduling system should incorporate checks to ensure that two or more units are not scheduled on the same tiring range at the same time without the coordination and concurrence of the commanders concerned. Periodic scheduling conferences should be conducted to correlate all major training activities with the available training facilities and to reconcile nontraining requests for range use with the established range schedule.

The Range Facility Management Support System (RFMSS) is an effective, automated management tool for range scheduling. An RFMSS data base allows the installation to enter specific data about ranges, training areas, firing points, range conflicts, and using units. SDZs can be generated on a plotter as overlays to range maps to illustrate scheduled activities. Using a module for scheduling allows the user to display schedules for up to 20 training areas over a period of 14 days.

Remote access to RFMSS by modem permits unit training personnel to identify available resources and submit schedule requests. The system generates schedule bulletins and charts showing approved range requests for any date, unit, or range. The system can also be used to track range use data, scheduled and unscheduled maintenance activities, and ammunition expenditures.

An effective communications system is essential to control range operations. A communications system is used to control firing, coordinate requests for medical assistance, and announce unsafe conditions. Two-way communications must be maintained between the range control organization and using units during all firing and weapons training periods. If communications are disrupted, the unit must cease fire or suspend operations until communication is reestablished. A range-control communications network normally consists of–

- An FM radio range-control firing net.
- An internal FM radio range-control administrative net.
- A radio or telephone backup range-control firing net.

The network must provide communications between the range-control network and each tiring range, weapons training facility, and training area within the installation training complex. The primary communications system may be either FM radio or telephone. The using unit must report all firing position openings, closings, and changes in firing status immediately to the range-control communications center. If the RFMSS is used, a communications (COMM) program is available to automate the recording of event data. The range-control communications operator can enter reports received into the RFMSS data base simply by pressing the appropriate function key on the RFMSS computer terminal. Range openings, closings, and firings are recorded and, if necessary, printed out to provide a detailed reconstruction of all calls and events.

LIVE-FIRE OPERATIONS

Safety is paramount during all live-fire and laser operations. Using-unit commanders (battalion/squadron) will ensure that the officer in charge (OIC) and the range safety officer (RSO) receive an installation or community safety briefing or course prepared according to AR 385-63 before obtaining battalion/squadron commander safety certification. The safety certification programs will train and qualify personnel in OIC and RSO duties for firing exercises or maneuver operations.

The officer in charge will be a commissioned, warrant, or noncommissioned officer in grade E7 or above, or a civilian in grade GS-09 or above, per Table 1-1, AR 385-63. The OIC is responsible for overall safety of training and proper use of the training facility. The OIC must be weapon-system-qualified and have satisfactorily completed a standard program of instruction in OIC duties. The OIC for a battalion or larger-sized CALFEX will be a field grade officer. The OIC will be physically present on the training complex during training.

Before firing, the range OIC ensures that –

- Required medical support is available.
- The correct firing point or position is occupied.
- The impact area is clear of unauthorized personnel; safety measures directed by the installation commander have been taken.

- Required communications are established and maintained.
- Only authorized ammunition, including proper fuzes, is used.
- Ammunition is within prescribed safe operating temperatures.
- All firing precautions and prefire checks have been performed.
- Immediate clearance to fire has been obtained from range control.
- Special-use airspace, if applicable, is clear for firing.
- Local range regulations and SOPS are followed.

During firing, the range OIC ensures that –

- Personnel do not move to or from the firing line on small-arms ranges and crew-sewed firing positions without permission of the range OIC or RSO.
- Material is not removed from the firing line without permission of the range OIC or RSO.
- The surface danger zone is monitored to ensure it remains clear.
- Projectile impacts are observed to determine if they are within prescribed SDZs.
- Weapon systems are cleared and checked during temporary suspension of firing.
- The type and quantity of ammunition fired and the number and approximate location of unexploded ordnance (UXO) are recorded. Data from these records is communicated to the range-control agency immediately after firing ends.
- Misfires, hangfires, and cookoffs are handled according to pertinent technical and field manuals for each malfunction and reported per AR 75-1 or AR 385-40.
- Firing ceases promptly when any unsafe act is observed or reported or when communications with range control are lost.
- Local range regulations and SOPS are followed.

The range safety officer will be a commissioned, warrant, or noncommissioned officer in grade E6 or above, or a civilian in grade GS-07 or above, per Table 1-1, AR 385-63. The RSO is responsible for the final determination to fire. The RSO must be weapon-system-qualified and have satisfactorily completed a standard program of instruction in RSO duties. The RSO must be physically present on the training complex and have no other responsibilities or duties.

The RSO ensures that –

- Local range regulations and SOPs are followed.
- Weapons are properly positioned.
- Authorized ammunition and explosives, including proper charges and fuze settings, are used.
- Firing settings and weapon systems are verified and within prescribed safety limits.
- SDZs are clear of non-mission-essential personnel.
- Proper hearing protection is worn by personnel in noise hazard areas (contours).
- Permission has been granted from range control to commence training or live firing.
- An immediate cease fire or check fire is ordered when any unsafe condition is observed or when communications with range control are lost.
- After completion of firing, weapon systems are reported clear to the OIC.

During laser operation, the RSO ensures that –

- Local range regulations and SOPs are followed.
- Unit personnel who employ lasers are thoroughly briefed, including an explanation of laser-related hazards and safety equipment.
- Azimuths and elevations of each laser range, firing position, and target are known.
- Units comply with SOPs for laser operations and training exercises.
- All personnel engaged in laser operations, including personnel in target areas, maintain continuous communications. If communication is lost, the RSO orders lasing to stop.
- Lasing stops immediately if positive control of the laser beam is lost.

CHAPTER 6

CURRENT ARMY RANGES

INTRODUCTION

This chapter describes standard ranges currently in the Army inventory. The descriptions include notional drawings based on current training materials and methods. All ranges should be site-adapted. The DA Range Program Coordinator (ATIC-RTS) is tasked with developing standard designs for all Army ranges. Design manuals are normally prepared for RETS-equipped ranges and for other priority ranges as directed by the HQDA Range Requirement Review Board per AR 210-21. Request standardized drawings from the design manuals through district offices of the Corps of Engineers. When there is a conflict between the standards USAEDH has published and those in this training circular, this circular takes precedence.

This training circular deletes the following ranges that were included in FM 25-7 ***(Training Ranges):***

- MOUT tire house.
- Tank crew combat firing course (replaced by multipurpose training range).
- Machine gun (M60 and M2) field-fire range (replaced by multipurpose machine gun range).
- Tank platoon battle run (replaced by multipurpose range complex).
- Live overhead-fire range (replaced by infiltration range).

The above ranges were originally designed to meet training requirements for specific weapon systems. However, they do not meet current criteria for Army standard ranges, even though some of the weapon systems may still be in the Army inventory. Installations with training requirements for nonstandard ranges should staff designs through the DA Range Program Coordinator (ATIC-RTS) to the DA Requirements Review Board per AR 210-21.

Identify individual soldier and collective tasks to be trained on ranges by referring to the appropriate weapon system gunnery manual. DA Pam 350-38 includes types of ammunition and ammunition requirements for specific ranges. Table 3-8, Chapter 3, of this circular provides guidelines for the number and type of ranges needed by a division or a training installation in peacetime. Mission and training throughput requirements determine the specific ranges required.

RANGE GROUPING

When possible, group all related ranges in the same area. For example, grouping rifle marksmanship ranges, hand grenade ranges, antiarmor ranges, and tank gunnery ranges reduces transportation costs, increases range use, and cuts down on facility requirements. When ranges are grouped properly, training can proceed in a concurrent, progressive fashion. Soldiers can move from range to range, using consolidated storage, maintenance, dining, and parking facilities. Grouping is the most economical way to plan ranges.

ARMYWIDE STANDARD RANGES

The following matrix descriptions, and illustrations (Table 6-1, Figures 6-1 through 6-44) provide individual and collective ranges (and selected training buildings) designated as Armywide standard. In some cases, the facility is also modernized with state-of-the-art equipment. Modernized facility standards have been designed to optimize manpower, real property, targetry integration, and O&M costs. Modernized facility standards also allow integration of training devices in lieu of live-fire engagement. Commanders have the flexibility to make minor modifications for mission training requirements.

Publication of this matrix does not constitute authorization or sole justification for initiating construction projects. When planning identifies and justifies a facility shortfall per AR 210-20, AR 210-21, and this training circular, modernized facilities are highly recommended over those that are merely standard. The matrix –

- Lists range facilities by type and function.
- Gives the Army's five-digit facility category code per AR 415-28.
- Indicates the type of facility design that currently exists:

- S = Armywide Standard.
- M = Modernized Armywide Standard.
- * = Candidate for modernization; construction category code not assigned in AR 415-28.

• Lists figure numbers for illustrations.

Table 6-1. Training range matrix

INDIVIDUAL SOLDIER SKILLS TRAINING			
Range/Facility	**Category Code**	**Type**	**Figure Number**
Combat Pistol Qualification Course/Military Police Firearms Qualification Course (MPFQC)	179 28	M	6-1
Multipurpose Indoor Range (Small Arms)	171 21	M	6-2
Basic 25-Meter Range (Zero)	179 01	M	6-3
Automated Field-Fire Range	179 02	M	6-4
Automated Record-Fire Range	179 03	M	6-5
Modified Record-Fire Range	179 03	M	6-6
Sniper Field-Fire Range	179 07	S	6-7
Night-Fire (Small-Arms) Range	179 04	S	6-8
Known-Distance (KD) Range	179 06	S	6-9
Machine Gun 10-Meter Range	179 09	S	6-10
Multipurpose Machine Gun Transition Range	179 10	M	6-11
Multipurpose Gunnery Range (MK19)	179 17	*	6-12
Hand Grenade Familiarization Range	179 13	S	6-13
Hand Grenade Qualification Course (Nonfiring)	179 16	S	6-14
Grenade Launcher Range	179 17	S*	6-15
Recoilless Rifle Range	179 18	S	6-16
Light Antitank Weapon (LAW) M72 Range	179 19	S	6-17

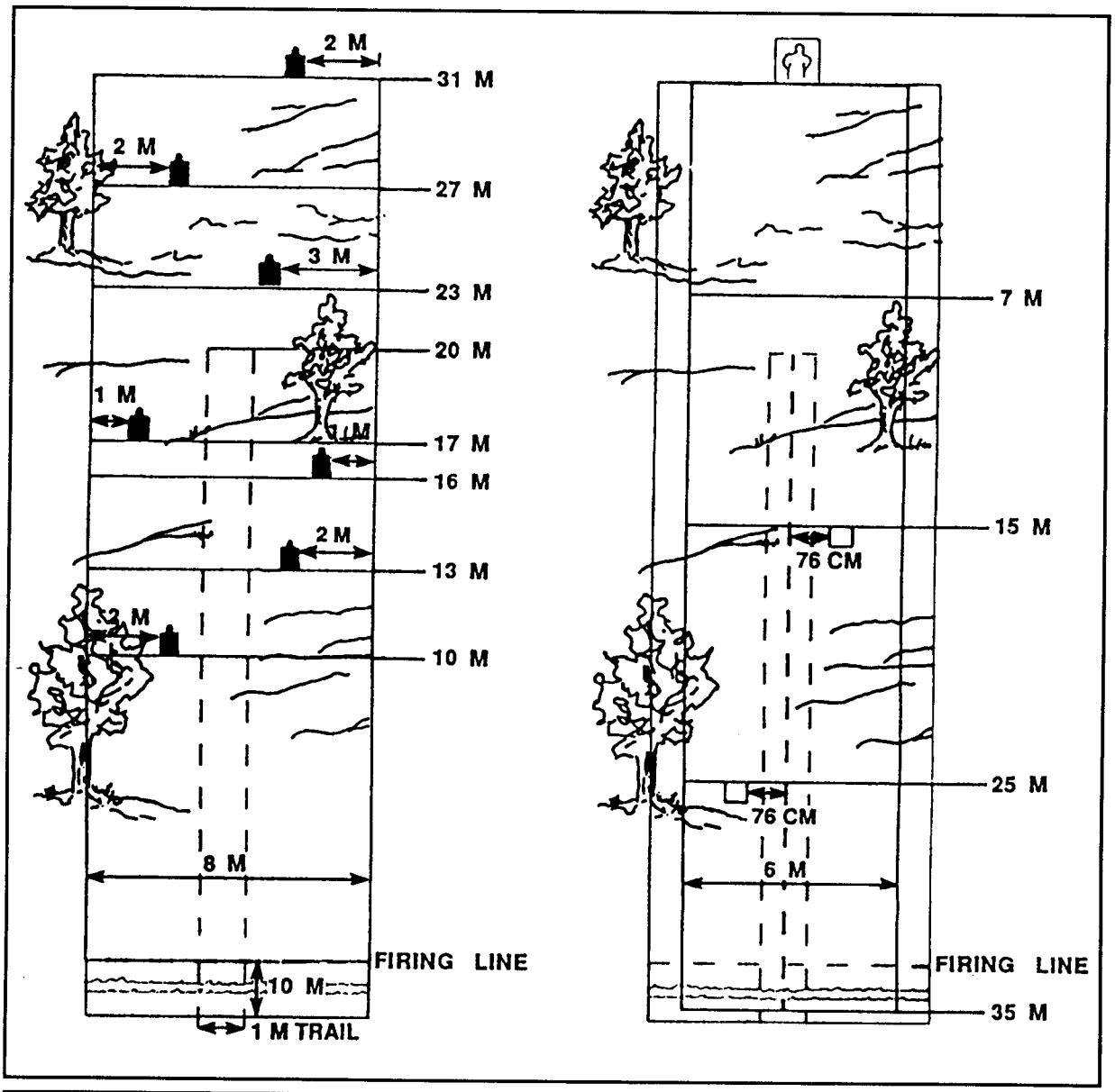
Table 6-1. Training range matrix (cont)

INDIVIDUAL SOLDIER SKILLS TRAINING (CONT)			
Range/Facility	**Category Code**	**Type**	**Figure Number**
Scaled Range (1:30 and 1:60)	179 30	S	6-18
Scaled Gunnery Range (1:5 and 1:10)	179 31	S	6-19
Stationary Gunnery Range	179 32	M	6-20
Antiarmor Tracking and Live-Fire Range	179 20	M	6-21
Light Demolition Range	179 21	S	6-22
Infiltration Course	179 67	S	6-23
Bayonet Assault Course Range	179 47	S	6-24
Target-Detection (TD) Range (Nonfiring	179 08	S	6-25
MOUT Assault Course (MAC)	179 23	M	6-26
Flame Operations Range	179 22	S	6-28

COLLECTIVE TASKS TRAINING				
Unit	**Range/Facility**	**Category Code**	**Type**	**Figure Number**
Crew	Mortar Scaled Range	179 24	S	6-29
	Mortar Range	179 25	S	6-30
	Field Artillery 1:10 Scaled Range	179 38	S	6-31
	Field Artillery Indirect-Fire Range	179 42	S	6-32
	Multipurpose Training Range	179 33	M	6-33
	Combat Engineer Vehicle (CEV) Range	179 35	S	6-34
	Air Defense Firing Range	179 43	S	6-35
	Gunship Harmoniza-tion Range	179 36	S	6-27
	Aerial Gunnery Range	179 37	S*	6-36

Table 6-1. Training range matrix (cont)

COLLECTIVE TASKS TRAINING (CONT)				
Unit	**Range/Facility**	**Category Code**	**Type**	**Figure Number**
Squad/ Section	Fire and Movement	179 89	S	6-37
	Squad Defense Range	–	–	6-38
	Infantry Squad Battle Course	179 26	M	6-39
Platoon	Infantry Platoon Battle Course	179 27	S*	6-40
	Multipurpose Range Complex, Heavy	179 12	M	6-41
	Multipurpose Range Complex, Light	179 12	M	6-42
	Platoon Defense Against Aircraft Range	179 44	S	6-43
	Military Operations on Urbanized Terrain Collective Training Facility (CTF)	179 23	M	6-44



Use: The CPQC (on the left) is used for instructional firing and combat pistol qualification. The MPFQC may be overlaid on this range (shown on the right).

Characteristics:

Number of firing positions – 15 lanes.

Firing line width – 120 m (8 m per lane).

Target area width – 120 m at furthest target (CPQC: 31 m; MPFQC: 35m).

Firing point configuration – CPQC: slightly raised area; MPFQC: 2 portable barriers, one 24" wide X 78" high at 25 m from the target; one 24" wide X 30" high at 15 m from the target.

Target configuration – CPQC: 7 E-type silhouettes (Fig B-11) with electrically activated, target-elevating mechanisms on each line. Targets located at 10, 13, 16, 17, 23, 27, 31 m. MPFQC: standing silhouette pasteboard target.

Associated facilities – standard facilities.

References – CPQC: FM 23-35, STP 7-11B1-SM, STP 7-11B24-SM, CEHND 1110-1-15; MPFQC: FM 19-10, CEHND 1110-1-15.

Additional Information: CPQC: each lane is a minimum of 31 m long; all lanes are exactly alike. MPFQC: each lane is 35 m long; all lanes are exactly alike.

Figure 6-1. Combat pistol qualification course (CPQC)/military police firearms qualification course (MPFQC)

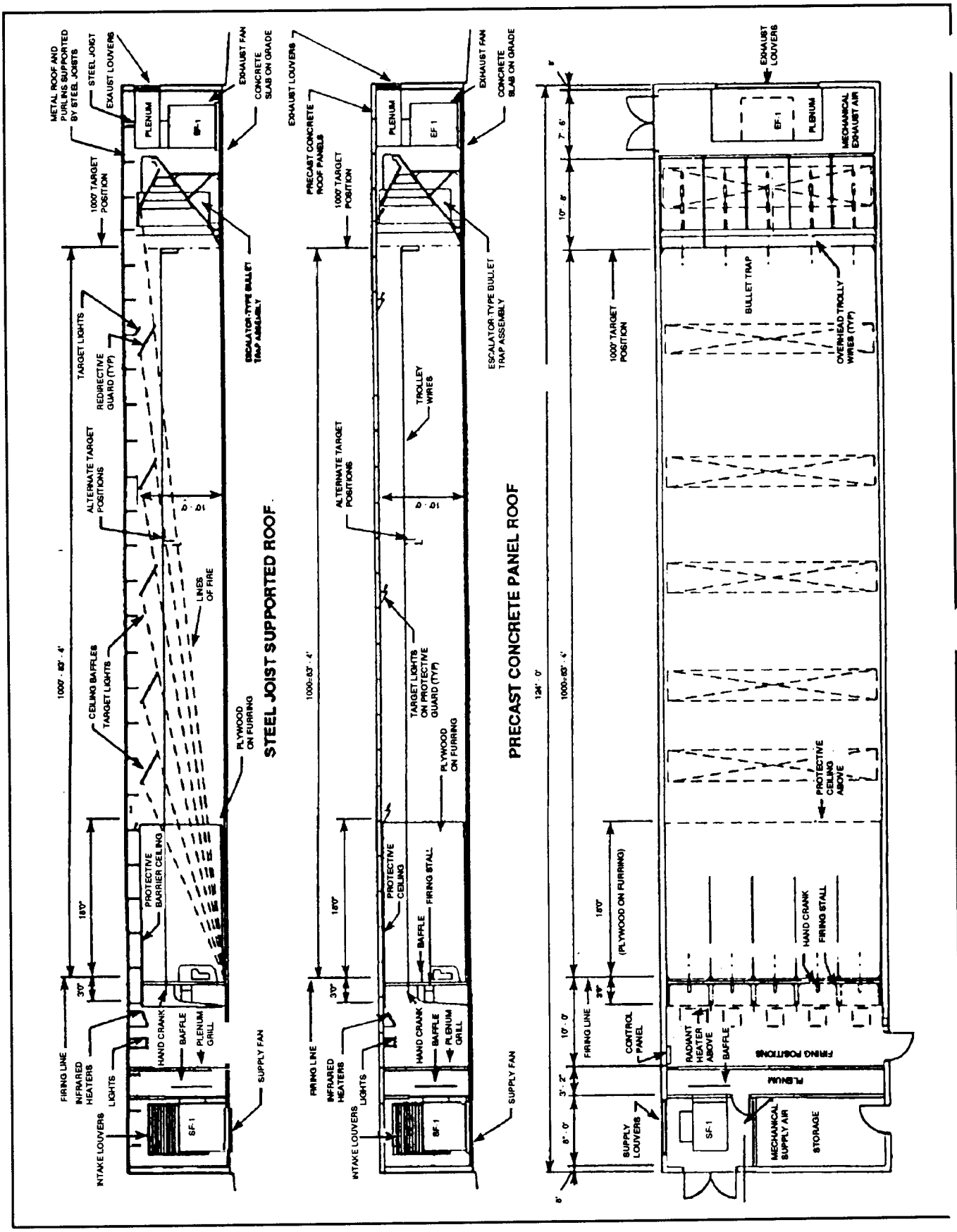


Figure 6-2. Multipurpose indoor range (small arms)

Use: This range is used for pistol, rifle, and machine gun marksmanship training (one crew-served weapon at a time). Soldiers can also zero their rifles on this range and train using the rimfire adaptor for the M16A1 rifle. Soldiers may fire plastic training ammunition (5.56mm and 50 cal) on this range.

Characteristics:

Number of firing positions—dependent on throughput and funding.

Firing line width—minimum 4' 8" (1.4 m) per position.

Target area width—minimum 4'8" (1.4m) per position.

Firing point configuration—numbered markers, movable benches, firing booths.

Target configuration—50' rifle and pistol targets, 25 m rifle targets, 25-yd pistol targets, 25 m zero targets, basic M60 machine gun marksmanship targets.

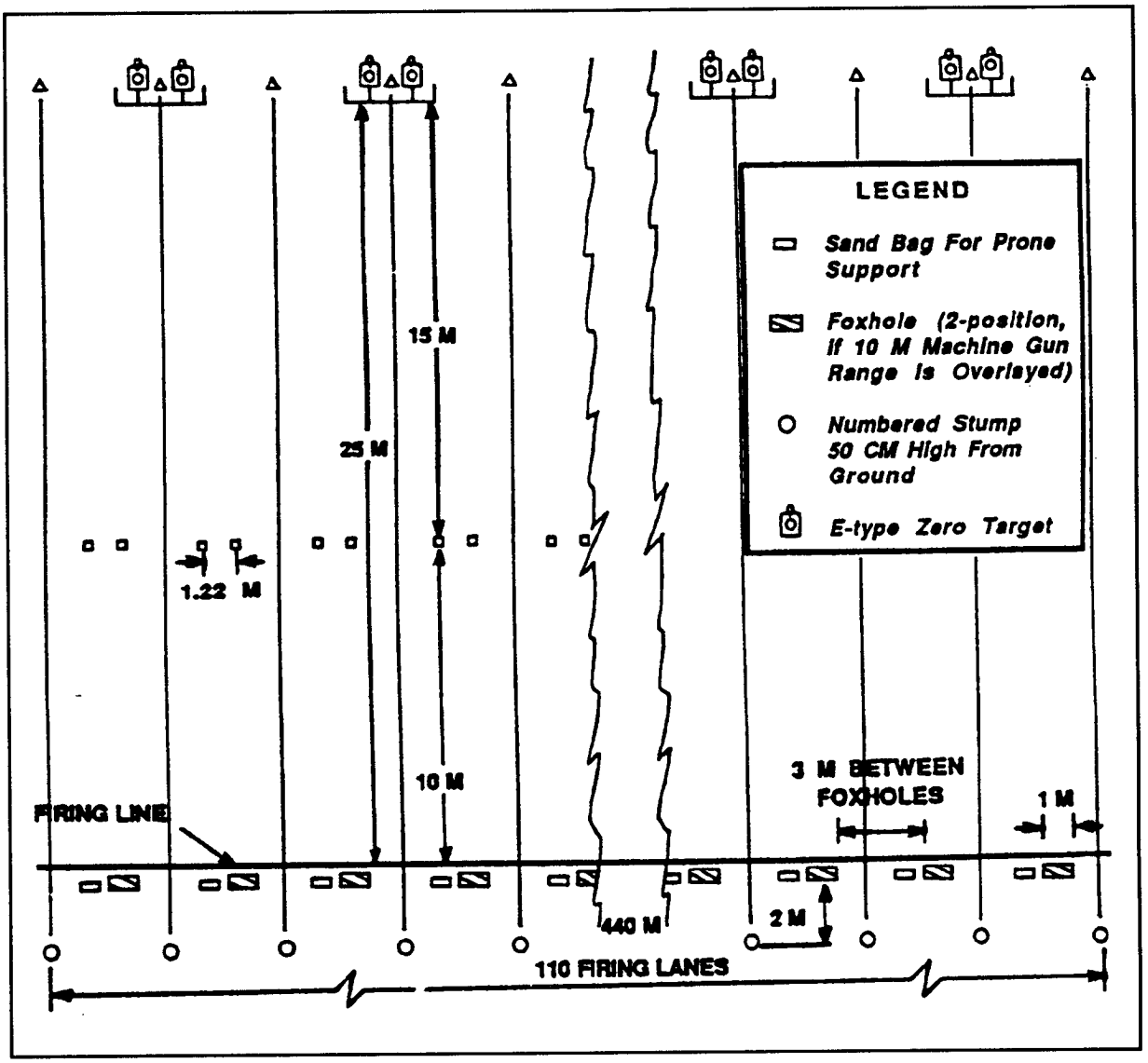
Associated facilities—control booth, shooting booth.

References—FM 23-9, FM 23-14, FM 23-35,FM 23-67, CEHND 1110-1-18, TB MED 501, NGR 415-5, National Rifle Association pamphlets.

Additional Information: Ranges used for both rifle and pistol shooting provide carrier mechanisms for targets at two heights: one at about 1.5 m, one at about .5 m—usually obtained by using detachable extension rods on the carrier.

NGR 415-5 determines size of armory indoor ranges for the National Guard.

Figure 6-2. Multipurpose indoor range (small arms)(cont)



Use: This range permits shot grouping, battle sight zeroing, 25 m scaled target practice, proficiency C course firing (Fig B-17).

Characteristics:

Number of firing positions – 110 lanes.

Firing line width – 440 m (4 m/lane).

Target area width – 440 m at furthest target (25 m).

Firing point configuration – foxholes, stumps, sandbags.

Target configuration – E-type silhouettes in fixed frames (Fig B-10) with 25 m zero targets (Fig B-1 thru B-7, B-9, B-17) or 25 m automatic rifle targets (Fig B-15).

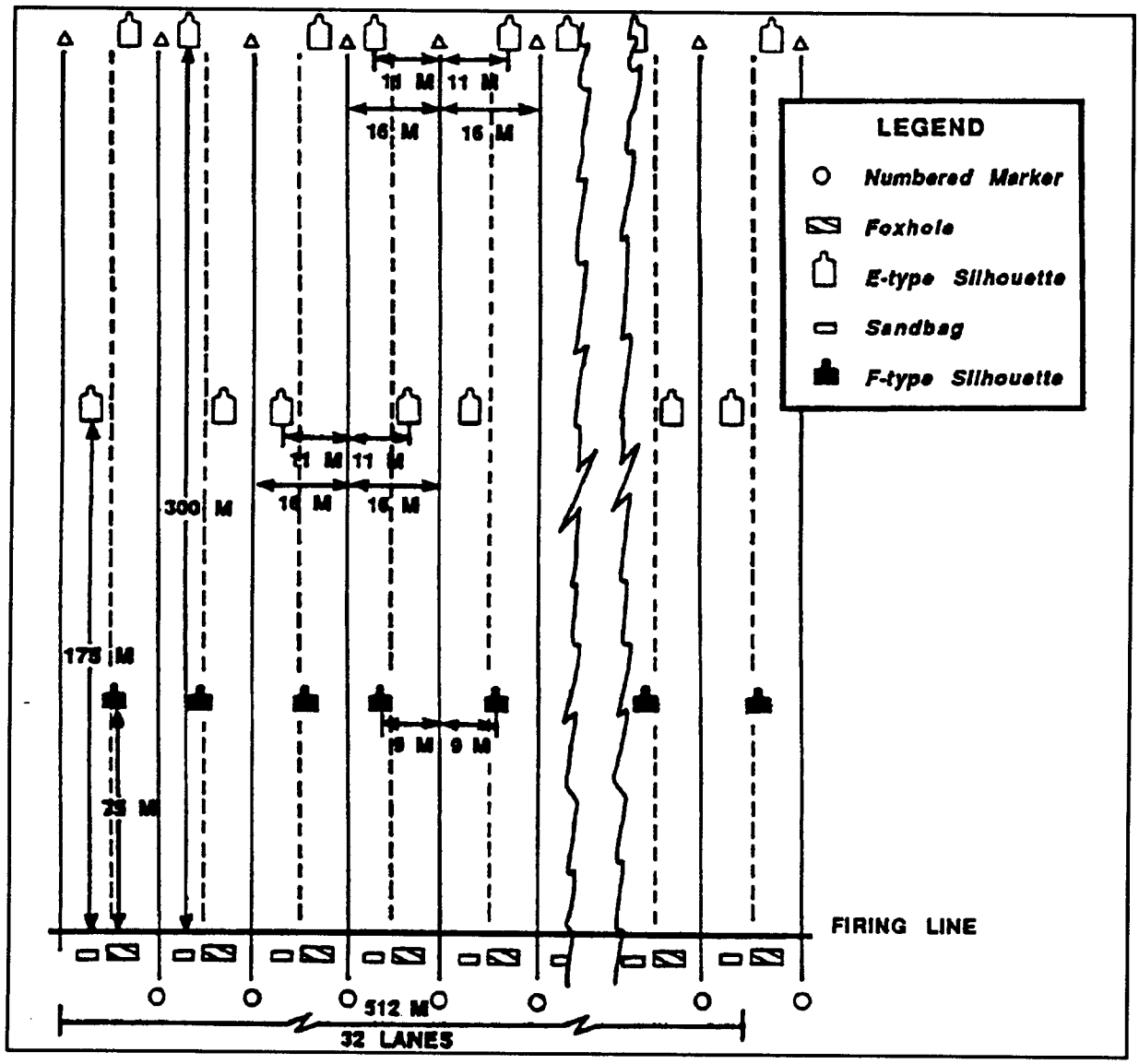
Associated facilities – standard facilities.

References – FM 23-8, FM 23-11, FM 23-65, FM 23-67.

Additional Information: 25 m recoilless rifle targets (Fig B-32, B-33) used when range is for subcaliber firing. Rather than construct a new machine gun 10 m range, the first 20 lanes of this range may have stands for target boots installed at 10 m if the range meets appropriate safety standards. Add MG 10 m range only if land is available to provide the required safety fan.

This range can be used for night fire (Fig 6-8, option 3).

Figure 6-3. Basic 25-meter firing range (zero)



Use: Soldiers fire at targets at distances comparable to those on battlefield, develop speed in target engagements, develop confidence in individual ability. The range may be adapted for night firing.

Characteristics:

Number of firing positions—32 lanes.

Firing line width—512 m (16 m per lane).

Target area width—512 m at furthest target (300 m).

Fiiring point configuration—foxholes, stumps, sandbags.

Target configuration—3 banks of targets having elevating mechanisms parallel to firing line; F-type silhouettes (Fig B-12) at 75 m, E-type silhouettes (Fig B-11) at 175 and 300 m.

Associated facilities—standard facilities.

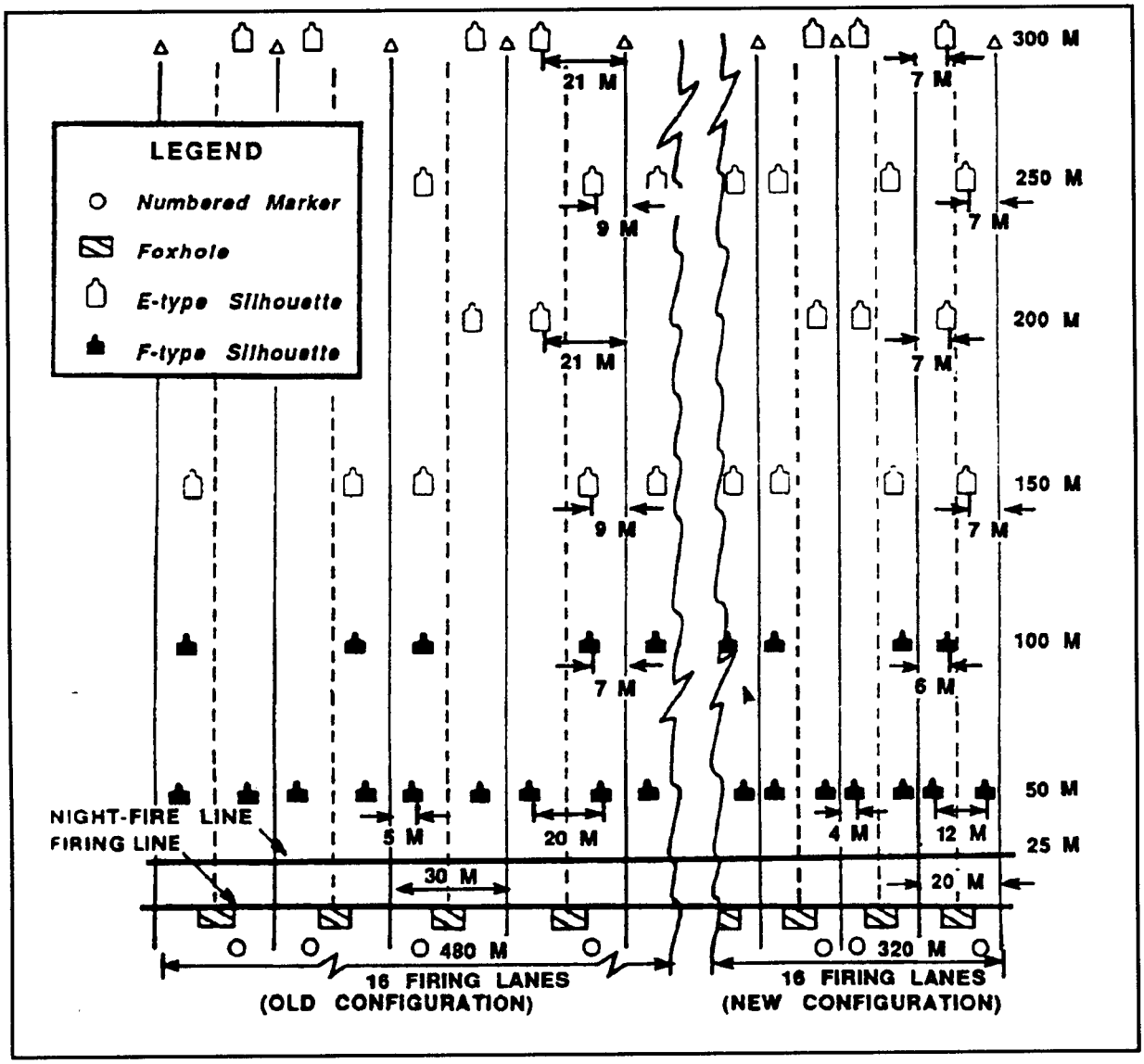
References—FM 23-9, HNDM 1110-1-5.

Additional Information: For downrange feedback field firing, 75 m (Fig B-6) and 175 m (Fig B-7) feedback targets should be used at those indicated distances as well as loudspeakers located downrange.

This range may be used for automatic rifle practice.

Except for initial field firing exercises, targets are exposed for prescribed periods of time.

Figure 6-4. Automated field-fire (AFF) range



Use: Soldiers practice engaging personnel targets in a simulated combat environment. Soldiers can also receive a qualification rating.

Characteristics:

Number of firing positions—16 lanes.

Firing line width—480 m (30 m/lane maximum); new ranges may use 20 m lanes.

Target area width—480 m at furthest target (300 m).

Firing point configuration—foxholes, numbered markers.

Target configuration—7 silhouettes with elevating mechanisms in each lane; 2 F-type silhouettes (Fig B-12) at 50 m (2 m apart); 1 F-type silhouette at 100 m; 1 E-type silhouette (Fig B-11) at 150, 200, 250, 300 m.

Associated facilities—standard facilities, ready area (waiting station where gunners cannot see targets), retired area (weapon-cleaning, personnel-holding station).

References—FM 23-9, HNDM 1110-1-5.

Additional Information: Terrain in target area slopes downward gradually approx 200 m, then upward gradually approx 110 m.

Target-elevating mechanisms are centrally and individually controlled. Computers connected to target sensors record performance.

Night firing is accomplished from the night-fire line, using 50 m, single E-type silhouettes at 25 m.

Figure 6-5. Automated record-fire (ARF) range

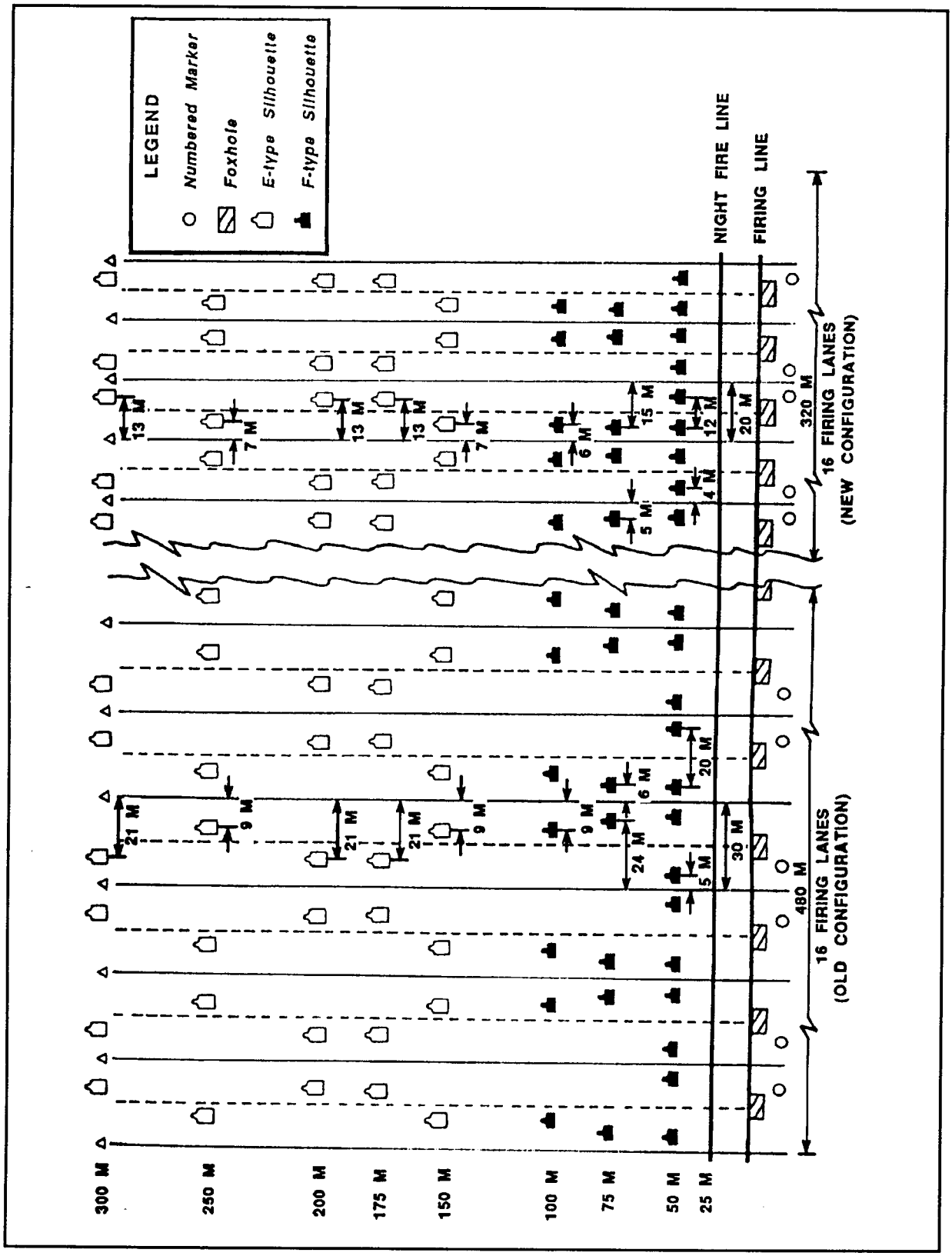


Figure 6-6. Modified record-fire (MRF) range

Use: This range allows soldiers to fire both field-fire and record-fire exercises on one facility. When LOMAH becomes available, it can be placed on the targets for electronic downrange feedback.

Characteristics:

Number of firing positions—16 lanes.

Firing line width—480 m (30 m/lane maximum); new ranges may use 20 m lanes.

Target area width—480 m at furthest target (300 m).

Firing point configuration—foxholes, numbered markers.

Target configuration—9 silhouettes with elevating mechanisms in each lane; 2 F-type silhouettes (Fig B-12) at 50 m (20 m apart); 1 F-type silhouette at 75 and 100 m; 1 E-type silhouette (Fig B-11) at 150, 175, 200, 250, 300 m.

Associated facilities—standard facilities, ready area (where gunners cannot see targets), retired area (weapon-cleaning, personnel-holding).

References—FM 23-9, HNDM 1110-1-5.

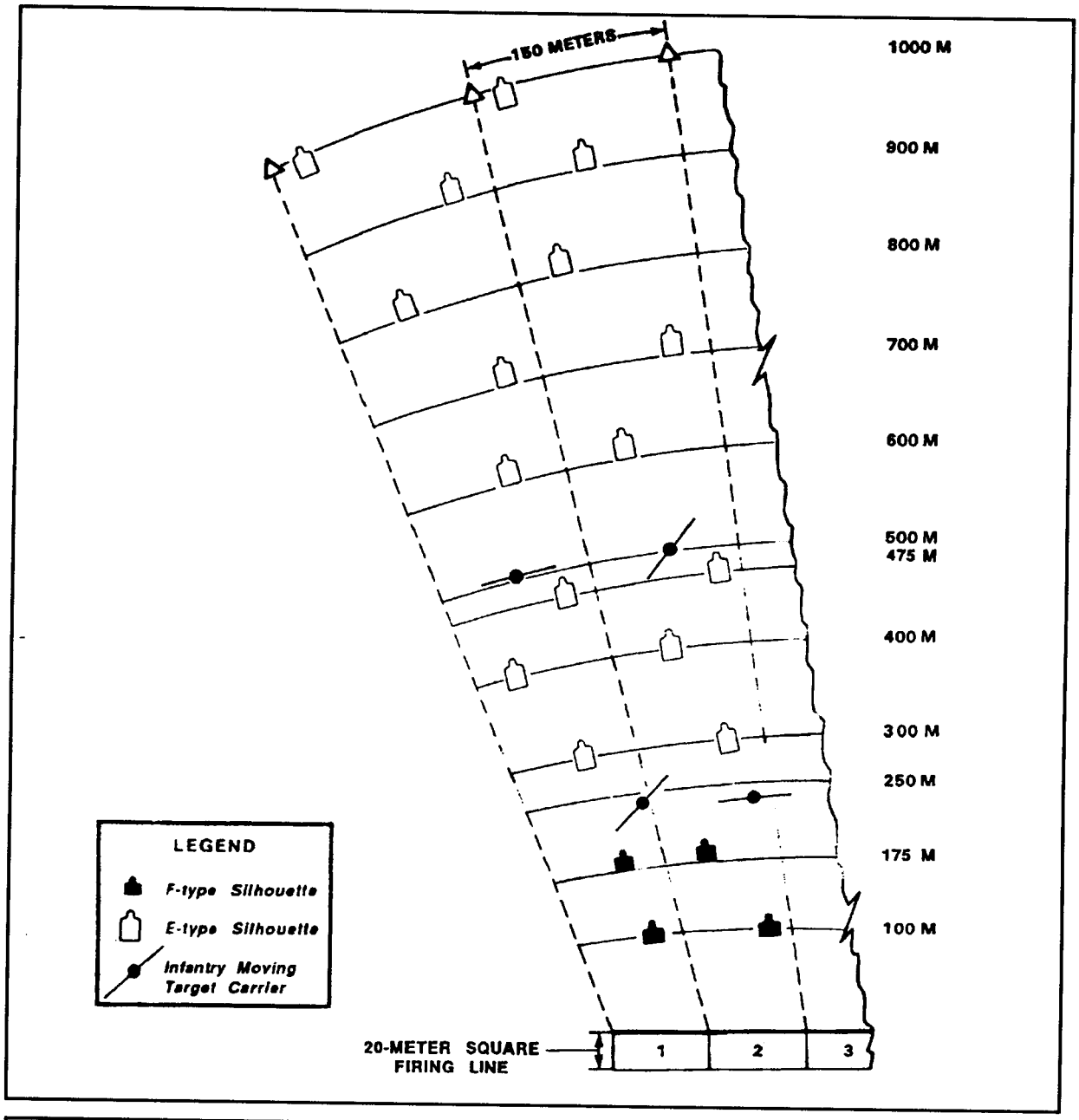
Additional Information: Terrain in target area slopes downward gradually approx 200 m, then upward gradually approx 110 m.

Target-elevating mechanisms are centrally and individually controlled. Night firing accomplished from night-fire line uses 50 m single E-type silhouettes at 25 m (Fig B-13).

This range is basically an ARF with one additional F-type silhouette at 75 m and one E-type silhouette at 175 m in each lane.

Construction of MRF instead of AFF/ARF ranges conserves land and reduces safety and maintenance concerns inherent in high-tech ranges.

Figure 6-6. Modified record-fire (MRF) range (cont)



Use: Snipers use this range for both day and night training. Selected personnel also use it for advanced rifle marksmanship training.

Characteristics:

Number of firing positions—4 lanes.

Firing line width—80 m (20 m/lane).

Target area width—600 m at furthest target (1000 m).

Firing point configuration—numbered markers on slightly elevated, sodded ground; sandbags for rifle support.

Target configuration—E-type and F-type silhouettes modified IAW TC 23-14, using elevating mechanisms arranged as shown in illustration; moving targets installed parallel to firing line or at 45° to firing line as indicated.

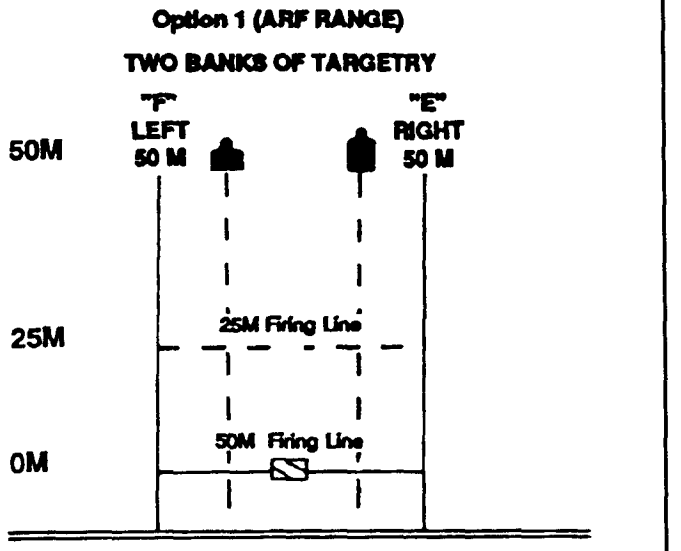
Associated facilities—standard facilities.

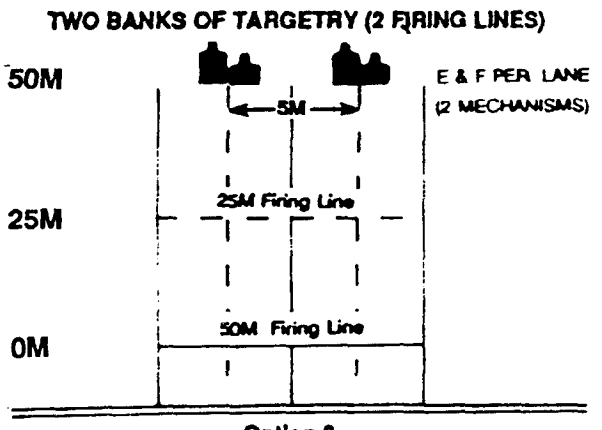
References—TC 23-14, CEHND 1110-1-15.

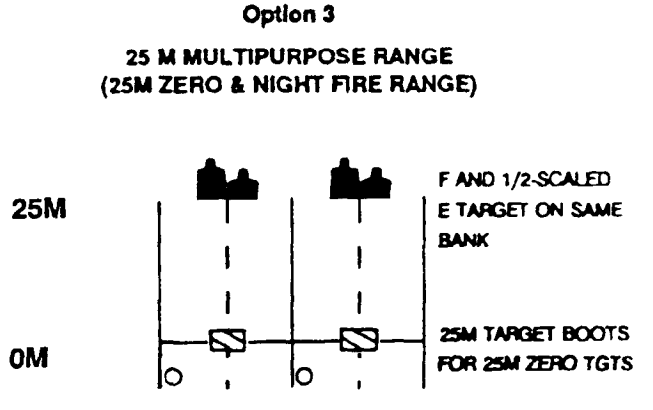
Additional Information: Natural vegetation is required in the target area.

Targetry is arranged as described in TC 23-14.

Figure 6-7. Sniper field-fire range







NOTE: Firing sequence will start at the 25m firing line. All firing orders will engage the left F target at 25 m first, then move back to the 0 m firing line and engage the right E target at 50 m. Night muzzle flash simulators will be installed at both meter targets.

NOTE: When using a field-fire range for night fire, 25 m and 50 m firing lines must be established. Mount an F target on 75 m target bank and have an E target lying on the ground next to the lifter (if using an M31A1 lifter, the E target should be mounted on a target bar). Firers will begin firing at the 25 m target from the 25 m firing line. After all orders complete 25 m firing, troops move downrange, replace the F target with the E target, and return to the 50 m firing line.

NOTE: Install two protected portable lifting mechanisms per lane. Protect with skip plates or sandbags. Place an F target on the left side lifter and a ½-scale E target on the right side lifter. Both exercises can be fired from the 0 m firing line at both F and E targets.

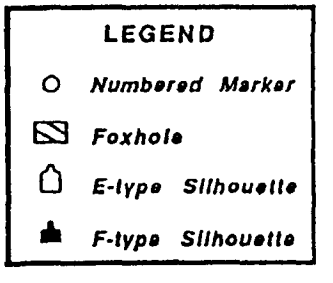


Figure 6-8. Night-fire (small-arms) range

Use: The range provides practice in unaided night fire of small arms.

Characteristics:

Number of lanes – 32.

Firing line width – 5 m.

Target area width – 175 m.

Firing point configuration – foxholes, numbered markers.

Target configuration – 2 silhouettes with lifting mechanisms in each lane: 1 E-type silhouette at 50 m, 1 F-type at either 25 or 50 m (Fig 6-5), or both at 25 m, using a 1:2 scaled E-type target. All targets set 5 m apart.

Associated facilities – standard facilities.

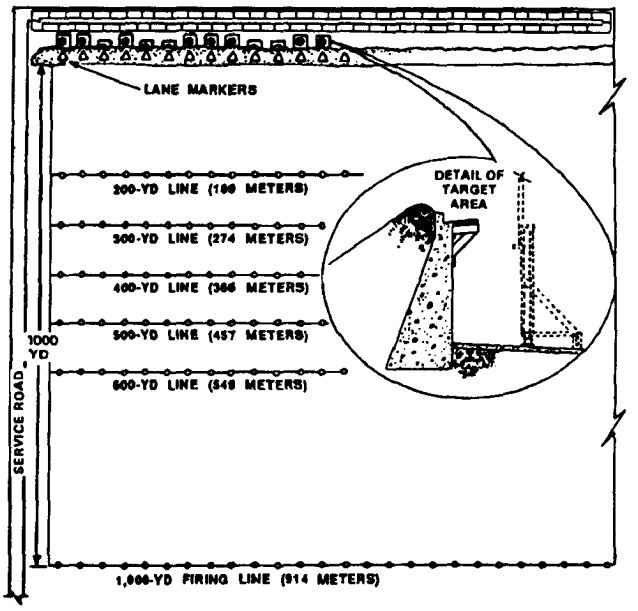
Reference – FM 23-9.

Additional Information: Use no artificial illumination to light the target. Affix a muzzle-flash simulator to each target-lifting mechanism. This simulator will give the shooter one of the indicators that a target is available. The soldier then uses night-firing principle and techniques to detect, acquire, and engage the target. The M31A1 target-lighting mechanism can be modified to produce a small-arms muzzle-flash simulation.

Option 1 can be adapted to the automated record-fire range. Option 3 can be adapted to the basic 25 m (zero) firing range.

The number of lanes on this range depends on the number of soldiers who must complete the training. The normal range has 32 lanes.

Figure 6-8. Night-fire (small-arms) range (cont)



Use: Army marksmanship units use this range for practice and competition. Soldiers use it for field firing the M16 when appropriate ranges are not available. RC and USMC units use it for qualification purposes.

Characteristics:

Number of firing positions – 55 points.

Firing line width – 165 m (3 m/point).

Target area width – 165 m at furthese target (1000 yd).

Firing point configuration – numbered markers on slightly elevated, sodded ground; telephone terminals every 10th marker.

Target configuration – standard A, B, C rifle targets in 6'X6' frames placed on holding mechanisms for KD targets.

Associated facilities – standard facilities and target pits.

References – AR 920-30, FM 23-8, FM 23-9.

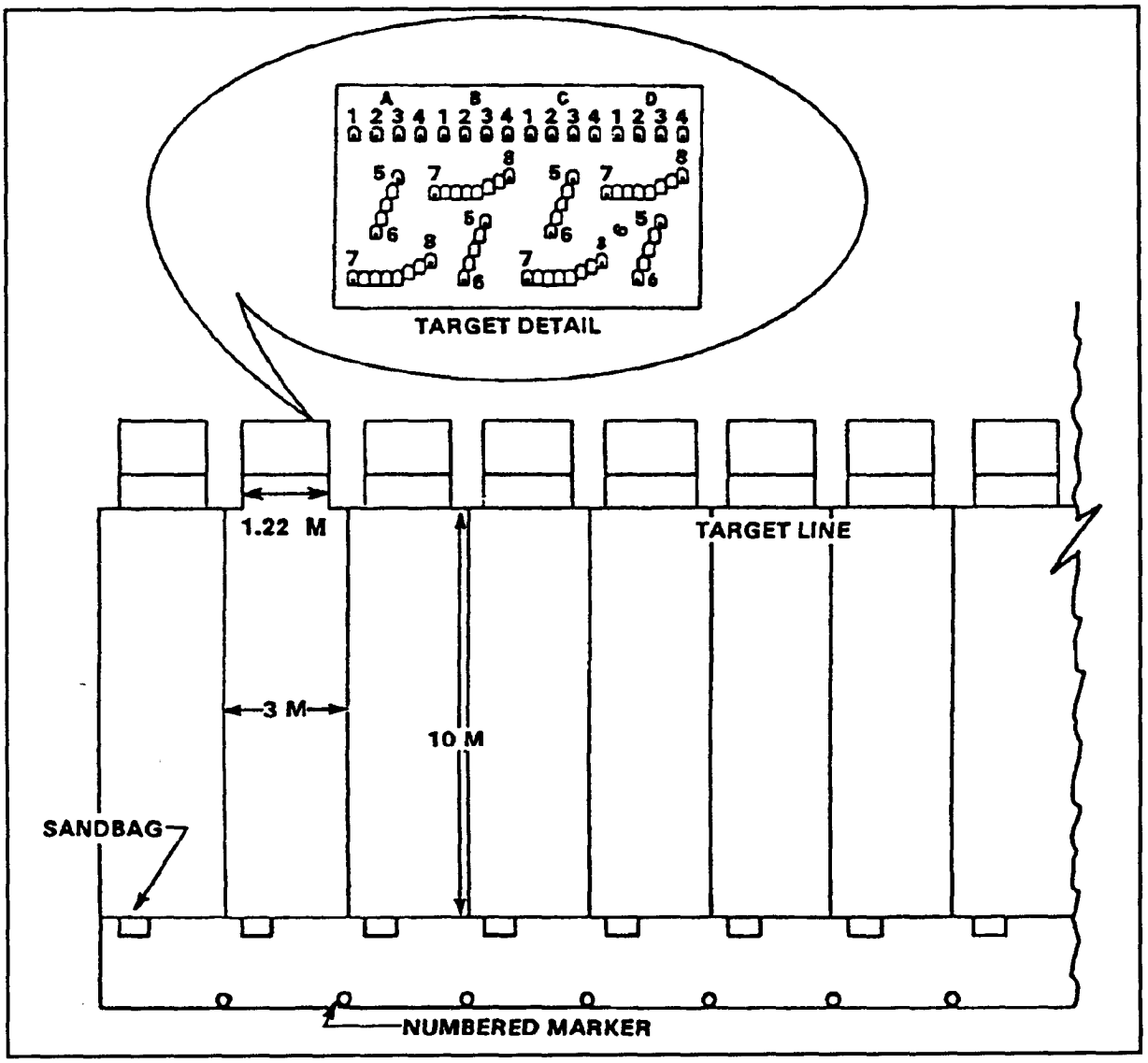
Additional Information: This range usually has 6 banks of targets at 200, 300, 400, 500, 600, 1000 yd. LOMAH can be installed for electronic downrange feedback.

The range is on terrain that, like the ARF range, slopes gradually downward approx 500 yd, then upward approx 500 yd.

RC units may use this range (modified KD course C fired at 200-yd firing line) for M16 qualification. Course C targets are standard E-type silhouettes.

Competitive marksmanship units use this range. Selected RC units may have to fire on a standard, alternate, or modified KD course C for qualification purposes when the KD range is not available.

Figure 6-9. Known-distance (KD) range



Use: Soldiers use this range to zero M60 and M2 machine guns and squad automatic weapon (SAW), to fire the 10 m portion of record fire, and to become familiar with weapon characteristics, noise, and recoil. They use this range to practice machine gun traversing and searching, to develop speed during operation, and to obtain an accurate burst. They can also zero M60 and M2 machine gun night vision devices.

Characteristics:

Number of firing positions – 20 lanes (if overlaid on 25 m zero range, use only 20 of 110 lanes).

Firing line width – at least 3 m/lane.

Target area width – 60 m at furthest target (10 m).

Firing point configuration – numbered markers on slightly elevated, sodded ground; brass deflectors between lanes.

Target configuration – machine gun, 10 m marksmanship targets (Fig B-30) stretched over a wood frame, one on each lane.

Associated facilities – standard facilities, public address system, bleachers.

References – FM 23-14, FM 23-65, FM 23-67.

Additional Information: Before building a new MG 10 m range, make every attempt to modify a 25 m rifle range for this use. Action will depend on the number of MG and the installation's other needs for range time. If range limits permit, this range may be used for 10 m firing of the M2. If using a 25 m range, lane width will be 4 m.

Figure 6-10. Machine gun 10-meter range

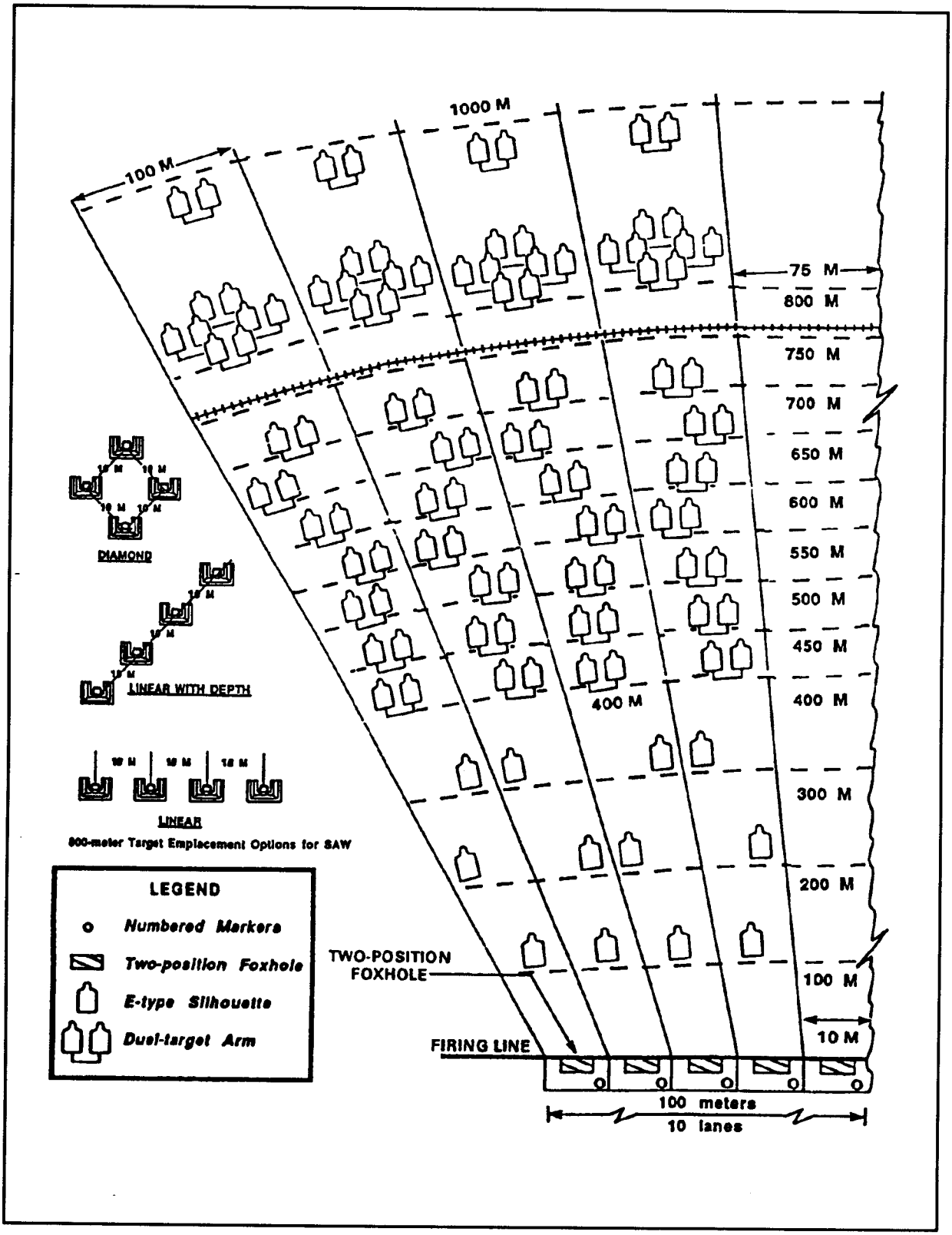


Figure 6-11. Multipurpose machine gun transition range

Use: This range is used in combination with the 10 m range. Gunners qualify with the M60 and M2 MG and SAW.

Characteristics:

Number of firing positions—10 lanes.

Firing line width—100 m (10 m/lane).

Target area width—100 m at furthest target (1000 m) for .50 cal; 70 m at furthest target (800 m) for M60 and SAW.

Firing point configuration—2 different configurations in each lane: the conventional ground mount or L-shaped MG position, and an armored personnel carrier cupola set over a 2 m deep hole.

Target configuration—all targets have electric elevating mechanisms. For the M60 MG, 8 double E-type silhouettes (Fig B-31) are in each lane between 400 and 800 m. Remaining 6 targets are 50 m apart between these 2 distances. For the M2 MG, 5 double E-type silhouettes are in each lane between 400 and 1000 m. Remaining targets are spaced 150 m apart between these 2 distances. For the SAW, add a single E-type silhouette at 100, 200, 300 m; convert the 400 m double E-type silhouette to a single E-type silhouette; add the 4-target array at 800 m. At 750-800 m there is a lightweight moving target system that can traverse both directions at varying speeds. Ensure target configurations and locations are in accord with applicable field manuals and circulars.

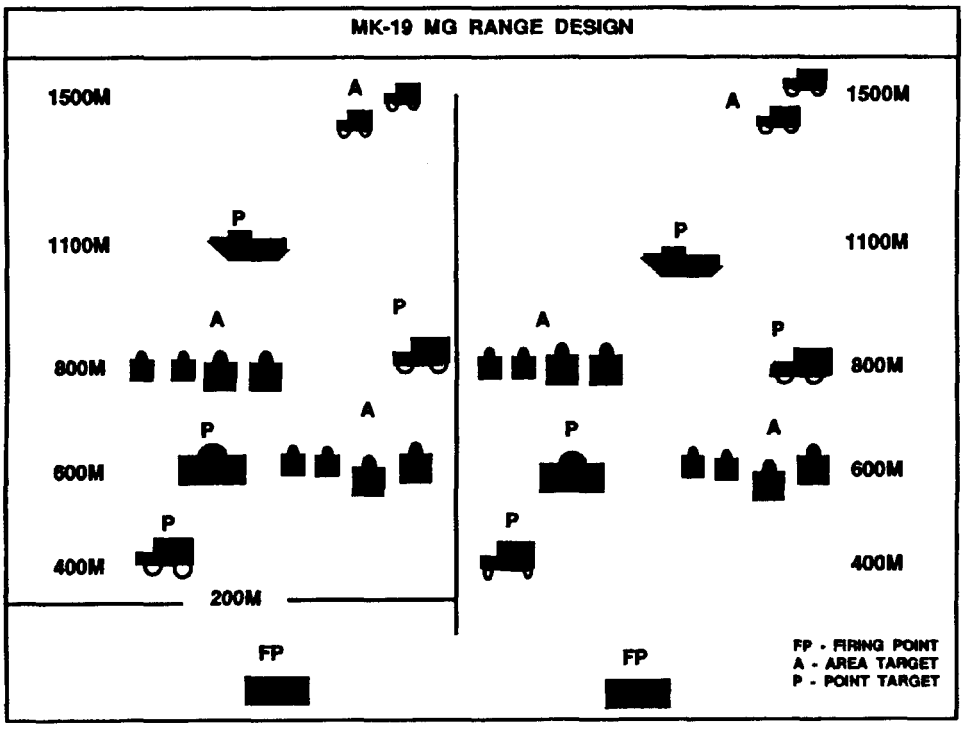
Associated facilities—standard facilities.

References—FM 23-14, FM 23-65, FM 23-67, CEHND 1110-1-15.

Additional Information: Installations can modify this range by adding light vehicle and bunker targets. They can use the modified facility for both M60 and .50-cal training. This eliminates the need for an MG field-firing range or a predetermined fire range.

All concurrent training stations are located 200 to 500 m from the firing range.

Figure 6-11. Multipurpose machine gun transition range (cont)



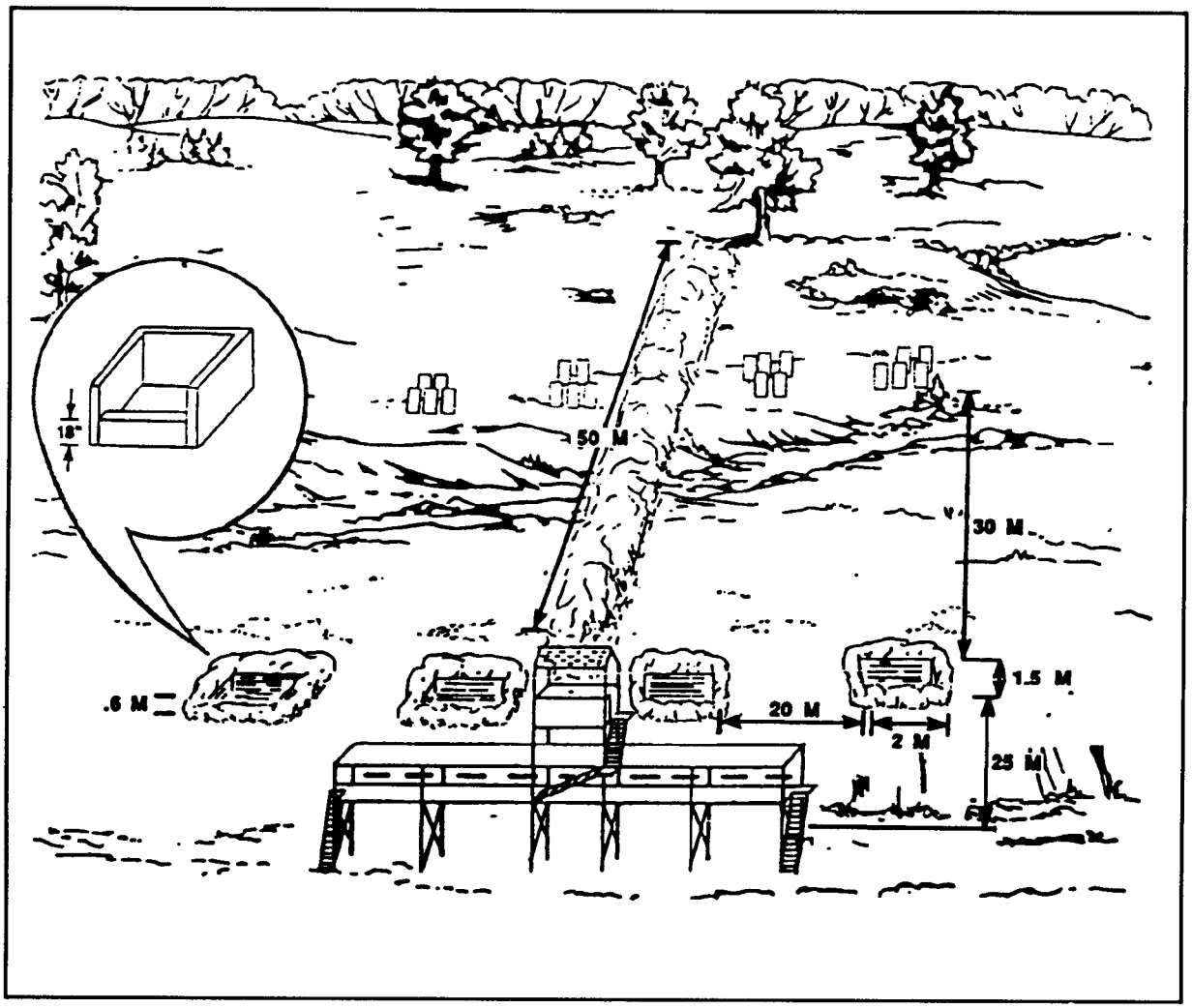
Use: Soldiers conduct qualification firing with the MK-19. They practice target observation, fire adjustment, machine gun traversing, searching, developing speed during operation, and obtaining an accurate burst. Soldiers can train with weapons on the ground or vehicle-mounted weapons.

Characteristics:

The size of the range depends on throughput. Minimum range design will start with 2 lanes.

Firing lane width—200 m; depth—1500 m with 20 m between lanes.

Figure 6-12. Multipurpose gunnery range (MK-19)



Use: Soldiers use this range to become familiar with the employment of live hand grenades.

Characteristics:

Number of firing positions—4.

Firing line width—80 m (20 m/lane).

Target area width—80 m at furthest target (30 m).

Firing point configuration—finished pit with berm in front and to sides that reaches shoulder level of soldier standing erect. Rear berm is knee-high.

Target configuration—4-5 sand-filled, 50-gal drums for each position.

Associated facilities—standard facilities; control tower 25 m behind firing line; facilities with viewing ports that permit soldiers to see effects of a grenade.

Reference: FM 23-30.

Additional Information: Pits are 2 m X 1.5 m and, if desired, may be finished with concrete block, poured concrete, or log walls. An earthen berm is erected on four sides.

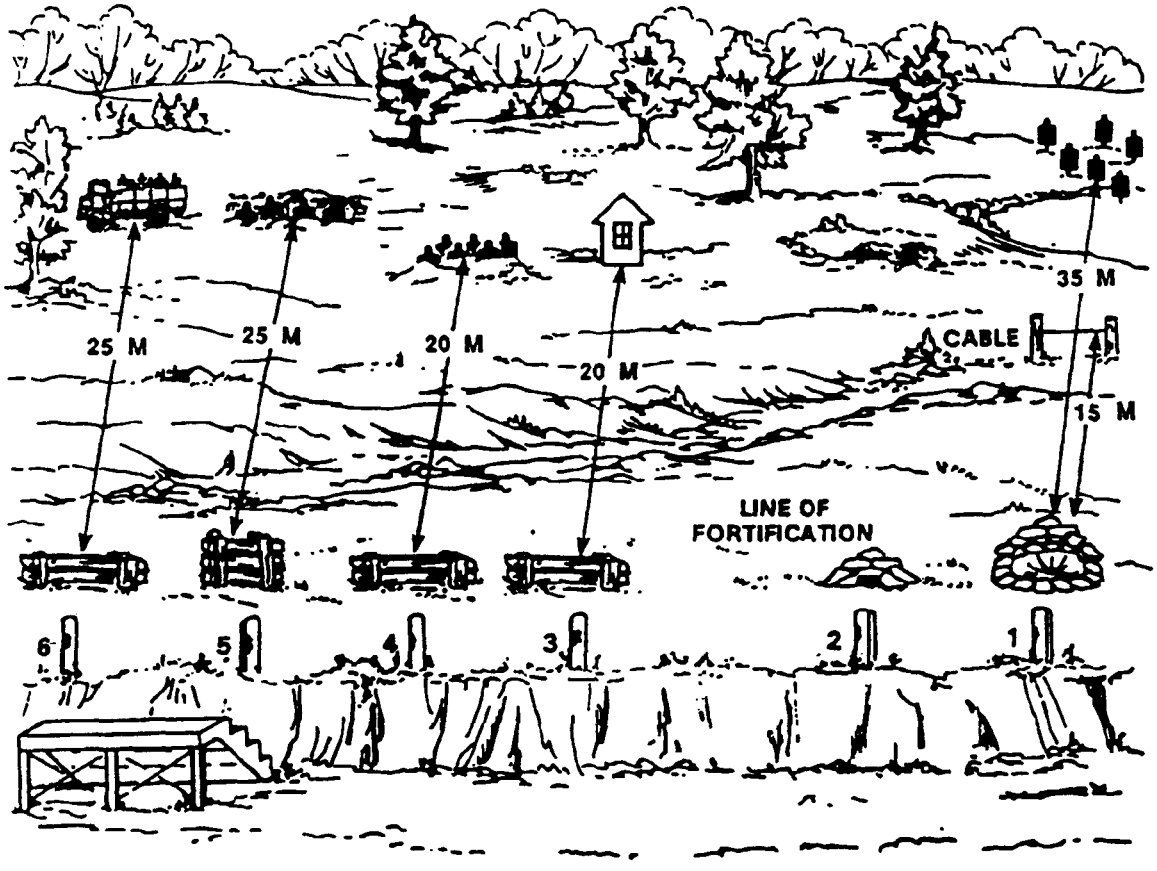
Steel, concrete, or wooden revetments or earthen berms 1.8 m high should separate at least two of the bays from the other two and extend out 50 m. This permits practice to continue on half the range if a dud occurs. Ideally, such dividers will separate all four bays.

Only the instructor and one soldier will be in a bay at one time.

Sand-filled drums provide an aiming point for the soldier as he throws the grenade.

The control tower must be tall enough and close enough to permit the range safety officer to observe what is happening in each pit.

Figure 6-13. Hand grenade familiarization range



Use: On this range soldiers learn to tactically employ hand grenades and receive a qualification rating. Soldiers also become familiar with the grenade's delay action.

Characteristics:

Number of firing positions – *6 stations.*

Firing line width – 125 m.

Target area width – 125 m at furthest target (30 m).

Firing point configuration – log walls, throwing position markers, foxholes.

Target configuration – foxholes, trench, a window, a bunker, a truck silhouette, an area of personnel E-type silhouette targets.

Associated facilities – standard facilities.

Reference – FM 23-30.

Additional Information: Stations must be at least 25 m apart for maximum efficiency and safety. Operations must stop whenever participants are forward of throwing lines.

Station 1 is a fighting position and a cluster of E-type silhouettes 35 m from the fighting position. A cable (4.5 m high) is suspended across the width of the field, 15 m from the throwing position.

Station 2 is a bunker with a 30 c sq aperture.

Station 3 is a low log wall and a window target 20 m from wall.

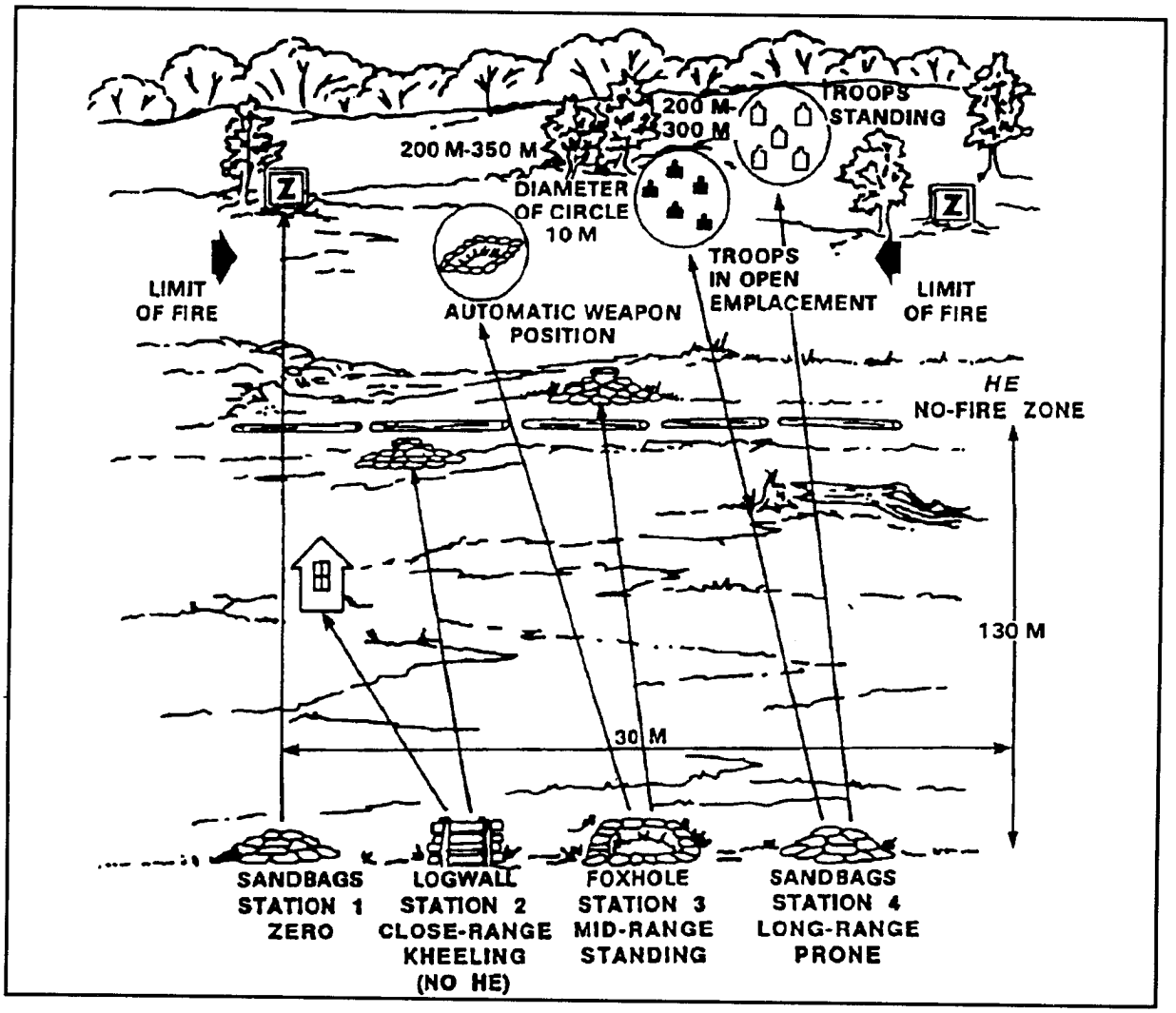
Station 4 is a low log wall and a cluster of E-type silhouettes behind cover 20 m from wall.

Station 5 is a chest-high log wall and a foxhole 5 m from wall.

Station 6 is a log wall and a 2½-ton open vehicle with E-type silhouettes in it, 25 m from wall.

This range may also be used as a hand grenade cookoff and impact course by setting up a number of area target stations. Soldiers can practice aiming and throwing with delays on this modified range as long as proper training practice grenades are matched to correct tactical target situations.

Figure 6-14. Hand grenade qualification course (nonfiring)



Use: This range is used to teach grenade launcher firing techniques, to qualify grenadiers, and to prepare grenadiers for combat situations. This range will accommodate M203 and M79 grenade launchers.

Characteristics:

Number of firing positions – 4 stations.

Firing line width – 120 m (30 m/lane).

Target area width – 120 m at furthest target (350 m).

Firing point configuration – log wall, sandbags, foxhole; a clearly marked, no-HE fire zone out to 130 m.

Target configuration – static E- and F-type silhouettes (Fig B-11, B-12) and locally produced bunkers, fortifications, and zero targets.

Associated facilities – standard facilities.

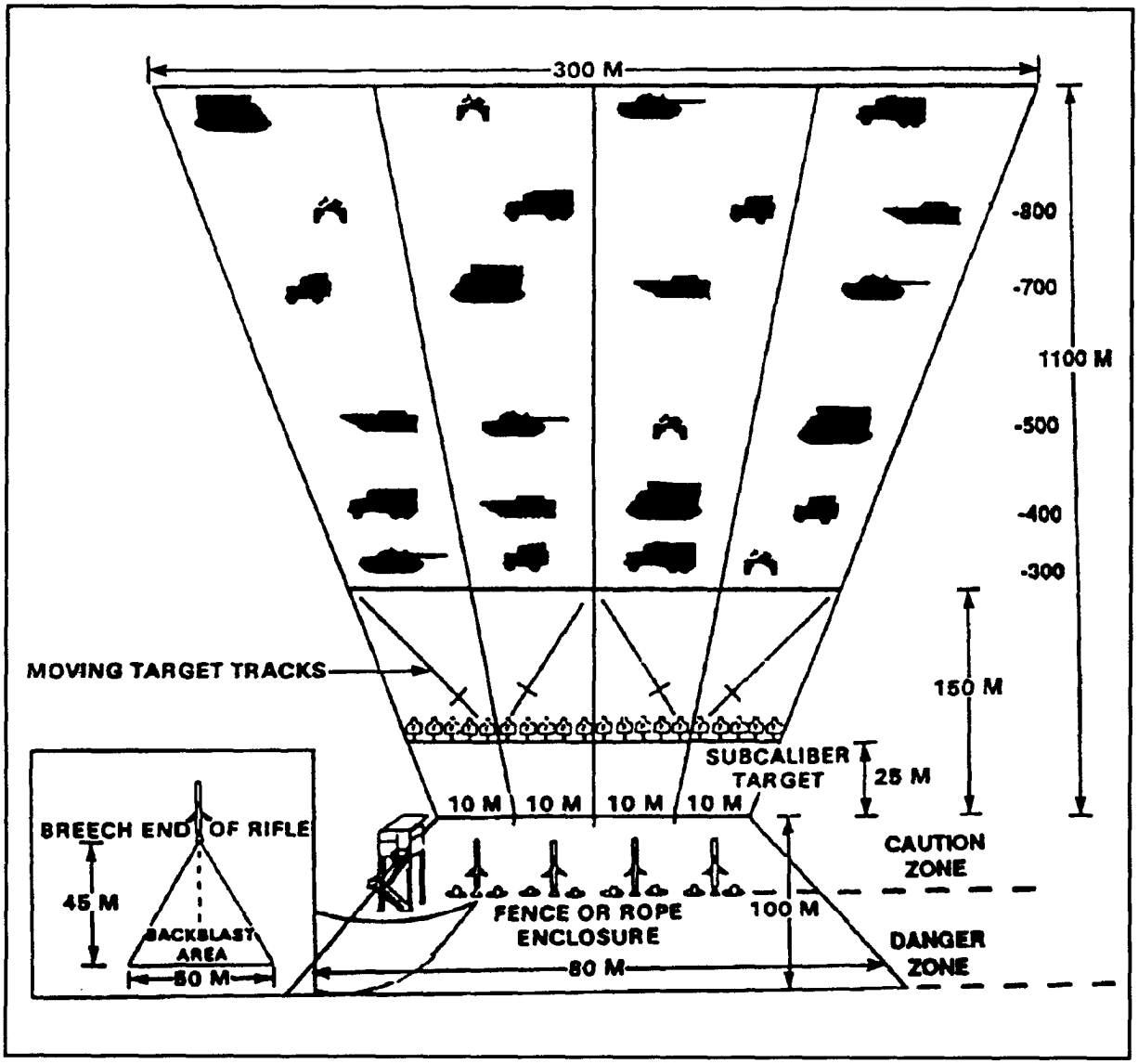
References – FM 23-31, STP 21-1-SMCT.

Additional Information: Zero targets are at least 2 m high and 2 m wide. Zero targets are clearly marked with a large contrasting "Z." They are located 200 m from the firing line. A window or door target is 90-100 m from the firing line. A small bunker is at 125 m and a simulated 2-man bunker at 150 m. An automatic weapons position is at 175 m. Area targets simulating personnel are 250-350 m from the firing line.

Targets are made of long lasting, durable material that can withstand constant use with little maintenance. For example, salvaged oil drums filled with sand make excellent semipermanent target material for this range.

CAUTION: HE ammunition may not be fired on Station 2 because of fragmentation hazard.

Figure 6-15. Grenade launcher range



Use: On this range, soldiers learn skills needed to defeat armored targets with recoilless rifles.

Characteristics:

Number of firing positions—4 points.

Firing line width—40 m (10 m/position).

Target area width—300 m at furthest target (1100 m).

Firing point configuration—large fenced or roped area divided into danger and caution zones.

Target configuration—static F-type silhouettes (Fig B-12), moving target for subcaliber fire, hard targets 150-1100 m from firing line.

Associated facilities—standard facilities.

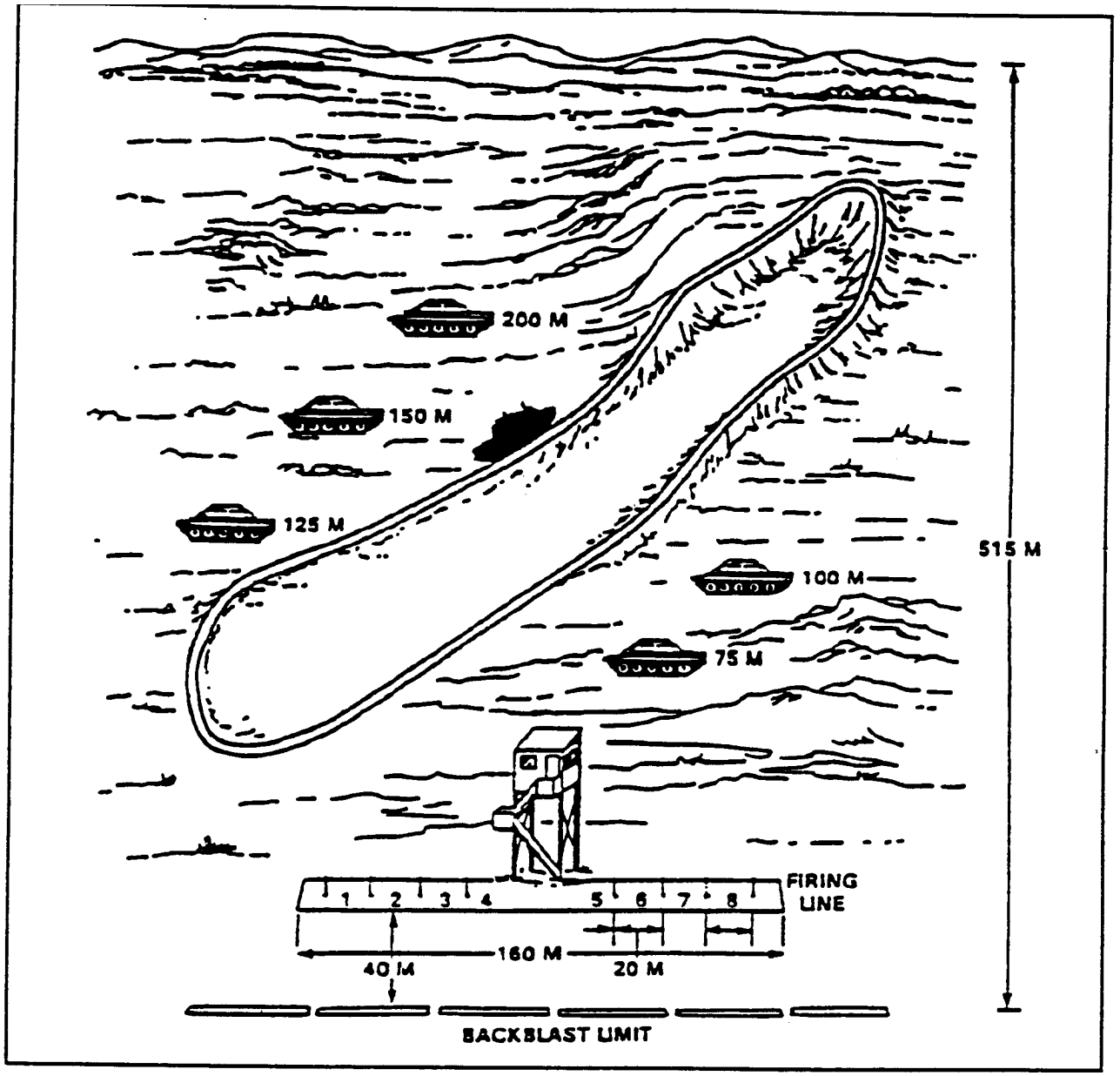
Reference—FM 23-11.

Additional Information: The backblast danger area for 90mm and 106mm recoilless rifles is a triangle with its apex at the breach end. It extends 45 m to the rear of the firing point and is 50 m wide at the base.

For subcaliber firing, attach F-type silhouettes to stakes and place them in the target area (5 targets for each rifle). Attach a 25 m rifle target to each silhouette for the 90mm rifle (Fig B-32, B-33). Attach a 50-ft slow-fire pistol target to each silhouette for the 106mm recoilless rifle (Fig B-18). Place the moving target 25 m from the firing line to practice target-leading techniques.

Place hard targets for the 106mm recoilless rifle at the following known ranges: 300, 400, 500, 700, 800, 1100 m. Place 3 other hard targets 150-450 m for the 90mm recoilless.

Figure 6-16. Recoilless rifle (90mm and 106mm) range



Use: On this range, soldiers learn skills needed to defeat armored vehicles with light antitank weapons. They also use the range for subcaliber exercises.

Characteristics:

Number of firing positions—8 points.

Firing line width—160 m (20 m/lane).

Target area width—275 m at furthest target (200 m).

Firing point configuration—5 stationary vehicle targets at 75, 100, 125, 150, 200 m; moving vehicle target engagements 100-200 m.

Associated facilities—standard facilities, water points, public address system.

Reference—FM 23-33.

Additional Information: The backblast danger area for the LAW is a triangle with its apex at the rear of the launcher. It extends 40 m to the rear of the firing point and is 38 m wide at the base of the triangle.

This range can be adapted to use MILES.

*Due to safety considerations, the backblast area for the 84mm M136 AT4 HEAT round has been extended from 60 to 100 m. The new backblast area applies to any range used for firing the weapon. Particular attention must be given when firing the AT4 on a standard LAW range since the backblast area for the M72 HEAT round is only 40 m. The area must be adjusted to support AT4 firing.

Figure 6-17. Light antitank weapon (LAW) M72 range

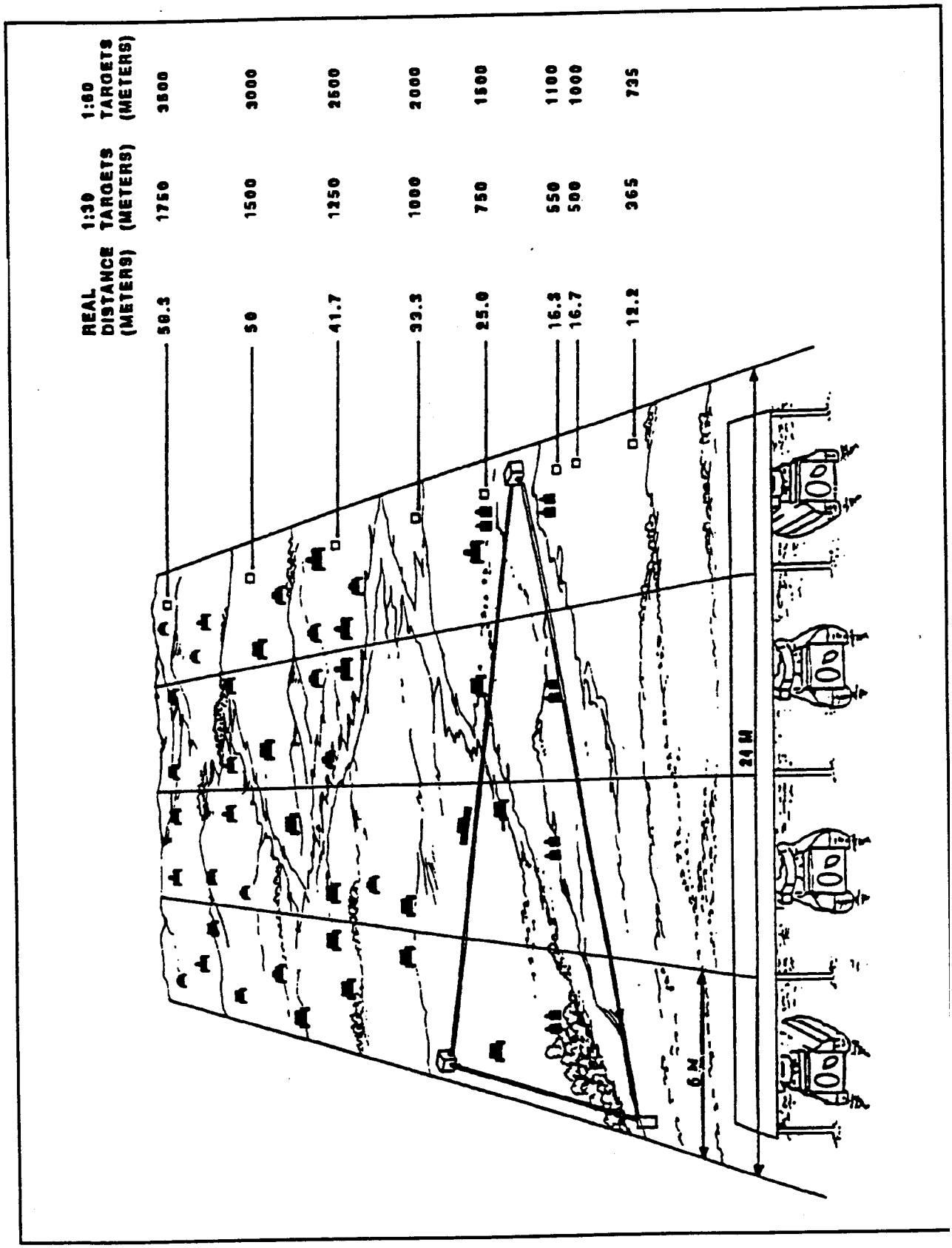


Figure 6-18. Scaled range, 1:30 and 1:60 scale

Use: Crews zero BFV weapons and adjust fire on stationary and moving targets using temporary and portable devices (BFVsubcaliber Tables I, II, III). The RC uses the range for tank training. Laser gunnery devices may be used. Either .22-cal or 5.56mm ammunition may be fired from stationary vehicles in a degraded gunnery mode. The range also accommodates fire-control exercises.

Characteristics:

Number of firing positions—4.

Firing line width—24 m (6 m/position).

Target area width—24 m at furthest target (58.3 m).

Firing point configuration—slightly lowered firing point in relation to target area (to reduce parallax).

Target configuration—an average of 10 vehicle targets per lane on a slightly raised impact area.

Associated facilities—standard facilities.

Reference—FM 23-1.

Additional Information: This range may be used by CEV crews for zeroing of weapons and adjustment of fire (CEV Tables I, II, III).

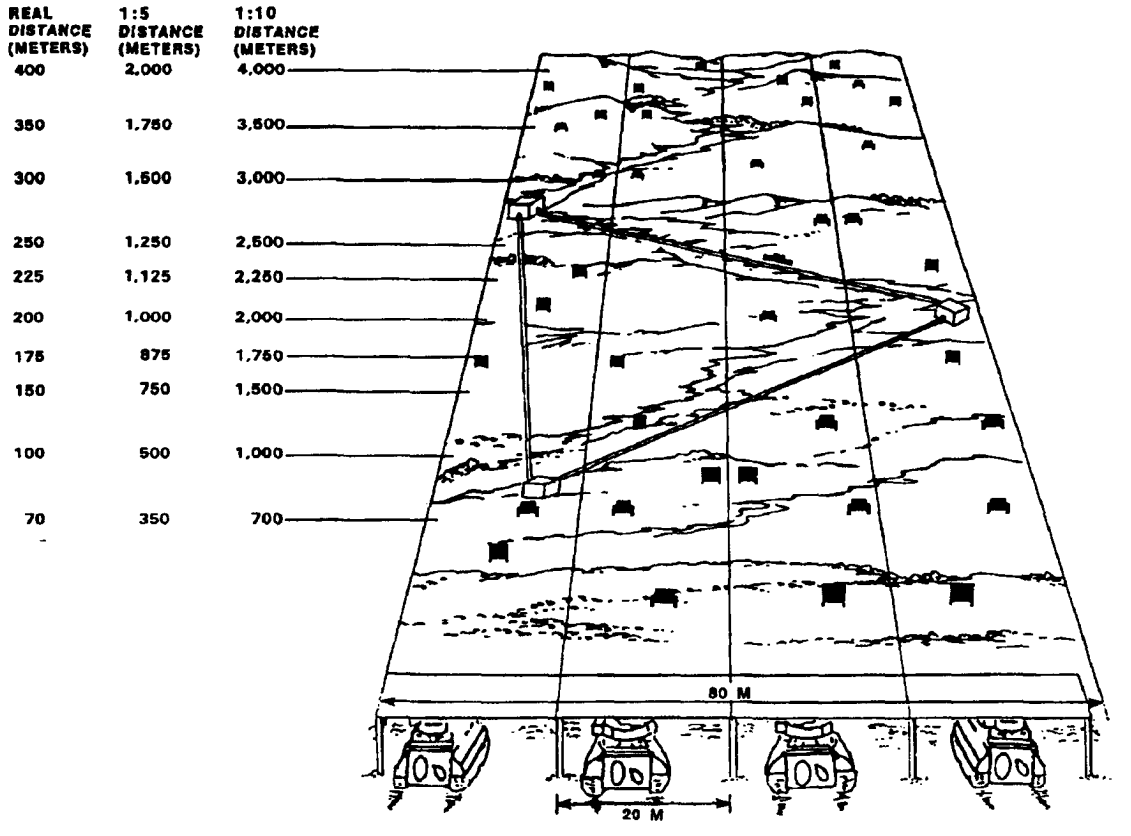
Two sets of targets allow mid-range engagements at 1:30 and long-range engagements at 1:60.

Requirements for Tables III, IV, and V are satisfied by using two moving target mechanisms. Moving target mechanisms are placed 12.2 - 27.6 m from the firing line in three arrays.

Many RC units have only two or three tanks at home stations. For this reason, they are required to have only as many firing points as necessary.

Significant training benefits from subcaliber training on this range include manipulating turret and gun controls, firing the main gun while tracking a moving target, interacting with other crew members, reacting to fire commands, identifying targets, and laying cross hairs for the main gun quickly and precisely on target.

Figure 6-18. Scaled range, 1:30 and 1:60 scale (cont)



Use: On this permanent facility, crews exercise all BFV fire-control systems. The RC uses it to exercise tank fire-control systems. It also serves subcaliber exercises using 5.56mm rifle and subcaliber mount.

Characteristics:

Number of firing positions – 4.

Firing line width – 80 m (20 m/position).

Target area width – 80 m at furthest target (400 m).

Firing point configuration – slightly lowered firing point in relation to target area (to reduce parallax); covered firing points.

Target configuration – frontal view stationary targets; an average of 10 vehicles per lane on slightly raised impact area.

Associated facilities – standard facilities.

References – FM 17-12, FM 23-1.

Additional Information: Two sets of targets allow both mid-range engagements at 1:5 scale and long-range engagements at 1:10 scale. A mechanism comparable to the M31A1(infantry E-type silhouette elevating mechanism) is required for stationary pop-up engagements.

Permanent 1:5 and 1:10 scaled moving systems must be designed especially for this range.

This range requires an impact area of 3600 m for 5.56mm ammunition and 5300 m for 7.62mm ammunition.

Figure 6-19. Scaled gunnery range, 1:5 and 1:10 scale

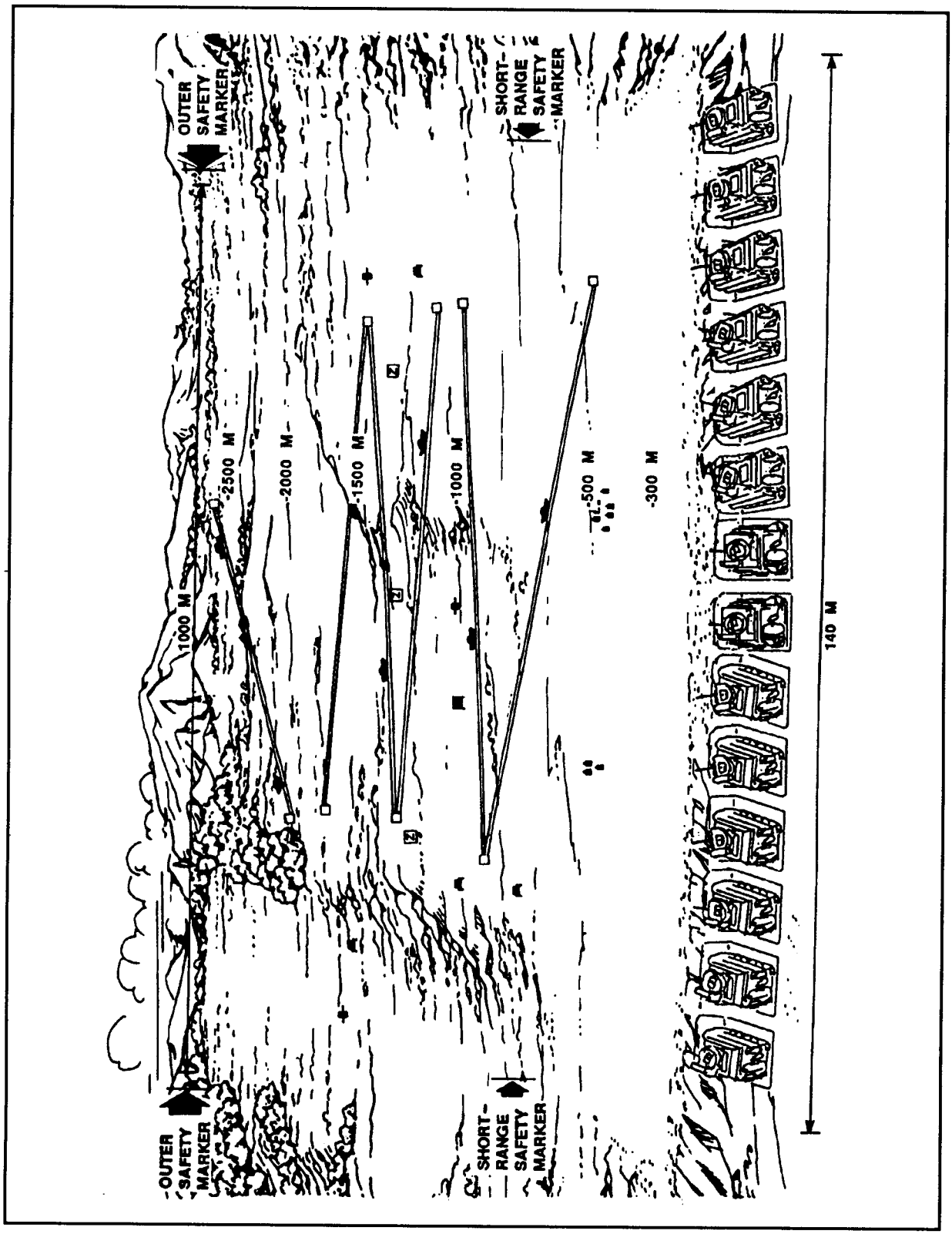


Figure 6-20. Stationary gunnery range

Use: On this range, crews train to rapidly engage and destroy targets during both day and night exercises (Tank and BFV Tables VI). Crews also may conduct subcaliber exercises against targets in tactical array. All exercises on this range are conducted in stationary vehicles.

Characteristics:

Number of firing positions—14 points.

Firing line width—140 m (10 m/position).

Target area width—1000 m at furthest target (2500 m).

Firing point configuration—hull-down firing position, turret-down firing position. Defilade position should be adjusted according to site-specific conditions.

Target configuration—4 moving vehicle targets on diagonal tracks at 1000-1200, 1200-1400, 1400-1600, 1800-2500 m (vehicle at 1800-2500 m varies, depending on whether BFV is using AP or TP-T).

Associated facilities—standard facilities, staging area.

References—FM 17-12, FM 23-1, CEHND 1110-1-16 (draft).

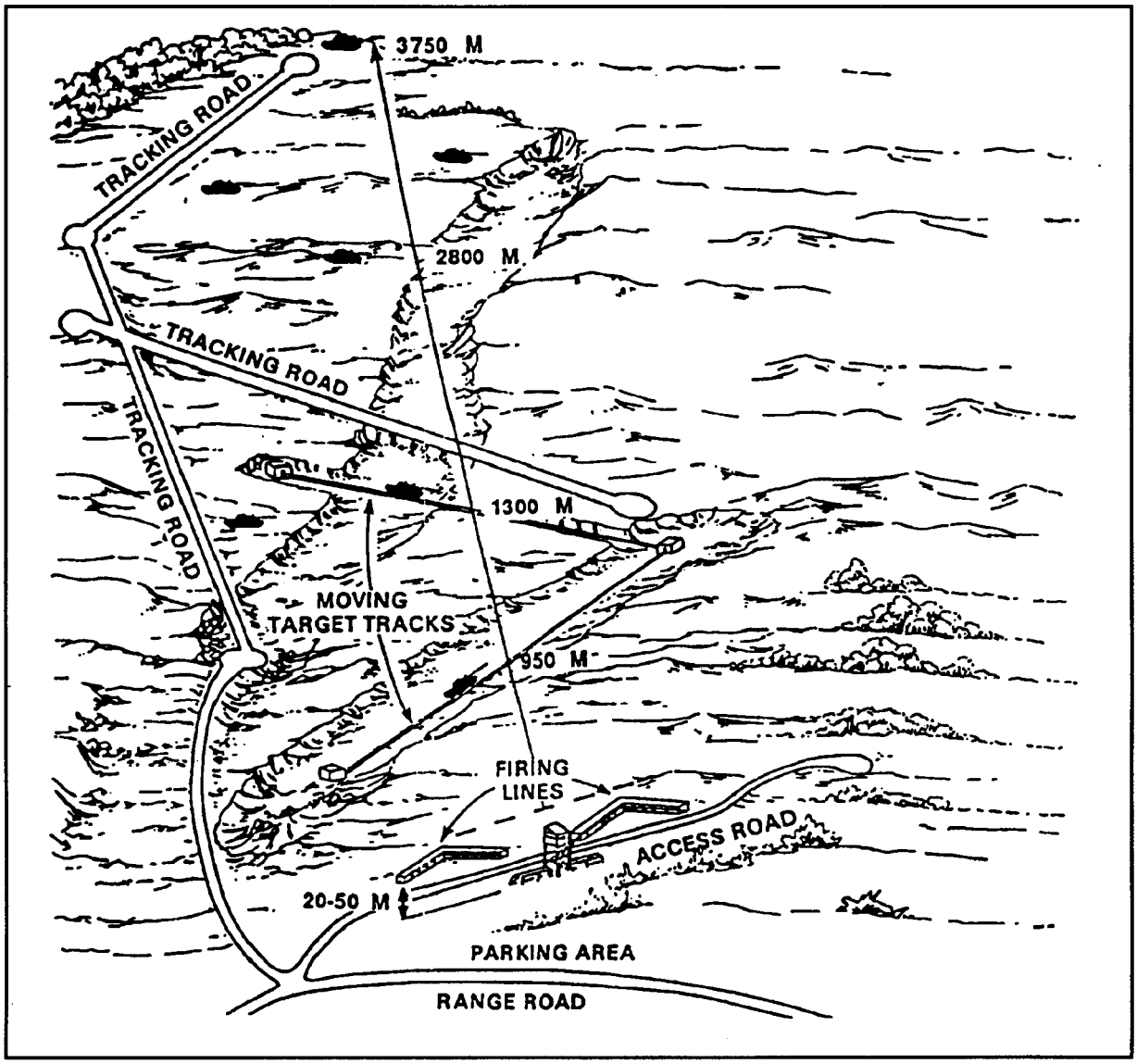
Additional Information: This range may be used for direct fire of field artillery weapons. Personnel in the control tower can control the range from behind the firing line; that is, they can present various tactical scenarios and stop or delay the action at any time.

Moving target systems, exposed 20-22 seconds, move at speeds up to 25 MPH.

Whenever possible, target mechanisms are set up to provide visibility from 2 or more firing positions.

If scheduling permits, Tank and BFV Tables VI also may be accomplished on the MPRC.

Figure 6-20. Stationary gunnery range (cont)



Use: On this range soldiers learn the techniques of engaging targets with medium and heavy antiarmor weapons. They also use it for field tracking exercises and for qualification exercises with tracking and launch effect trainers.

Characteristics:

Number of firing positions—20 points (2 firing lines, 10 points on each line).

Firing line width—50 m.

Target area width—1000 m.

Firing point configuration—2 raised firing lines; 10 firing positions on one and 10 vehicle positions on the other.

Target configuration—2 moving target tracks, 3 tracking roads; 4 stationary targets.

Associated facilities—standard facilities, ammunition point with overhead cover.

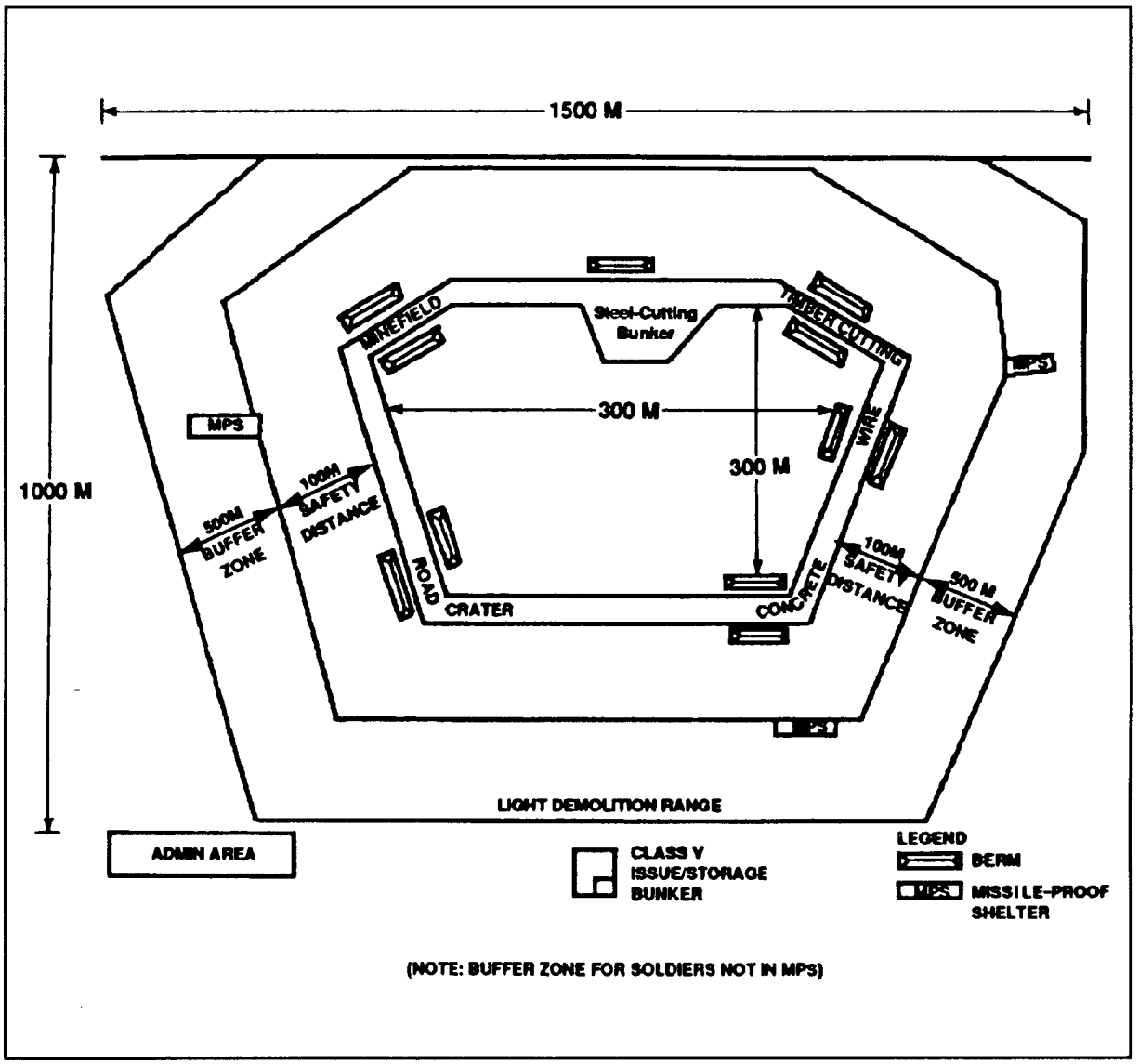
References—FM 23-34, TC 23-24, CEHND 1110-1-16 (draft).

Additional Information: Tracking roads must support any wheeled or tracked vehicle. Turnaround, crossover pads are concrete. Cover and enclose concurrent training sites.

The range has two moving target tracks with centers at 950 and 1300 m. Tracks are 300 m long. Four targets are located 2800-3750 m from the firing line.

Use only training ammunition on this range.

Figure 6-21. Antiarmor tracking and live-fire range



Use: The light demolition range is used to execute the following missions: steel cutting, timber cutting, breach with a bangalore torpedo, breach with hand-emplaced explosives, breach concrete obstacles, breach log obstacles, and create a crater.

Characteristics:

Explosive limit—200 lb at the road crater site. Site must be refilled after each use.

Wire obstacle width—7 m; length—20 m. Use 1 bangalore kit to breach the obstacle.

Minefield width—10 m; length—20 m. Mines may be placed on the surface or buried.

Steel-cutting chamber has a ledge to mount steel or concrete beams. Steel and concrete beams vary in width and length.

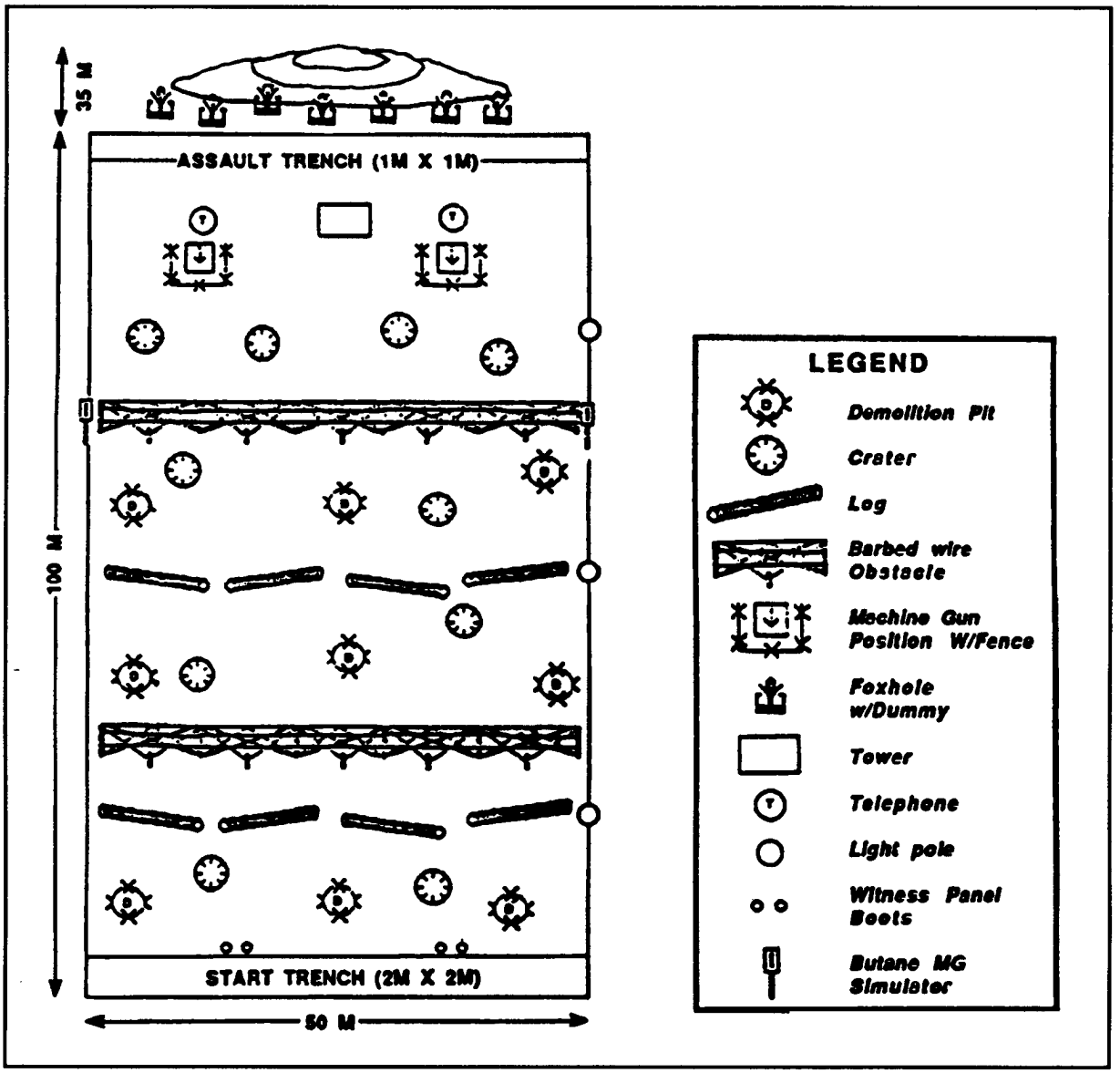
Timber-cutting site—10 m wide, 35 m long. There are 8 concrete base supports (4 on each side of road) for placement of logs. Poles should be no larger than 36 c in diameter nor taller than 10 m. Charges should be placed to prevent damage to the concrete base.

The concrete obstacle is constructed with concrete cubes or tetrahedrons. It is 10 m X 30 m.

Associated facilities: Administrative area, ammunition storage/breakdown area, 3 missile-proof shelters.

References: FM 5-25, FM 5-34, FM 5-102, FM 20-32.

Figure 6-22. Light demolition range



Use: This range conditions soldiers to move under live fire. It also simulates combat conditions.

Characteristics:

Number of firing positions—2 points.

Firing lane width—50 m.

Target area width—NA.

Firing point configuration—2 fixed machine gun positions.

Target configuration—NA.

Associated facilities—control tower, concurrent training station, utility building, demolition bunkers, salvage walls (at right and left limits of fire).

Additional Information: Construct surface danger fans for each machine gun; establish firing procedures and overhead clearance of personnel IAW DA Pam 385-XX.

When the range is first opened, conduct test firings on each machine gun. Then conduct test firings prior to each scheduled use of the range to determine dispersing pattern. It is essential that the lowest recorded shot clear personnel by the required height of 2.5 m. Secure machine gun to prevent movement during firing. Use machine gun traverse and elevating stops to prevent firing beyond the right and left limits of fire or below minimum elevations.

This range is primarily used for basic training at Army training centers.

Figure 6-23. Infiltration course

Use: Soldiers use this range to become accustomed to carrying a rifle with fixed bayonet through obstacles and immediately using the bayonet when necessary.

Characteristics:

Number of lanes—4 minimum.

Firing line width—10 m minimum per lane.

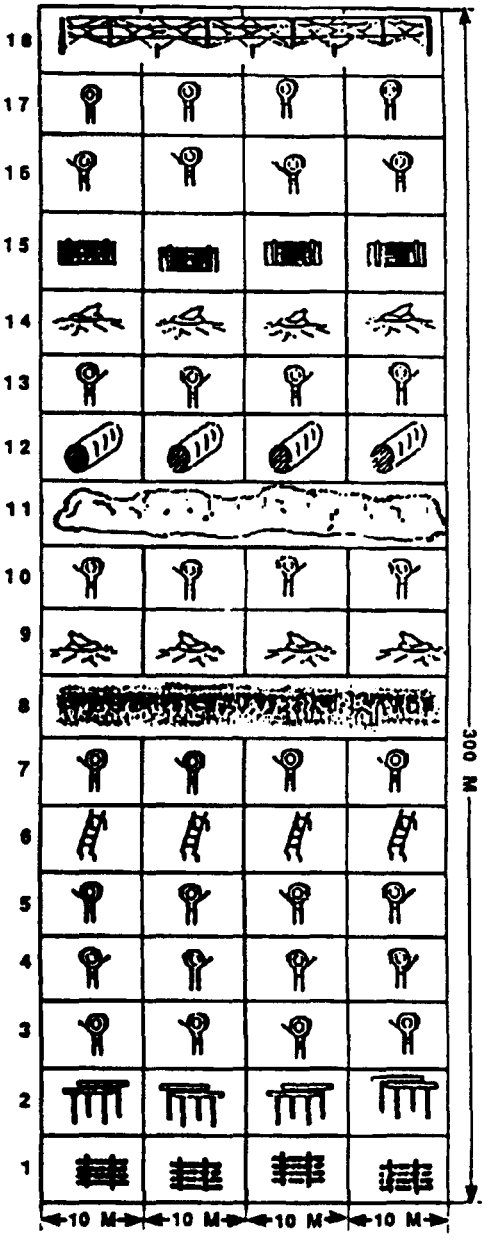
Target area width—NA.

Firing point configuration—NA.

Target configuration—NA.

Associated facilities—standard facilities.

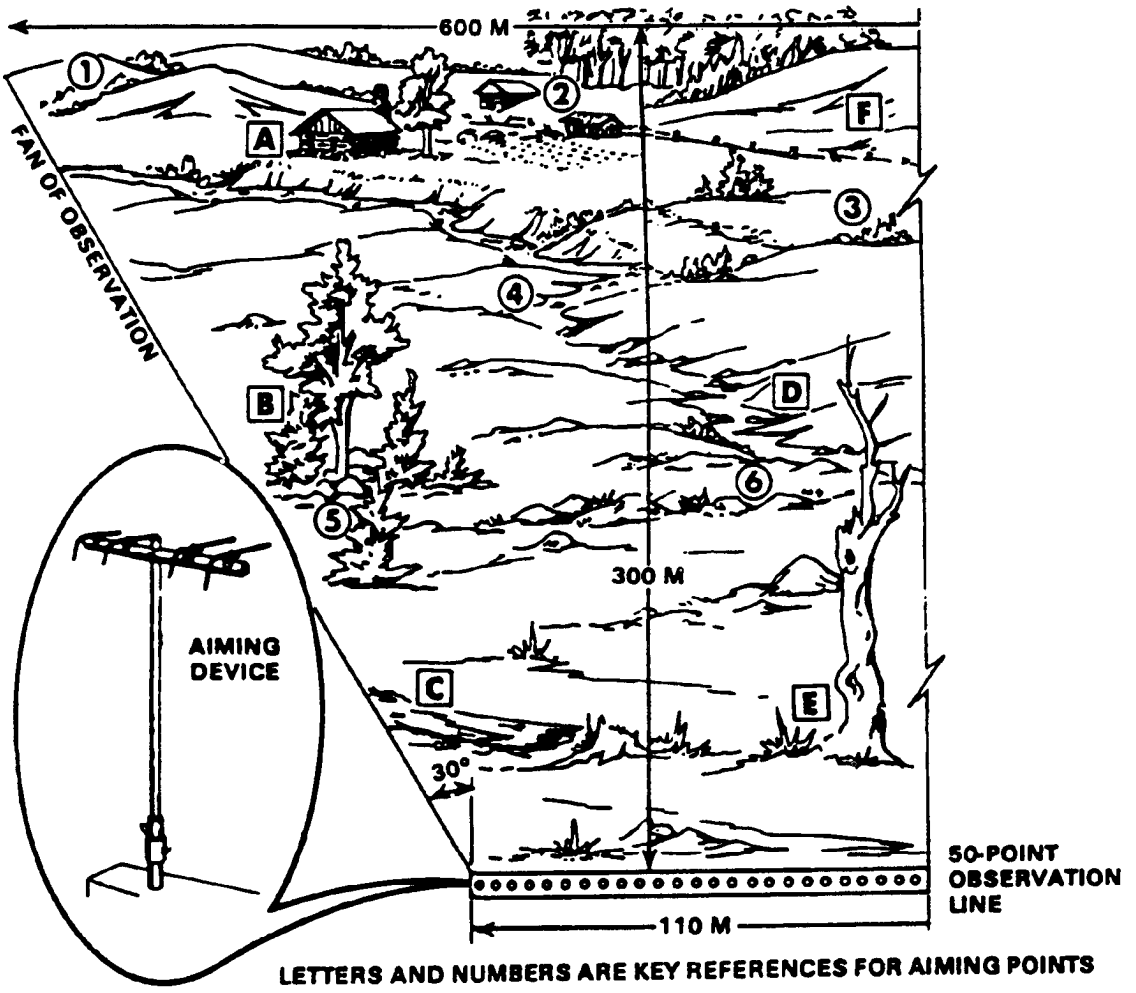
Additional Information: Course is about 300 m long with minimum of 18 events per lane. There is a minimum of four lanes; terrain available and the number of soldiers that must go through the course dictate the number of lanes.



OBSTACLE NUMBER, NAME, AND PROCEDURE

1. LONG WALL - CRAWL OVER
2. HURDLES - JUMP OVER
3. PARRY LEFT THRUST
4. PARRY RIGHT - BUTT STROKE TO GROIN
5. PARRY THRUST (SLASH OPTIONAL)
6. LOG BALANCE & HORIZONTAL LADDER
7. PARRY LEFT - BUTT STROKE TO HEAD
8. DITCH-JUMP DITCH
9. PRONE TARGET IN CRATER
10. PARRY THRUST (SLASH OPTIONAL)
11. DIRT MOUND - CRAWL OVER
12. TUNNEL CRAWL
13. PARRY RIGHT, THRUST
14. PRONE TARGET IN CRATER
15. FENCE VAULT
16. PARRY LEFT/RIGHT - BUTT STROKE TO GROIN
17. THRUST
18. DOUBLE APRON BARBWIRE FENCE, INVERTED CRAWL (PRONE)

Figure 6-24. Bayonet assault course range



Use: On this range soldiers learn to detect personnel on the battlefield under varying degrees of mobility, concealment, and visibility.

Characteristics:

Number of firing positions – 50 points.

Observation line width – 110 m (2 m/position).

Target area width – 600 m at furthest target (300 m).

Observation point configuration – marked points with locally fabricated aiming devices.

Target configuration – 14 numbered panels as reference points for locating target and 7 lettered panels for marking visual targets.

Associated facilities – standard facilities.

Reference – FM 23-9.

Additional Information: Natural vegetation is required in the target area. The paths of travel for target operations are concealed from the observation line.

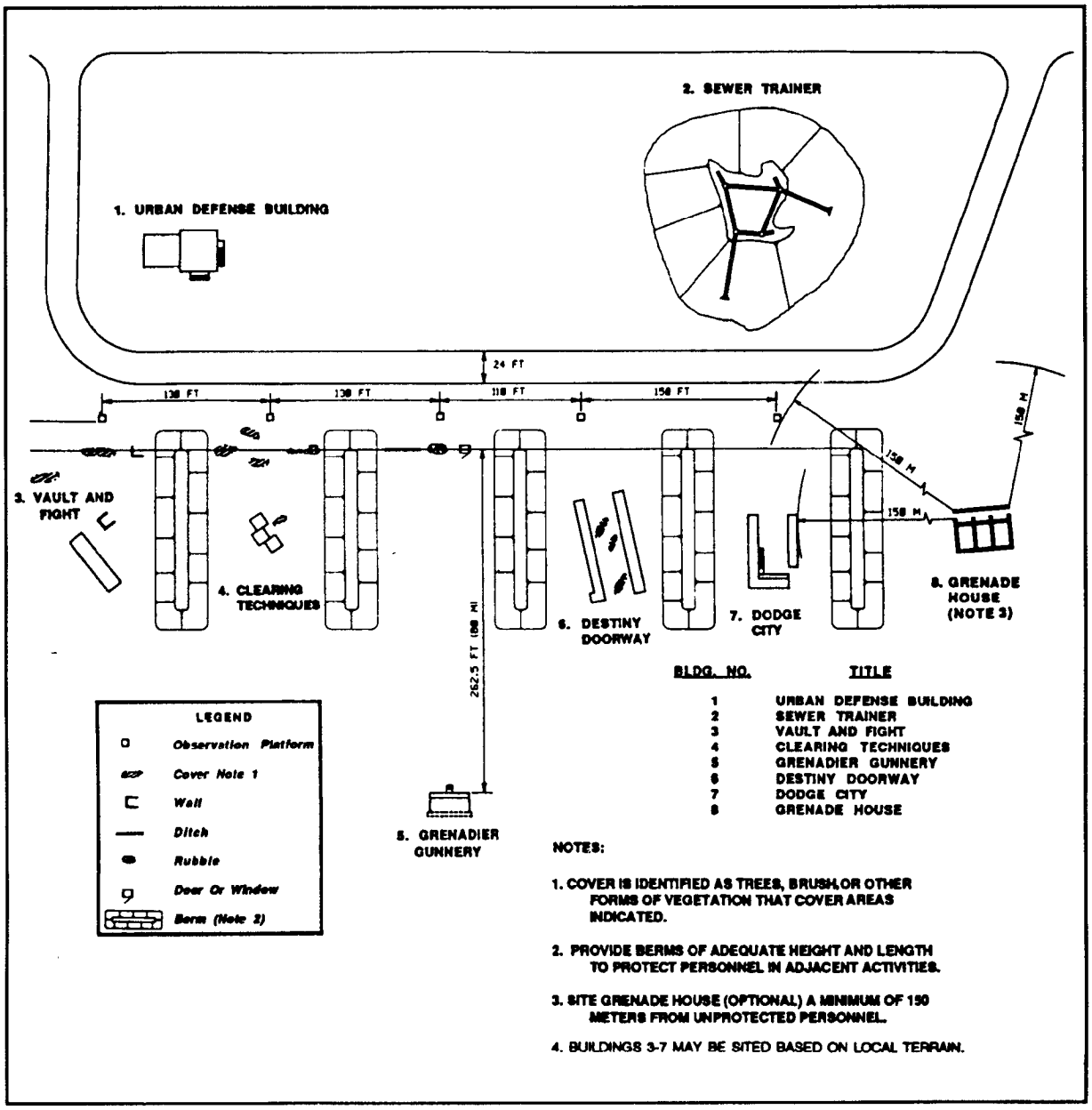
Location of the panels, sound system, and target operators depends on visibility from the observation line.

Panels are constructed to be raised or lowered for individual target identification.

With a 300 m depth, this range needs about 150 stakes for target events.

If standard target detection ranges are unavailable, the principles of this range can be applied to parks, fields, or other areas having suitable vegetation.

Figure 6-25. Target-detection (TD) range (nonfiring)



Use: This range facility is used for individual and low-level collective training using live-fire or MILES.

Characteristics:

Number of firing positions – 8 training structures.

Firing line width – 20 m between training structures.

Target configuration – course should be site-adapted.

Associated facilities – standard facilities.

References – FM 90-10(HTF), FM 90-10-1(HTF), ARTEP 7-20-MTP, CEHND 1110-1-7.

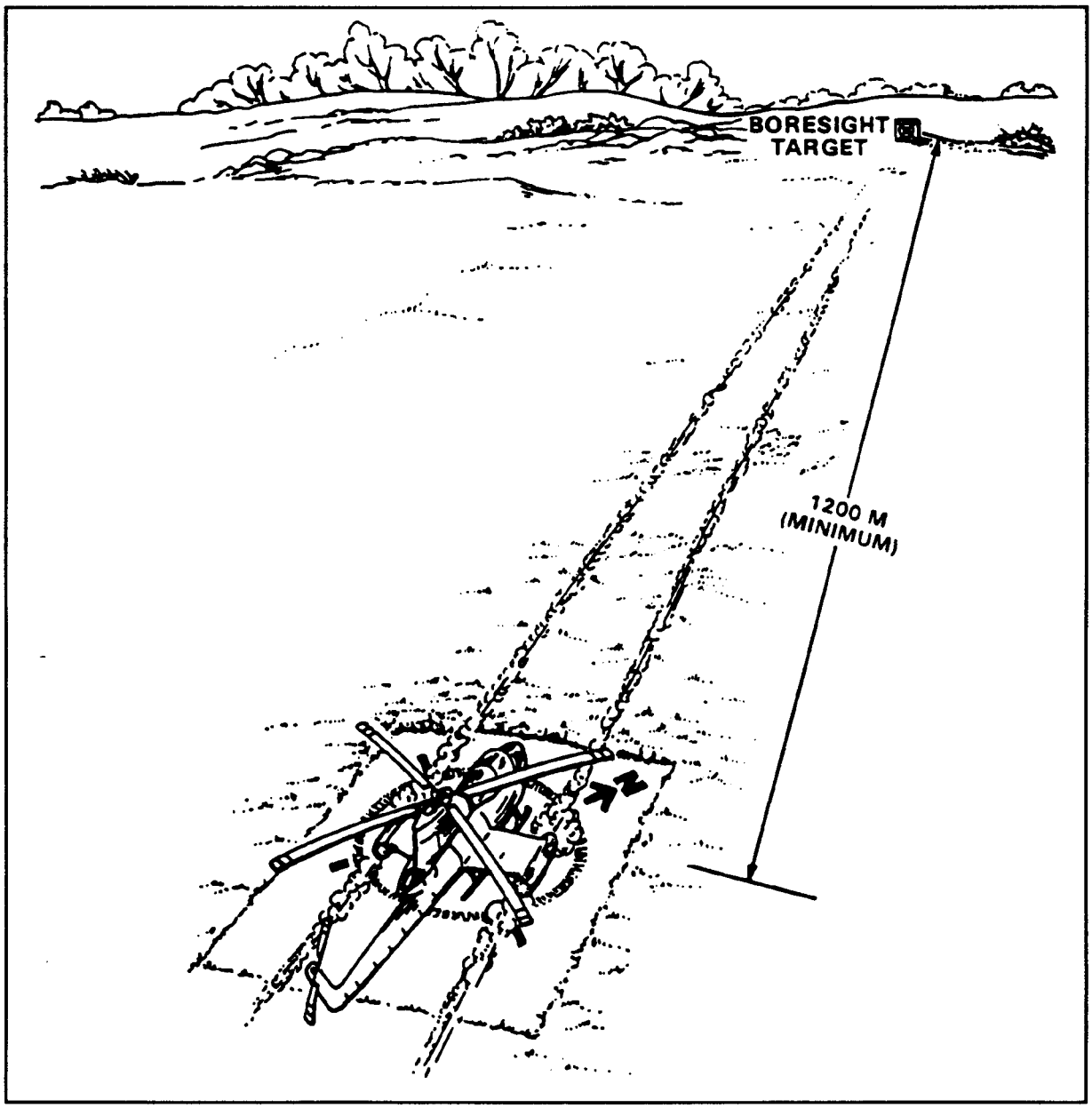
Additional Information: Each training structure supports one or more individual/low-level collective tasks.

Vegetation should be left natural. Course preferably is located adjacent to an impact area or surface danger zone.

Site the grenade house a minimum of 150 m from unprotected personnel (see AR 385-63).

Low-level collective skill proficiency is attained in this range facility before advancing to the MOUT collective training facility.

Figure 6-26. Military operations on urbanized terrain (MOUT) assault course (MAC)



Use: This range is used to boresight, align, and zero all weapon systems on individual aircraft.

Characteristics:

Number of firing positions – 1 point.

Firing line width – 10 m.

Target area width – 10 m.

Firing point configuration – Flat, level pad with clearly marked cardinal headings.

Target configuration – zero and boresight panel (3.5 m X 3.5 m).

Associated facilities – none.

Reference – FM 1-140.

Additional Information: Range is collocated with aerial gunnery ranges.

Vegetation is removed from entire target area to guarantee visibility.

Harmonization targets are at same elevation as firing points with target centers on same horizontal plane as weapons. Harmonization distances are determined from the technical manual for the weapon system.

Figure 6-27. Gunship harmonization range

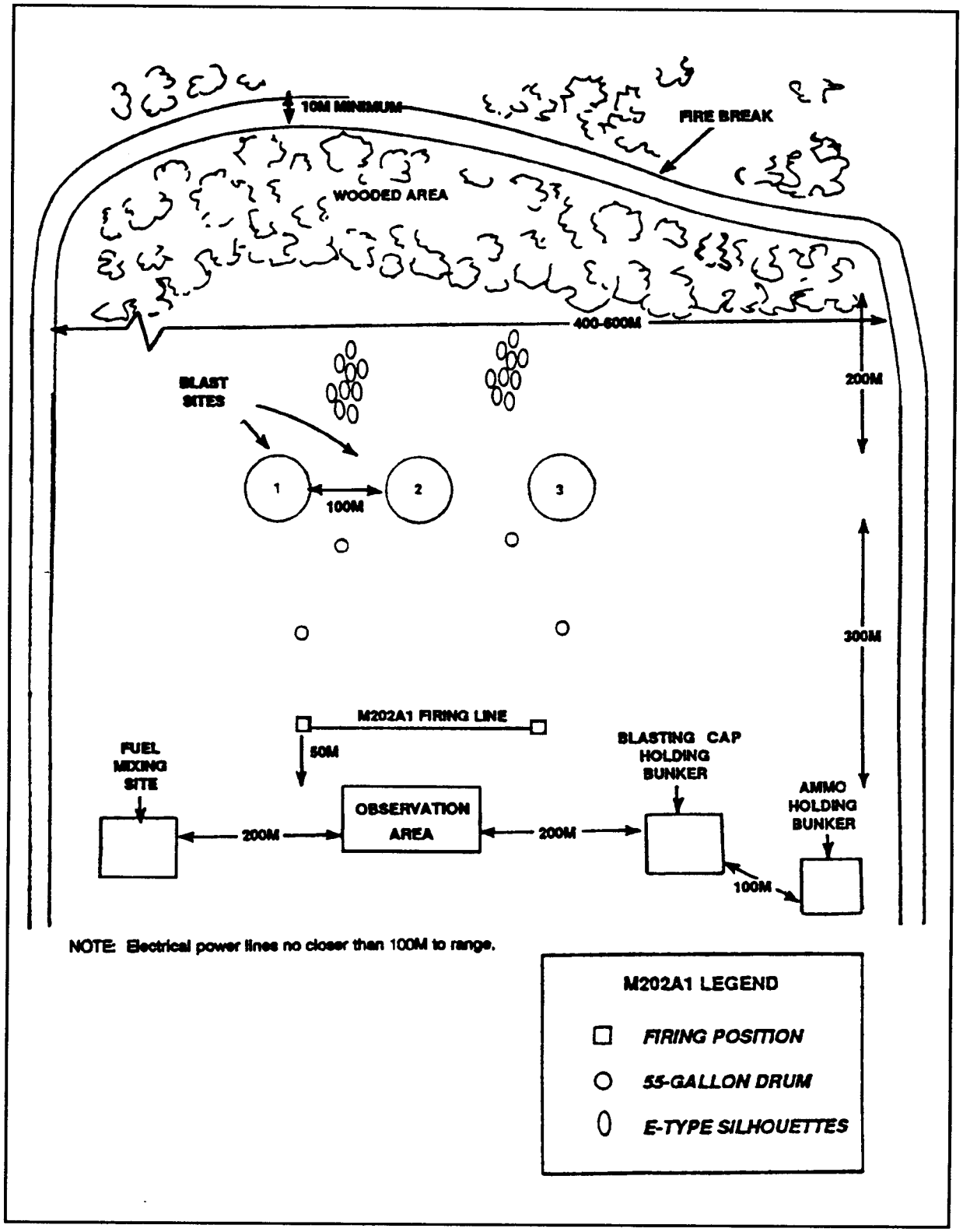


Figure 6-28. Flame operations range

Use: Use this range to conduct training in fabrication and detonation of flame field expedient (FFE) devices and familiarization and sustainment firing of the M202A1 (flash).

Characteristics:

Number of firing positions—3 blast sites for FFE.

Firing line width—10 m for M202A1. Firing points are at least 10 m apart.

Target area width—400-600 m.

Firing point configuration for FFE—observation area with bleachers and overhead cover of corrugated steel; must have clear observation to all blast sites.

Firing line for the M202A1 rocket launcher—50 m in front of the observation area.

For the M202A1 one dirt/sand-filled barrel located 100 m from the firing line, one located 200 m from the firing line; 10 E-type silhouette targets emplaced 400 m from the firing line.

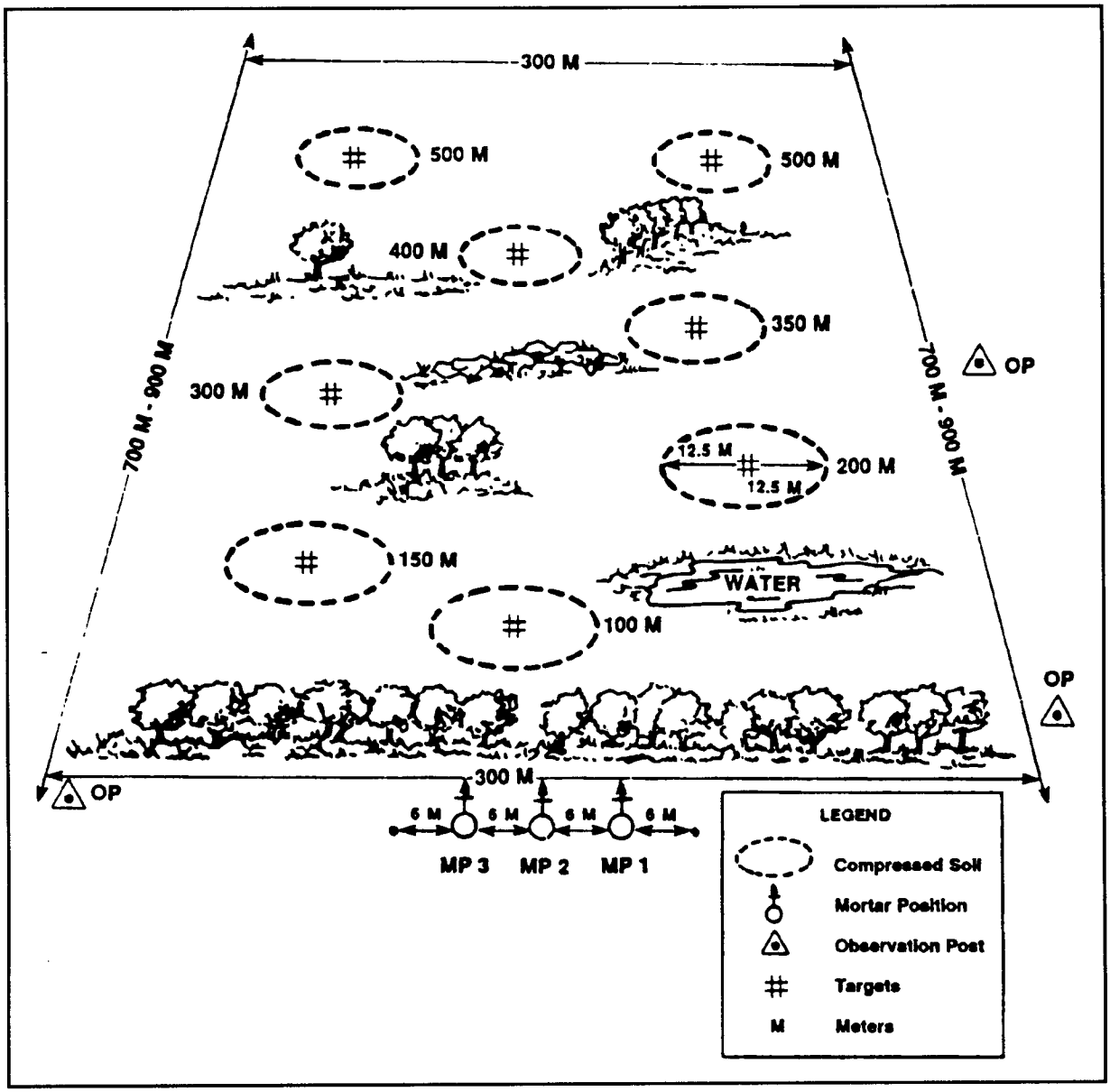
Target configurations for FFE—5 randomly dispersed F-type silhouettes in Blast Area 31 to represent troops in the open; (optional) large concrete drainage pipe covered with 36" of dirt in Blast Area 2 to represent a tunnel complex.

Associated facilities—standard facilities, ammo-holding bunker, blasting-cap-holding bunker, and fuel-mixing site.

References: FM 5-25, FM 20-33, TC 23-2.

Additional Information: Minimum distance from blast site to fire breaks is 300 m. Course is designed to train soldiers' basic demolition skills and fabrication of FFE devices for: casualty production, area denial, destruction of light armored vehicles, and use in MOUT. Fire breaks must be at least 10 m wide and bare of all vegetation. Blast sites are scraped clean of gravel, rock, metal, or other possible missiles to a depth of 0.15 m.

Figure 6-28. Flame operations range (cont)



Use: Crews practice firing 60mm, 81mm, and 120mm mortars on this range. Crews practice with short-range training ammunition (non-HE range).

Characteristics:

Number of firing positions – 3 points.

Firing line width – approx 24 m.

Target area width – 300 m.

Firing point configuration – 3 prepared mortar positions.

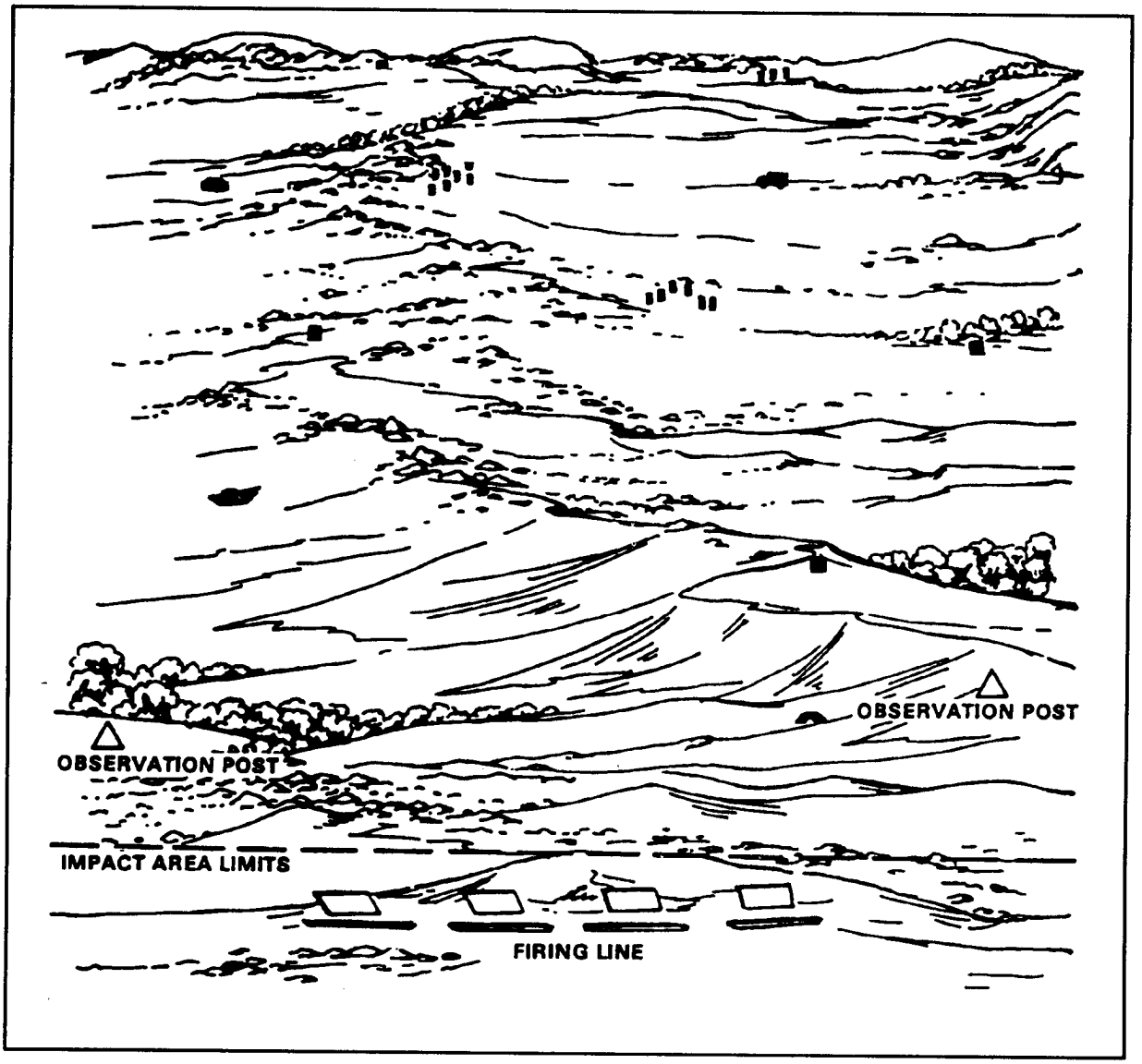
Target configuration – salvaged objects that serve as adjusting points. On a permanent range a 25-30 m area around each target is compacted soil. This prevents the loss of rounds that otherwise might bury themselves in soft soil.

Associated facilities – standard facilities.

Reference – FM 23-85.

Additional Information: For the 60mm mortar, crews will fire cartridge M840. For 81mm and 120mm mortars, crews use cartridge 81mm target practice (SR) M880. Minimum depth of the range is 700 m. If enough land is available, the range may be 800 m deep.

Figure 6-29. Mortar scaled range



Use: Mortar crews and forward observers use this range to maintain technical proficiency in mortar firing. The range can handle the 60mm, 81mm, 107mm, and 120mm mortars.

Characteristics:

Number of firing positions – 6 firing positions per firing point.

Firing line width – 180 m.

Target area width – 2000 m.

Firing point configuration – gun laid in with aiming circle in vicinity of firing point.

Target configuration – personnel, vehicle, and material targets augmented by surveyed natural terrain features.

Associated facilities – standard facilities.

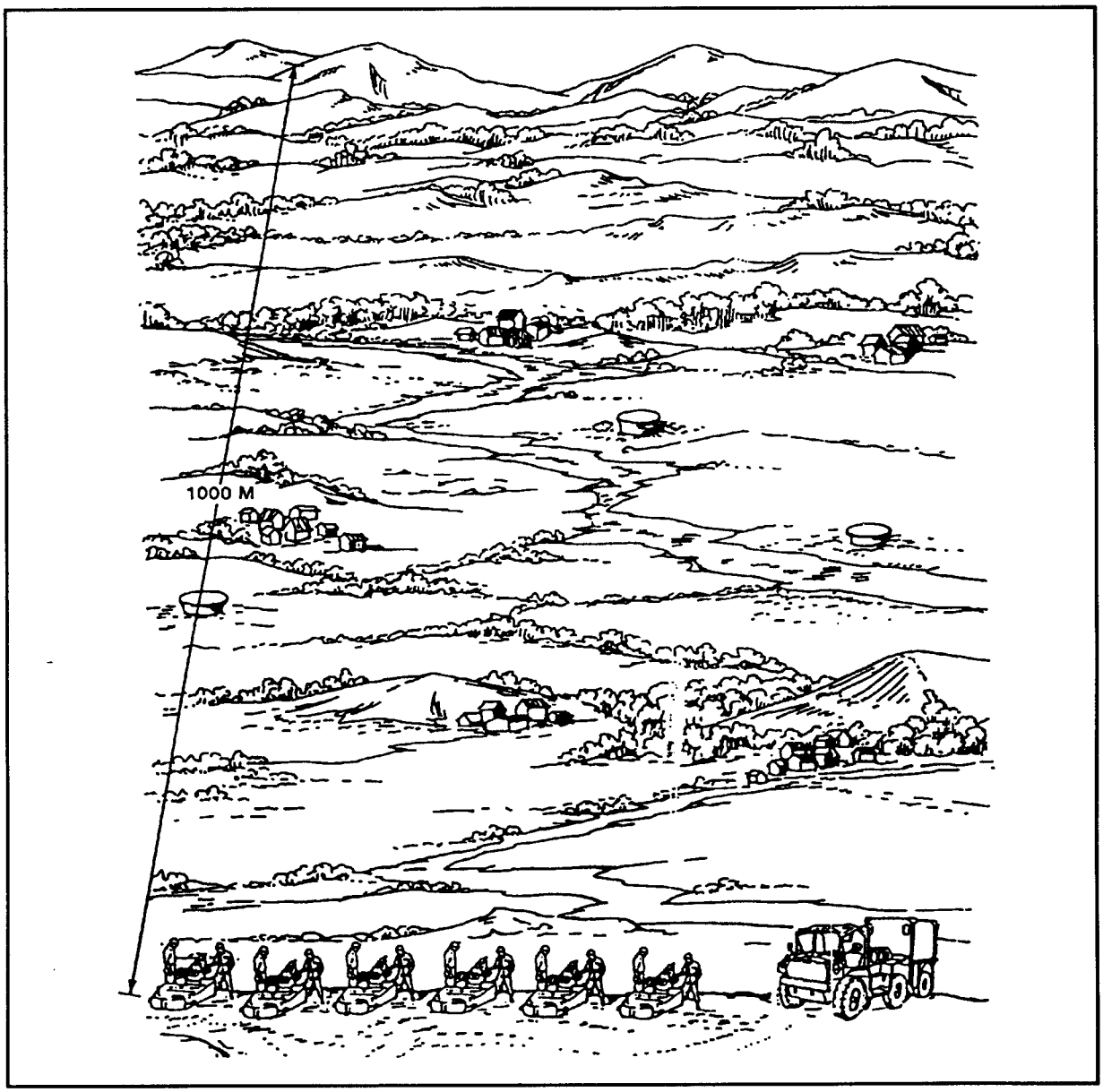
References – FM 7-90, FM 23-85, FM 23-90, FM 23-91, FM 23-92.

Additional Information: This range may be next to a unit maneuver area. It can then be used to support maneuver training with tactical smoke and illumination. Approx 10 surveyed firing points are needed on each division post to calibrate aiming circles.

Based on safety, forward observation areas are located in front of firing areas and slightly to the flank of primary mortar-to-target lanes.

A common impact area is used for all types of mortars. It is at least 2 km wide and 6 km deep. Firing at maximum and minimum range is obtained by using different firing points.

Figure 6-30. Mortar range



Use: This 1:10 range is used to teach firing skills to the entire field artillery team in local training areas.

Characteristics:

Number of firing positions – 6-8 points.

Firing line width – 150 m for a battery, 250 m for a battalion.

Target area width – 500 m at the furthest target (1000 m).

Firing point configuration – flat, rolling terrain that permits the hub-to-hub positioning of field artillery cannons.

Target configuration – 1:10 scale material and vehicle targets, predominant terrain features, buildings. Targets should be locally constructed by TASC.

Associated facilities – none.

Reference – TC 6-40.

Additional Information: This range may be constructed as a permanent, semipermanent (shared), or temporary (single training exercise) facility.

This range requires a controlled firing area with restricted airspace.

The firing points are on line with the observation posts so that observation posts do not interfere with lateral safety limits.

Realistic, 3-dimensional reference points are constructed from salvage materials such as cardboard boxes, automobile tires, cinder blocks, drums, ammunition boxes, propellant containers, and plywood. Sheet metal buildings are ideal reference points if constructed as shown in Fig B-40. The 14.5mm training round is used on this range.

Figure 6-31. Field artillery 1:10 scaled range

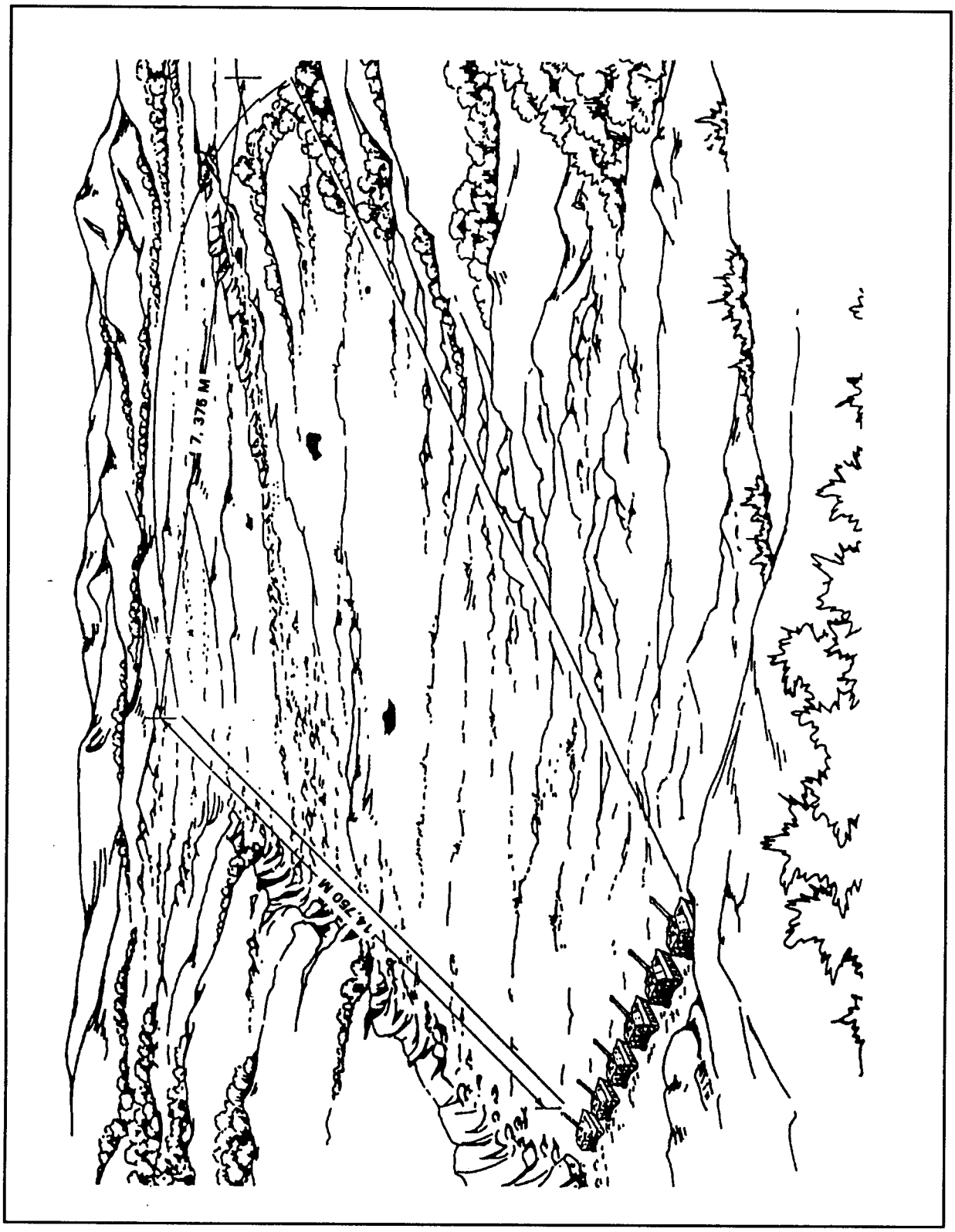


Figure 6-32. Field artillery indirect-fire range

Use: This range is used to fire all artillery weapon systems in service practice and in direct support of maneuver.

Characteristics:

Number of firing positions—optional.

Firing line width—large enough to accommodate a firing battery.

Target area width—optional.

Firing point configuration—dependent on local SOP.

Target configuration—enough durable targets to provide viable training opportunity.

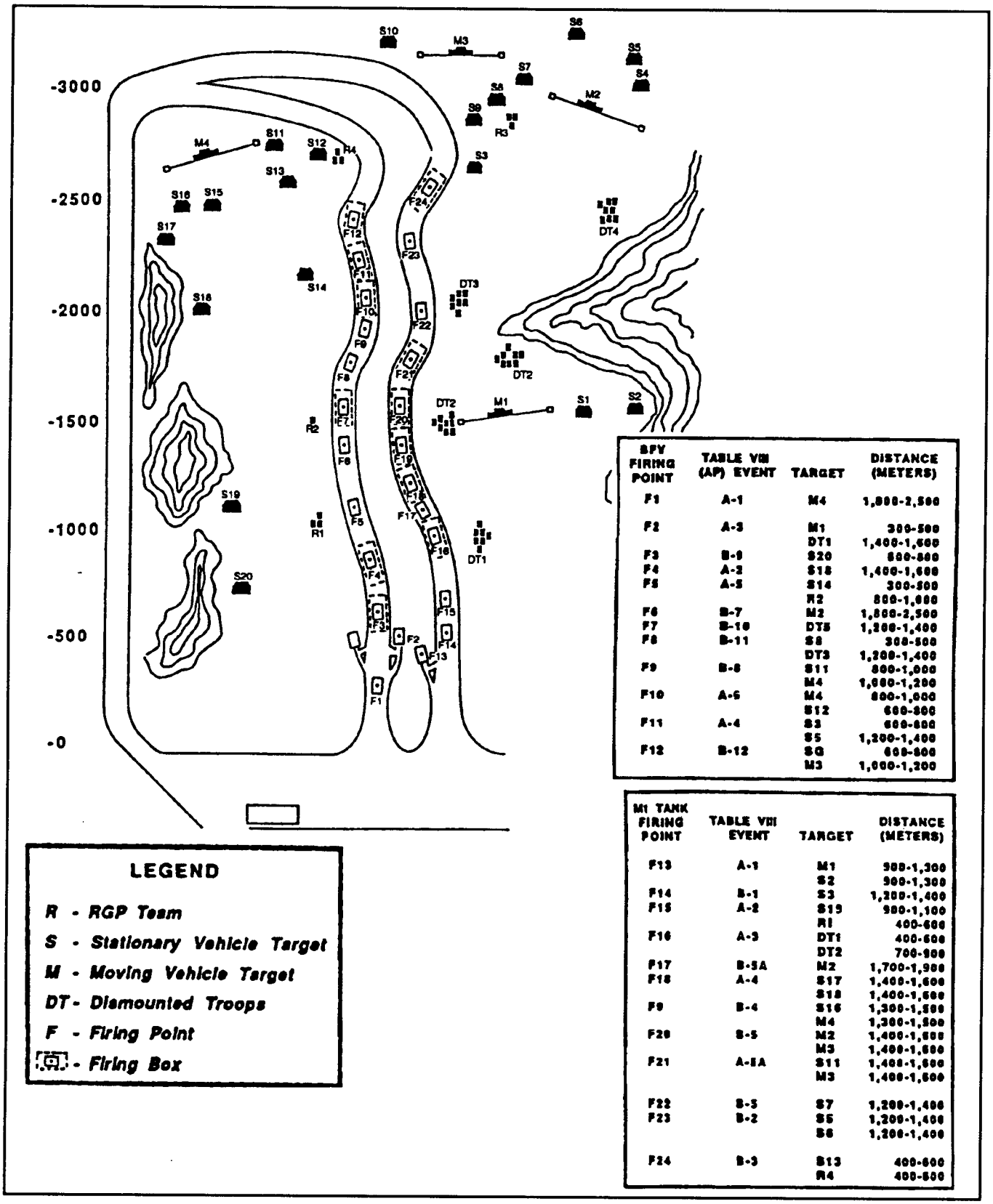
Associated facilities—surveyed-in observation post.

References—FM 6-30, TC 6-40, TC 25-1.

Additional Information: The ranges of other division weapon systems border this range's impact area. Theoretically, this impact area is an indirect-fire target area surrounded by concentric rings of progressively softer targets, danger zones, and, finally, direct-fire ranges.

A battery-firing position is 200-400 m long. Its exact size depends on weapons formation and terrain at the firing point.

Figure 6-32. Field artillery indirect-fire range (cont)



BFV FIRING POINT	TABLE VIII (AP) EVENT	TARGET	DISTANCE (METERS)
F1	A-1	M4	1,800-2,500
F2	A-3	M1	300-500
		DT1	1,400-1,600
F3	B-9	S20	800-800
F4	A-2	S18	1,400-1,600
F5	A-5	S14	300-500
		R2	800-1,800
F6	B-7	M2	1,800-2,500
F7	B-10	DT5	1,200-1,400
F8	B-11	S8	300-500
		DT3	1,200-1,400
F9	B-8	S11	800-1,000
		M4	1,000-1,200
F10	A-6	M4	800-1,000
		S12	600-800
F11	A-4	S3	600-800
		S5	1,200-1,400
F12	B-12	S6	600-800
		M3	1,000-1,200

M1 TANK FIRING POINT	TABLE VIII EVENT	TARGET	DISTANCE (METERS)
F13	A-1	M1	900-1,300
		S2	900-1,300
F14	B-1	S3	1,200-1,400
F15	A-2	S19	900-1,100
		R1	400-600
F16	A-3	DT1	400-600
		DT2	700-900
F17	B-3A	M2	1,700-1,900
F18	A-4	S17	1,400-1,600
		S18	1,400-1,600
F9	B-4	S16	1,300-1,500
		M4	1,300-1,500
F20	B-5	M2	1,400-1,600
		M3	1,400-1,600
F21	A-3A	S11	1,400-1,600
		M3	1,400-1,600
F22	B-3	S7	1,200-1,400
F23	B-2	S5	1,200-1,400
		S6	1,200-1,400
F24	B-3	S13	400-600
		R4	400-600

Figure 6-33. Multipurpose training range (MPTR)

Use: This range is used to teach M1 and BFV crews skills needed to defeat stationary and moving targets in a tactical array. It is also used for crew qualification, dry firing, and subcaliber engagements. All operations are conducted from moving vehicles.

Characteristics:

Number of firing positions—2 trails.

Firing line width—50 m (minimum).

Target area width—NA.

Firing point configuration—numbered markers on each trail.

Target configuration—20 stationary vehicle targets, 4 moving vehicle targets, 50 E-type silhouette targets (Fig B-11) placed in tactical arrays along trails. Stationary vehicle targets are frontal views; moving targets are flank. The range uses the target array for tank or BFV Table IX.

Associated facilities—standard facilities, holding station, vehicle maintenance station.

References—FM 17-12-1, FM 23-1, CEHND 1110-1-16 (draft).

Additional Information: This course is designed to channel the armored vehicle crew into the best engagement route (tactically sound) for target arrays on the range. Only one vehicle, using one lane, will be on the range at a time.

Numbered markers are emplaced for controllers to identify locations and provide point cues for target display. They should be positioned with care to be concealed from continuous observation by crews.

Crew qualification can be accomplished.

Target array and firing position/distance scenarios are according to Table VIII in the appropriate reference (FM 17-12-1, FM 23-1). Crews can also fire Table X using Table IX arrays.

Bradley suppressive fire engagements may require up to four sets of ITMs patterned in a "W." Additional ITMs may be requested and justified on DD Form 1391 to meet these requirements.

Figure 6-33. Multipurpose training range (MPTR) (cont)

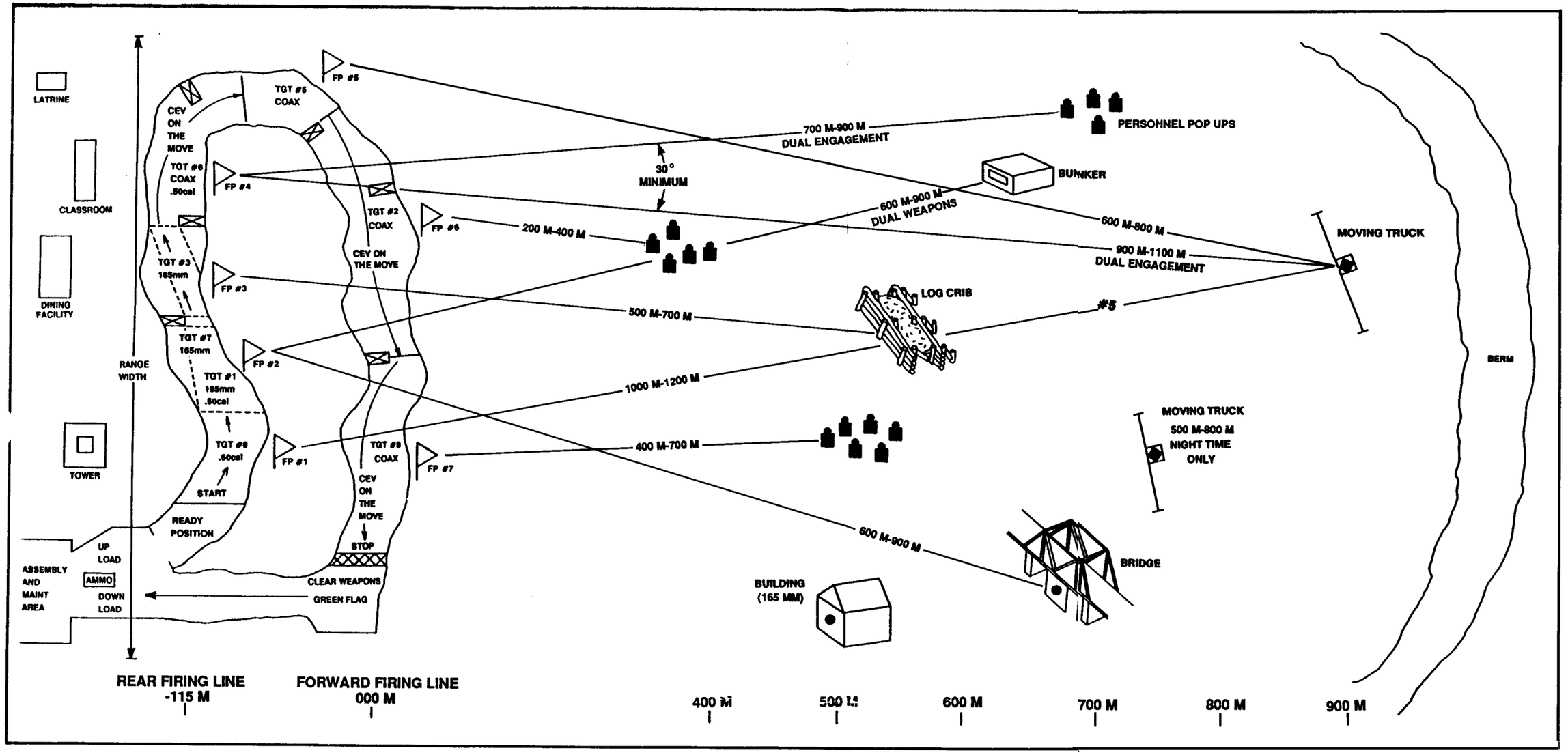


Figure 6-34. Combat engineer vehicle (CEV) range

Use: CEV crews learn skills needed to destroy stationary and moving targets during day and night exercises. It is used for crew qualification, dry firing, and subcaliber engagements. Crews conduct engagements at the halt and from moving vehicles with simultaneous weapon application.

Characteristics:

Number of firing positions—1 U-shaped trail approx 700 m long.

Firing line width—15 m (minimum).

Target area width—NA.

Firing point configuration—man-made numbered marker located at each firing point along the path of travel.

Target configuration—4 stationary targets (bunker, log crib, house, bridge); 2 moving vehicle targets; 16 E-type silhouette targets (Fig B-11) placed in 3 tactical arrays. Moving targets are flank views. Target array and firing position/distance scenarios are IAW Table V in the applicable reference.

Associated facilities—standard facilities.

References—TC 5-117.

Additional Information: By design, this course channels the CEV crew through the course while they engage tactical target arrays. Range target distances are configured for either the 165mm demolition gun to fire training practice (TP) rounds or the subcaliber device. This range is not designed for the 165mm high-explosive plastic (HEP) round.

The maneuver trail is constructed of compacted aggregate. It has 5 reinforced concrete firing positions. Revetment obstacles constructed of sandbagged barrels require crews to traverse and maneuver between firing positions. Only one vehicle will use the range at a time.

One set of range outer markers is installed at 300 m, a second set at 500-700 m.

For stationary targets, the bunker target can be simulated by suspending a 2m X 2m canvas sheet from poles. Alternatively, use a 4' X 8' sheet of plywood. The log crib is constructed with one stack of telephone poles. Driven I-beams support each end of the stacked poles. Concrete and earth protect the beams. Alternatively, use a 4' X 8' sheet of plywood. The house is painted on weighted canvas suspended from poles. Place a 2m X 2m target panel at the lower left corner of the building to indicate point of impact. The bridge is a steel structure—it may be the frame of an old range tower. Use a 2 m X 2 m panel to indicate point of impact.

Figure 6-34. Combat engineer vehicle (CEV) range (cont)

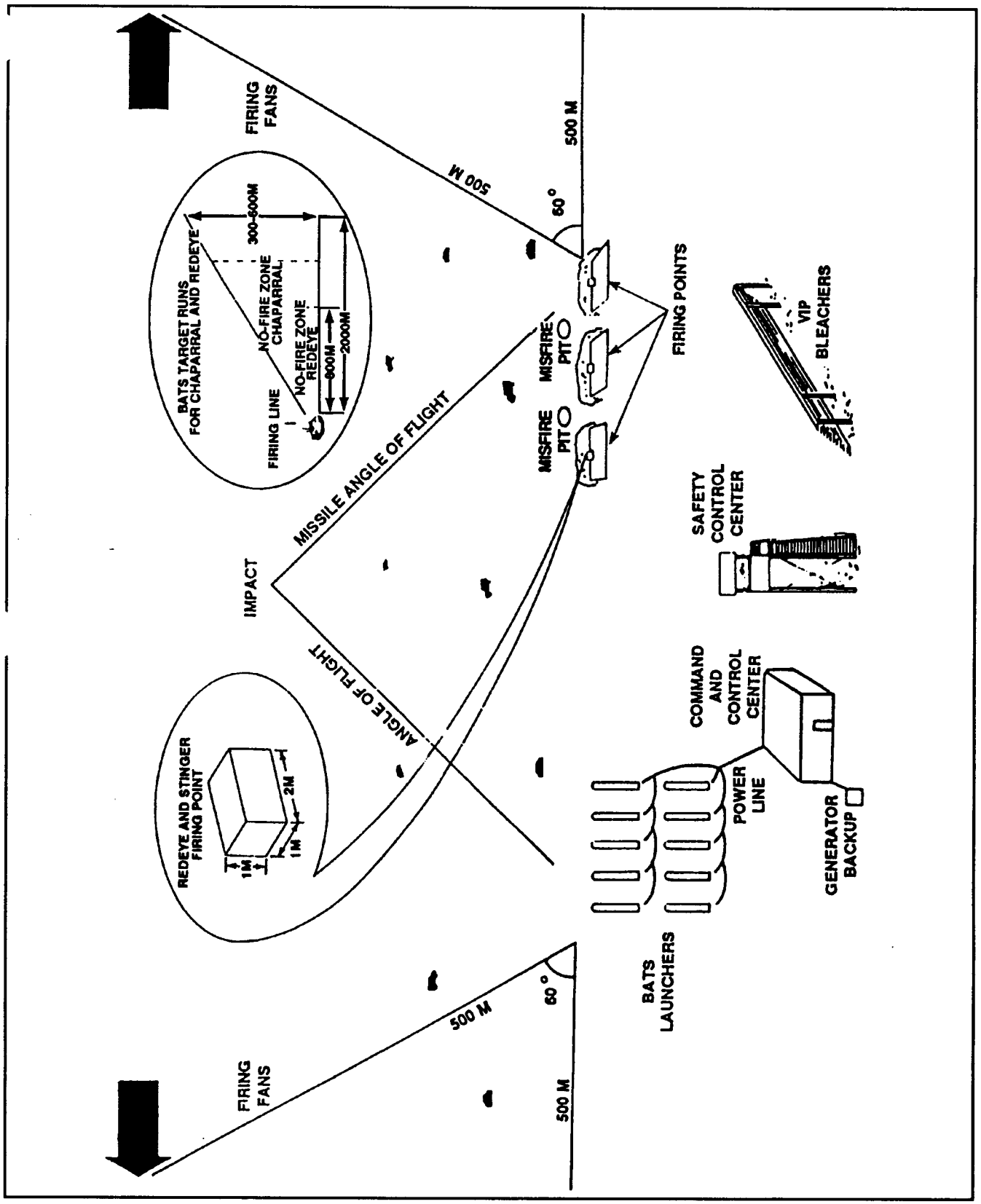


Figure 6-35. Air defense firing range

Use: Used for air defense service practice with the Chapparal, Stinger, Redeye, and Vulcan systems; also used for small arms air defense (SAAD) training.

Characteristics:

Number of firing positions – 6 points.

Firing line width – 500 m.

Target area width – 3500 m.

Firing point configuration – flat, rolling terrain cleared of vegetation; a concrete block for Redeye firing.

Target configuration – ballistic aerial target system (BATS) (Fig B-43); soft-skinned vehicle and material targets for ground service practice of Vulcan system.

Associated facilities – preparation, missile-assembly, prefire, and target-launch stations; tracking positions; utility building (for missile maintenance).

References – FM 44-1-2, FM 44-62, FM 44-102.

Additional Information: For ground firing, large red arrows covered with highly visible paint are placed on right and left outer limits of the ricochet area. Red flags are placed on the firing line at start-fire and cease-fire points.

Stinger and Redeye missiles have a 15^{O} cone-shaped danger zone centered directly to the rear of the launcher. To avoid hazards, the ground directly to the rear of the gunner is cleared of all obstacles and the launcher breech placed 1 m off the ground.

Figure 6-35. Air defense firing range (cont)

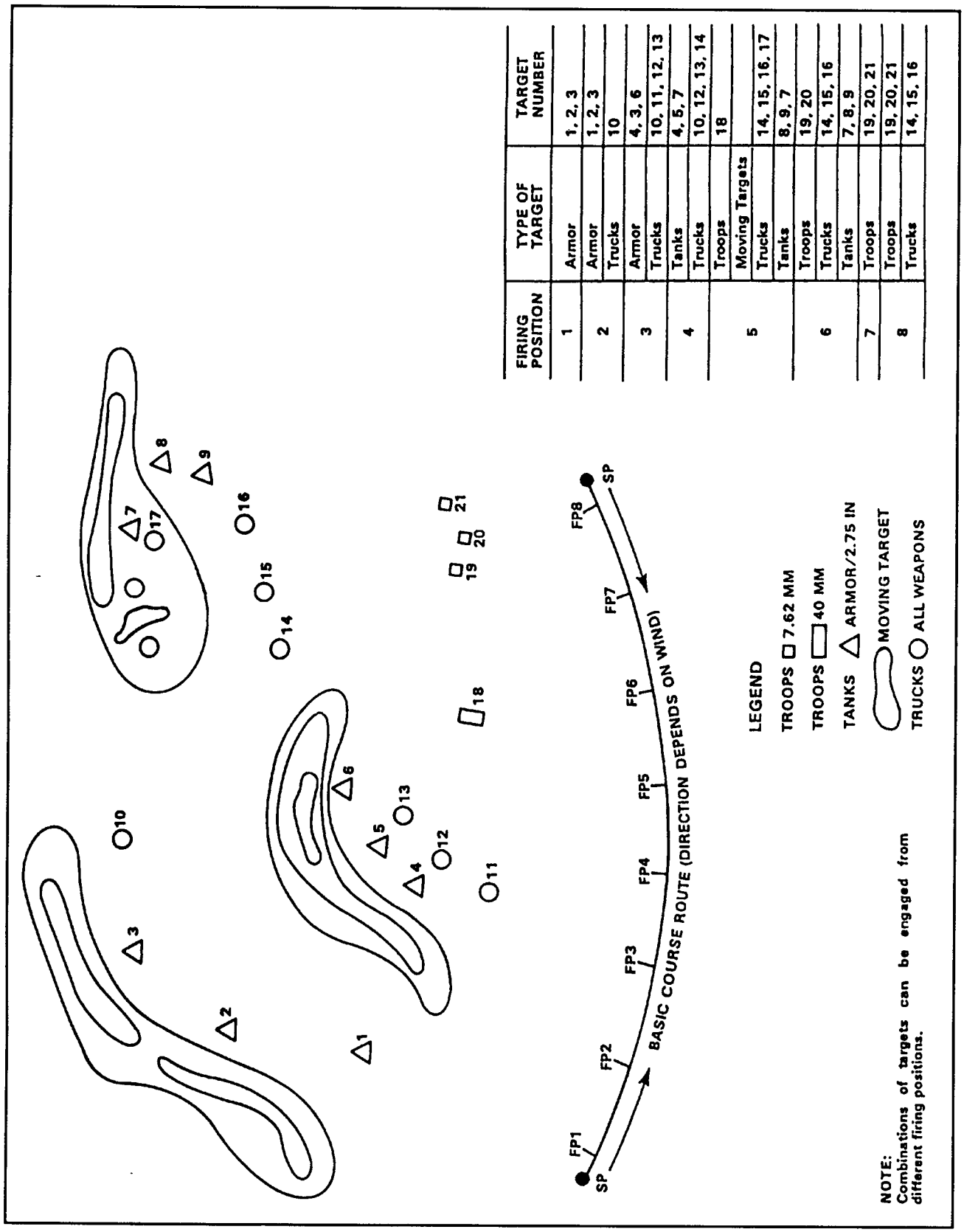


Figure 6-36. Helicopter gunnery range

Use: This range is used for individual, crew, and unit attack helicopter gunnery exercises. It can handle the 7.62mm machine gun, 40mm grenade launcher, 30mm/20mm cannon, 70mm rocket, and TOW.

Characteristics:

Number of firing positions – 8 points.

Firing line width – 1500 m (minimum).

Target area width – 2000 m (minimum).

Firing point configuration – man-made marker or prominent natural terrain feature at each point with access to emergency landing area.

Target configuration – both stationary and moving personnel, vehicle, fortified position targets.

Associated facilities – control point (tower, ground vehicle, or airborne controller), helicopter parking and landing area (for ammunition storage and issue), rearm pad, refuel point, administration facility.

Reference – FM 1-140.

Additional Information: A terrain navigation course is a working part of the range. Scout aircraft use the course to direct attack helicopters to firing points. There, scouts hand off targets to attack aircraft. Attack aircraft then orient on the target, unmask, and acquire and engage the target.

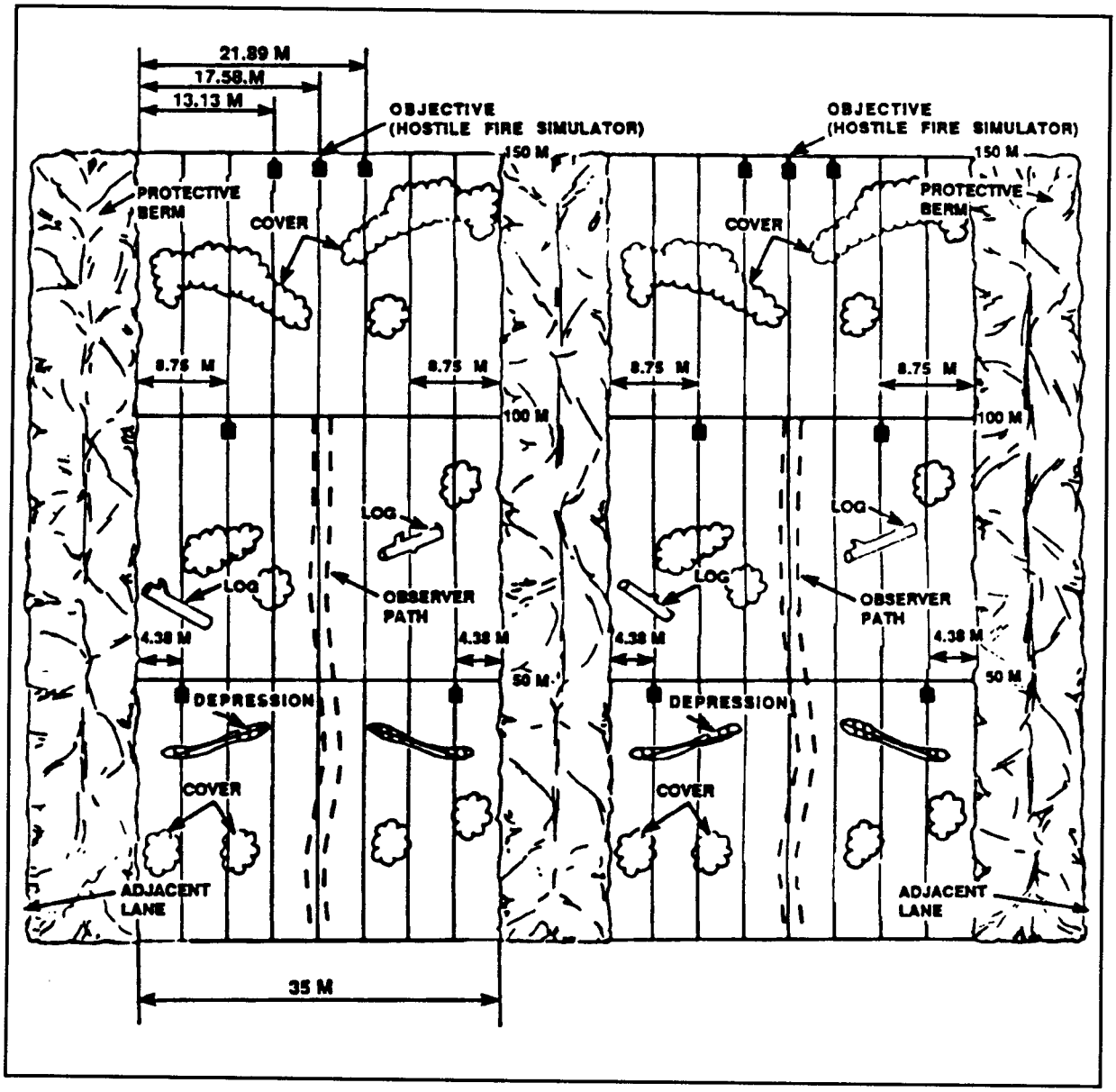
Start-fire line, safe aiming line, and cease-fire line are clearly marked to be visible from the range control point and from the air. Landing pads on the firing line are also clearly marked for both day and night landings.

Separate ground vehicle parking areas are located to the rear of the firing line.

Two-way radio and telephone communications are established and maintained with all aircraft, control groups, and agencies operating on the range.

Armored vehicle gunnery ranges and MPRCs can satisfy aerial gunnery training requirements provided safety is maintained and target-elevating mechanisms are protected.

Figure 6-36. Helicopter gunnery range (cont)



Use: Soldiers learn individual and buddy-team movement and maneuver techniques while engaging targets with the M16A1 rifle (using blank and live ammunition).

Characteristics:

Number of firing positions—determined by throughput.

Firing lane width—35 m.

Target area width—35 m/lane at maximum depth of 150 m.

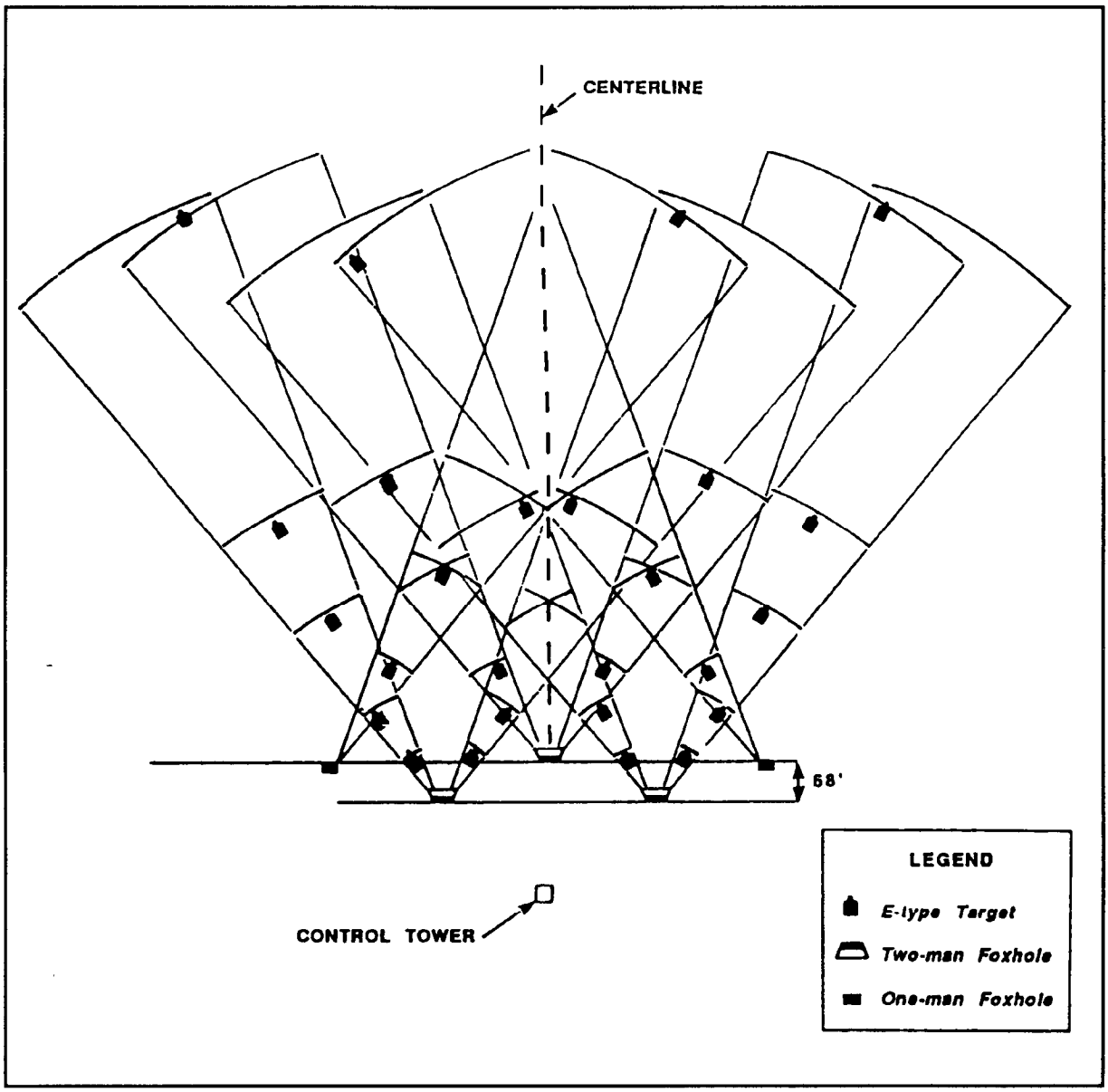
Firing point configuration—natural terrain with berms on both sides to separate from adjoining lanes.

Target configuration—6 E-type silhouettes with standard target mechanisms and 1 small arms hostile-fire simulator (machine gun). E-type silhouettes are located at 50, 100, and 150 m. Hostile-fire simulator is located in center at the 150 m bank.

Associated facilities—standard facilities.

Additional Information: Each lane is 150 m long; all lanes are exactly alike for target placement. All should have natural features that offer concealment. Soldiers show their ability to select covered and concealed positions, move while under fire, apply principles of teamwork, and lay suppressive fire on enemy soldier targets.

Figure 6-37. Fire and movement range



Use: Soldiers learn to employ mutually supporting fires from defensive positions against attacking troops.

Characteristics:

Number of firing positions—5 minimum (total depends on throughput).

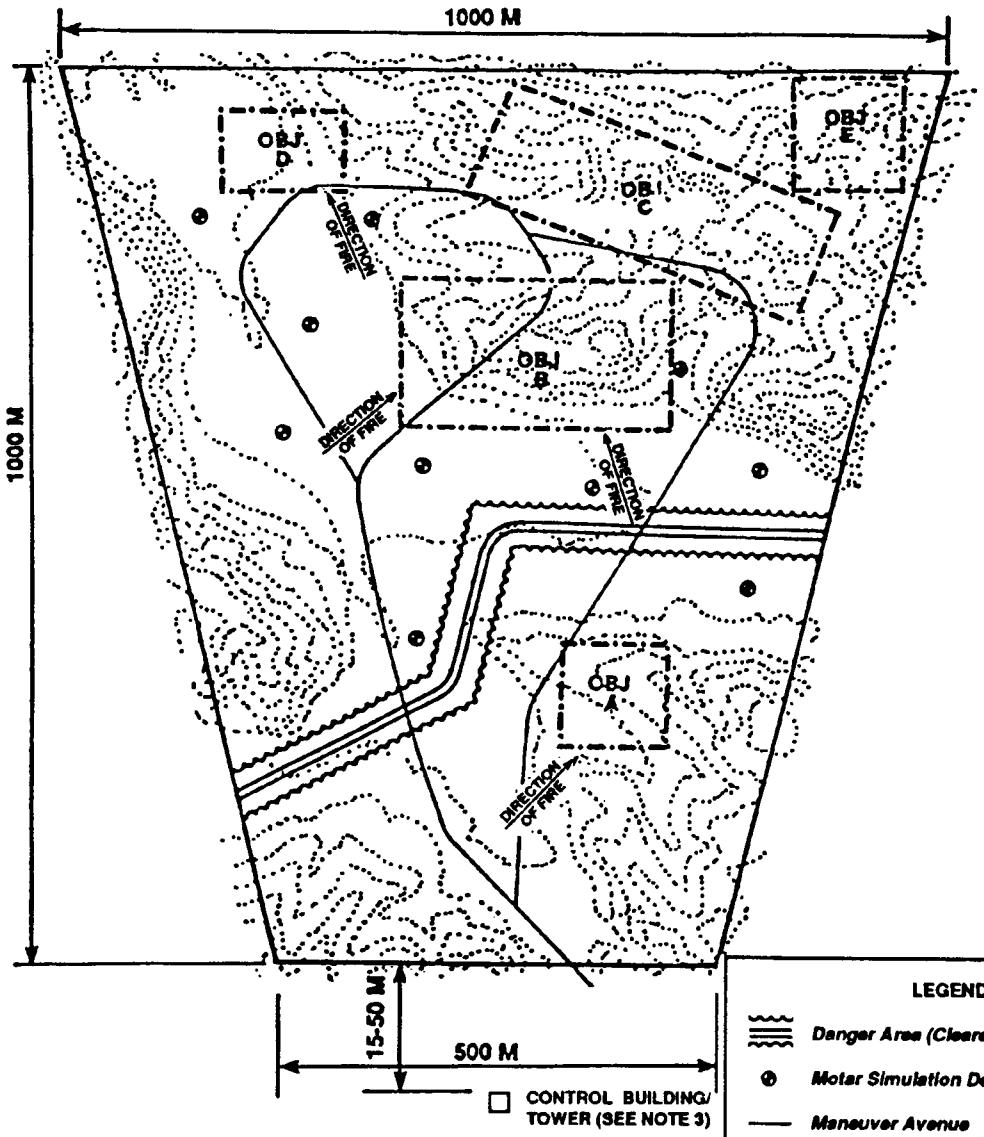
Firing point configuration—each firing position is a frontal parapet defensive position. On ranges having 5 positions, 3 will be 2-man foxholes, 2 will be 1-man foxholes.

Target configuration—27 E-type targets with lifting mechanisms. Targets are staggered at 25, 50, 100, 150, 300 m.

Associated facilities—standard facilities.

Additional Information: Each defensive position will have a right and a left sector of fire. Within each there will be 5 targets. These will be staggered at distances of 25, 50, 100, 150, and 300 m, measured from the firer's position on either side of the position. Soldiers will engage targets in their sector of fire to provide support for adjacent fighting positions.

Figure 6-38. Squad defense range



NOTES:

1. ISBC LAYOUT DEPICTS TARGET POSITIONS AND TRAINING SCENARIO SPECIFICALLY TAILORED FOR THE TOPOGRAPHY SHOWN. THE LOCATION OF TARGET GROUPING A,B,C, AND D MUST BE SITED IN THE AREAS THAT SUPPORT TRAINING STRATEGIES BASED ON SITE-SPECIFIC CONDITIONS.
2. RANGE BOUNDARIES ARE GENERIC AND REPRESENT MAXIMUM EXPECTED LAND USE REQUIREMENTS. ACTUAL RANGE BOUNDARY CONFIGURATION MAY VARY DEPENDING ON SITE-SPECIFIC CONDITIONS.
3. SITE CONTROL BUILDING/TOWER 15-50 METERS FROM THE BASELINE IN AN AREA THAT WILL PROVIDE AN UNOBSTRUCTED VIEW TO THE BASELINE.

NO. OF TARGETS AND TRAINING STRUCTURES REQUIRED PER OBJECTIVE								
OBJ	SAT	AMTC	SIT	IMT	IHFS	MG BUNKER	OB BUNKER	TRENCH
A	0	0	4	0	4	0	0	0
B	2	0	8	2	8	2	0	2
C	2	1	0	0	0	0	1	0
D	1	0	5	2	5	1	0	0
E	1	0	5	2	5	1	0	0

Figure 6-39. Infantry squad battle course (ISBC)

Use: On the ISBC, a dismounted infantry squad can conduct mission-oriented training in offense, defense, and retrograde. It practices the 7 critical war-fighting operations of ambush, movement to contact, attack, raid, retrograde, defense, and reconnaissance/security. A squad can conduct both individual and collective tasks.

Characteristics:

Number of firing positions—5 target zones (Objectives A-E).

Firing line width—500 m at baseline.

Target area width—1000 m at furthest target.

Firing point configuration—hasty positions selected throughout the course, using natural cover and concealment.

Target configuration—area has 5 objectives. Objective A simulates a Threat outpost. It is sited 200-300 m downrange on a ridgeline or other strategic area that the squad can attack in a frontal suppressing engagement and a lateral defeating engagement. Objective B, the final objective, has 2 target groupings; all targets in each group are approx 15 m apart. Each group is located with a Threat trench. The objective will also have a stationary armored target (SAT) and 2 machine gun bunkers. Target groupings will be 500-600 m downrange from the baseline. Objective C is a Threat counterattack force that repels the squad's advance into Objective B. Objective C is located another 200 m downrange from Objective B. Objectives D and E are also counterattack forces. The location of these 2 areas is 900-1000 m downrange from the baseline.

Associated facilities—standard facilities.

References—CEHND 1110-1-19, ARTEP 7-8-MTP, ARTEP 7-8-Drill.

Additional Information: All target locations are site-adapted. All must be located in areas that support desired tactics and the user's training requirements.

All trenches, bunkers, and armored vehicle emplacements must simulate typical Threat styles.

Mortar simulation device emplacements are located in areas from which unfriendly mortar fire is to be simulated.

Helicopter landing areas, designed for heavy use, should be located to support aerial insertion and extraction of the squad.

Depending on training requirements, a danger area may be incorporated into the range layout.

Training exercises can use either live fire (if all safety requirements can be met) or nonlive fire (if safety concerns so dictate).

For non-live-fire exercises, troops will use personnel-safe laser equipment.

Figure 6-39. Infantry squad battle course (ISBC) (cont)

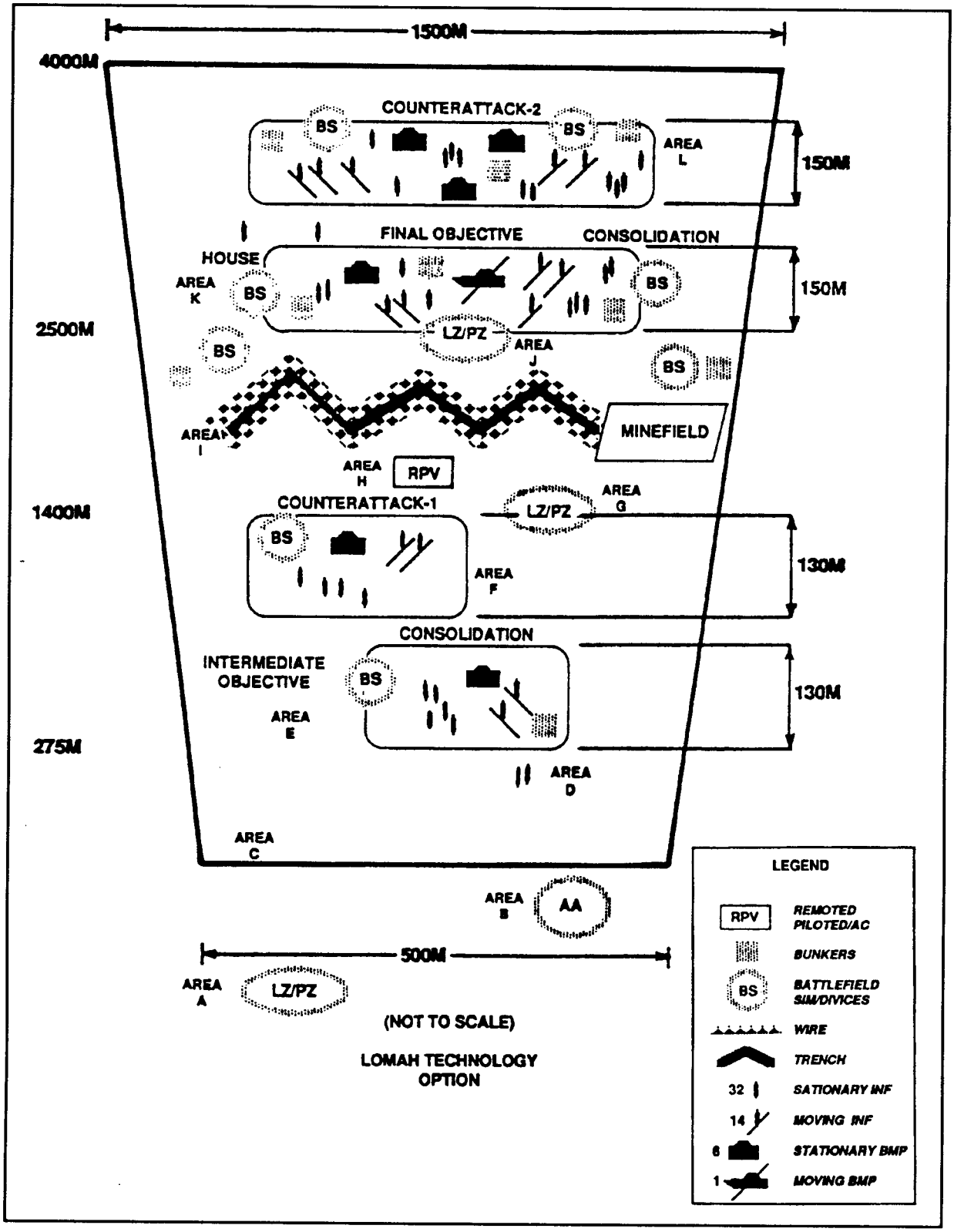


Figure 6-40. Infantry platoon battle course

Use: The IPBC gives dismounted and mounted infantry platoons the opportunity to conduct fire and movement exercises in offense, defense, and retrograde operations.

Characteristics:

Baseline width is 500 m;downrange width, 1500 m; length of downrange area, 4000 m. Downrange activity areas consist of–

- Area Controlment Area, 600 m behind baseline.
- Area A: LZ/PZ, 400 m behind baseline.
- Area B: Assembly Area (AA), 250 m behind baseline.
- Area C: LD or baseline, 0 m.
- Start point for downrange Area D: OP 250 m downrange.
- Area E: Interim Objective, 1100 m downrange.
- Area F: counterattack area, 1500 m downrange.
- Area G: LZ/PZ, 1900 m downrange.
- Area H: remoted pilotless vehicle (RPV) TASC RCMAT, 2200 m downrange.
- Area I: wire/trench/minefield obstacles downrange.
- Area J: LZ/PZ, 3100 m downrange.
- Area K: final objective, 3500 m downrange.
- Area L: counterattack area, 3850 m downrange.

Targetry configuration–Targetry must be emplaced to present a target for both the base of fire element and the maneuver element throughout the entire range. Required targetry and training structures are listed in the table below.

Associated facilities–standard facilities.

References–ARTEP 7-8-drill, ARTEP 7-8-MTP.

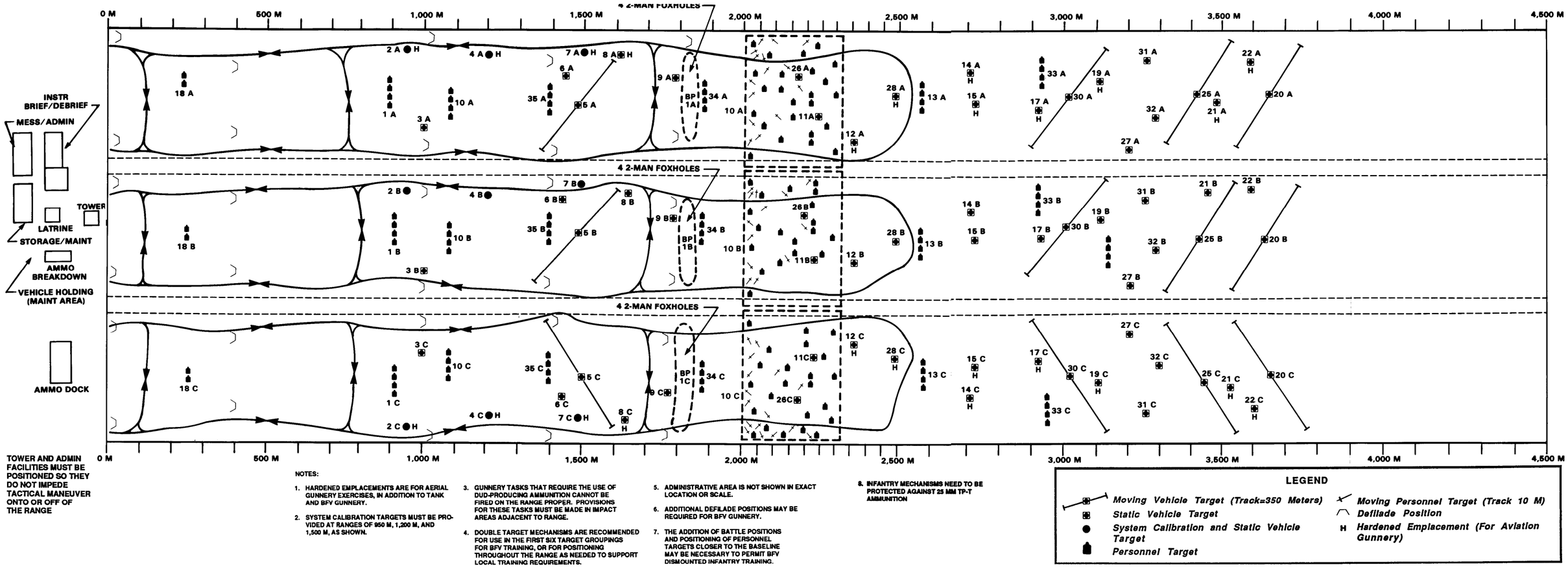
Additional Information: Weapons fired on this course are listed in Apprendix A of this manual.

Objective	SAT	AMTC	SIT	IMT	IHFS*	MSD	Bunker‡	House‡	Trench
A	—	—	2	—	2	—	—	—	—
B	1	—	6	2	6	1	1	—	—
C	1	—	5	2	5	1	—	—	—
D	—	—	2	—	2	2	2	—	1
E	1	1	14	5	14	2	3	1	—
F	3	—	14	5	14	2	3	—	—
Total	6	1	43	14	43	8	9	1	1

*Optional.

‡There are two SITs located in the assault/defend house, and one SIT associated with each machine gun bunker.

Figure 6-40. Infantry platoon battle course (cont)



NOTES:

1. HARDENED EMPLACEMENTS ARE FOR AERIAL GUNNERY EXERCISES, IN ADDITION TO TANK AND BFV GUNNERY.
2. SYSTEM CALIBRATION TARGETS MUST BE PROVIDED AT RANGES OF 950 M, 1,200 M, AND 1,500 M, AS SHOWN.
3. GUNNERY TASKS THAT REQUIRE THE USE OF DUD-PRODUCING AMMUNITION CANNOT BE FIRED ON THE RANGE PROPER. PROVISIONS FOR THESE TASKS MUST BE MADE IN IMPACT AREAS ADJACENT TO RANGE.
4. DOUBLE TARGET MECHANISMS ARE RECOMMENDED FOR USE IN THE FIRST SIX TARGET GROUPINGS FOR BFV TRAINING, OR FOR POSITIONING THROUGHOUT THE RANGE AS NEEDED TO SUPPORT LOCAL TRAINING REQUIREMENTS.
5. ADMINISTRATIVE AREA IS NOT SHOWN IN EXACT LOCATION OR SCALE.
6. ADDITIONAL DEFILADE POSITIONS MAY BE REQUIRED FOR BFV GUNNERY.
7. THE ADDITION OF BATTLE POSITIONS AND POSITIONING OF PERSONNEL TARGETS CLOSER TO THE BASELINE MAY BE NECESSARY TO PERMIT BFV DISMOUNTED INFANTRY TRAINING.
8. INFANTRY MECHANISMS NEED TO BE PROTECTED AGAINST 25 MM TP-T AMMUNITION

Figure 6-41. Multipurpose range complex—heavy (MPRC-H)

Use: This range provides collective training facilities for M1, M2, and M3 vehicles and attack helicopters. It accommodates platoon-level collective training exercises as well as individual and crew qualification training.

Characteristics:

Target area width – 1000 m.

Firing point configuration – fighting positions, hull-down defilades.

Target configuration – 12 moving vehicle targets, 60 stationary vehicle targets, 153 personnel targets, 45 moving E-type silhouette personnel targets. Target locations will be based on site adaptation.

Associated facilities – standard facilities, instructor briefing/debriefing classroom, ammunition breakdown, administrative area, vehicle-holding and maintenance area, air-conditioned control tower.

References – FM 17-12, FM 23-1, ARTEP 7-20-MTP, ARTEP 71-2, HNDM 1110-1-6.

Additional Information: The target system for the MPRC-H is fully automated and self-scoring. The computer central console can independently program and control timing and exposure sequence of each armor and infantry target.

The MPRC-H uses the remoted target system.

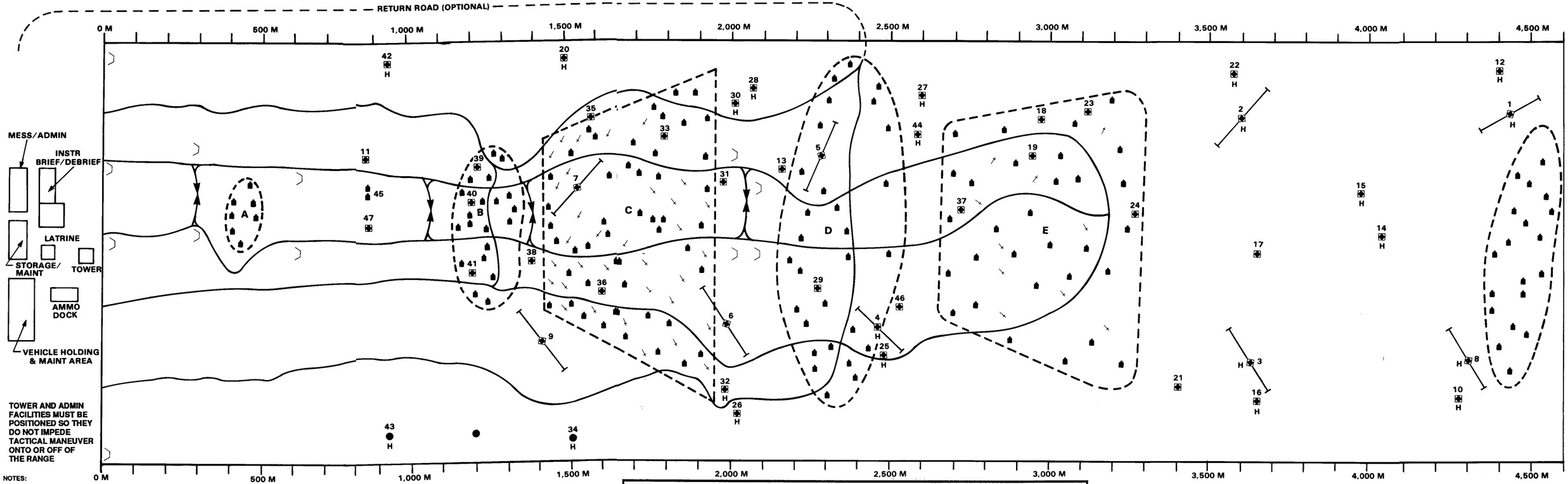
This range uses thermal targets, night illumination devices, and hostile-fire, target-kill, and visual-flash simulators.

The MPRC-H accommodates all current armor and fighting vehicle proficiency and sustainment tasks as well as providing an arena for combined arms live-fire exercises.

The MPRC-H meets all range requirements for the following gunnery programs:

- Tank Tables VII, VIII, IX, X, XI, XII.
- BFV Tables VII, VIII, IX, X, XI, XII.
- Infantry Squad Battle Course.
- Infantry Platoon Battle Course.
- Scout Squad Attack Course.
- Fire and crew qualification for attack helicopters.

Figure 6-41. Multipurpose range complex – heavy (MPRC-H (cont))



NOTES:

1. HARDENED EMPLACEMENTS ARE FOR AERIAL GUNNERY EXERCISES, IN ADDITION TO TANK AND BFV GUNNERY.
2. SYSTEM CALIBRATION TARGETS MUST BE PROVIDED AT RANGES OF 950 M, 1,200 M, AND 1,500 M, AS SHOWN.
3. GUNNERY TASKS THAT REQUIRE THE USE OF DUD-PRODUCING AMMUNITION CANNOT BE FIRED ON THE RANGE PROPER. PROVISIONS FOR THESE TASKS MUST BE MADE IN IMPACT AREAS ADJACENT TO RANGE.
4. DOUBLE TARGET MECHANISMS ARE RECOMMENDED FOR USE IN THE FIRST SIX TARGET GROUPINGS FOR BFV TRAINING, OR FOR POSITIONING THROUGHOUT THE RANGE AS NEEDED TO SUPPORT LOCAL TRAINING REQUIREMENTS.
5. ADMINISTRATIVE AREA IS NOT SHOWN IN EXACT LOCATION OR SCALE.
6. ADDITIONAL DEFILADE POSITIONS MAY BE REQUIRED FOR BFV GUNNERY.
7. THE ADDITION OF BATTLE POSITIONS AND POSITIONING OF PERSONNEL TARGETS CLOSER TO THE BASELINE MAY BE NECESSARY TO PERMIT BFV DISMOUNTED INFANTRY TRAINING.

Figure 6-42. Multipurpose range complex - light (MPRC-L)

Use: This range primarily satisfies training requirements for light infantry units (ARTEPs, FTXs, CALFEXs). It also can satisfy mobilization training requirements of armor units (M60A3, M1).

Characteristics:

Target area width – 1000 m.

Firing point configuration – assorted fighting positions, hull-down defilade positions.

Target configuration – 9 moving vehicle targets, 37 stationary vehicle targets, 153 stationary E-type silhouette personnel pop-up targets, 46 moving E-type silhouette personnel targets. Target locations will be based on site adaption.

Associated facilities – standard facilities, instruction briefing/debriefing classroom, ammunition breakdown, administrative area, vehicle-holding and maintenance area, air-conditioned control tower.

References – FM 17-12, FM 23-1, ARTEP 7-20-MTP, HNDM 1110-1-8.

Additional Information: The target system for the MPRC-L will be fully automated and self-scoring. The computer central console will have the capability to independently program and control the timing and exposure sequence of each armor and infantry target.

The MPRC-L uses the remoted target system.

Hostile-fire simulator, thermal targets, night-illumination devices, target-kill simulators, and visual-flash simulators are used on this range.

The MPRC-L accommodates all current armor and fighting vehicle proficiency and sustainment tasks as well as providing an arena for combined arms live-fire exercises for light and dismounted infantry.

The MPRC-L meets range requirements for the following gunnery programs:

- Tank Tables VII, VIII, IX, X, XI, XII.
- BFV Tables VII, VIII, IX, X, XI, XII.
- Infantry Squad Battle Course.
- Infantry Platoon Battle Course.
- Attack helicopter individual and crew qualification.

Figure 6-42. Multipurpose range complex – light (MPRC-L) (cont)

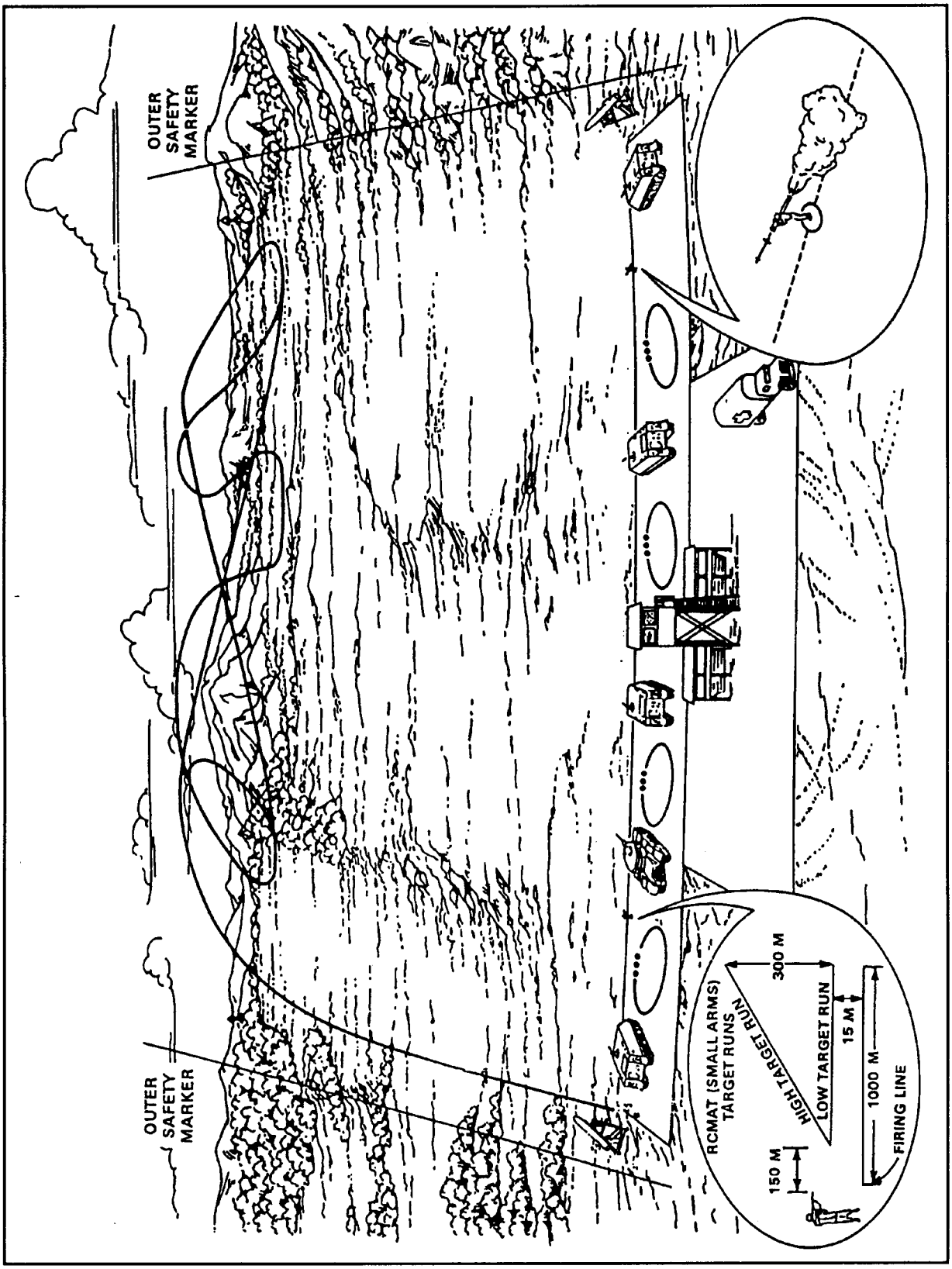


Figure 6-43. Platoon defense against aircraft range

Use: This range is used to support combined arms air defense exercises, including rifle or tank platoons and forward-area units.

Characteristics:

Number of firing positions – 6 areas: 2 air defense weapon areas, 4 squad areas.

Firing lane width – 700 m.

Target area width – 1500 m.

Firing point configuration – flat or rolling terrain with visibility to targets.

Target configuration – BATS (Fig B-43) for the Redeye system and a radio-controlled miniature aerial target (RCMAT) (Fig B-45) system for small arms weapons.

Associated facilities – control tower with FM radio and telephone hot loop.

References – FM 44-4, FM 44-5.

Additional Information: This range requires additional operating and safety personnel due to hazards that can occur when different sizes and types of weapons are used at the same time. Personnel are required to assemble, launch, and control targets.

The telephone hot loop provides communications among range control officers, platoon learers, and target controllers. FM radios are also required as a backup communications system.

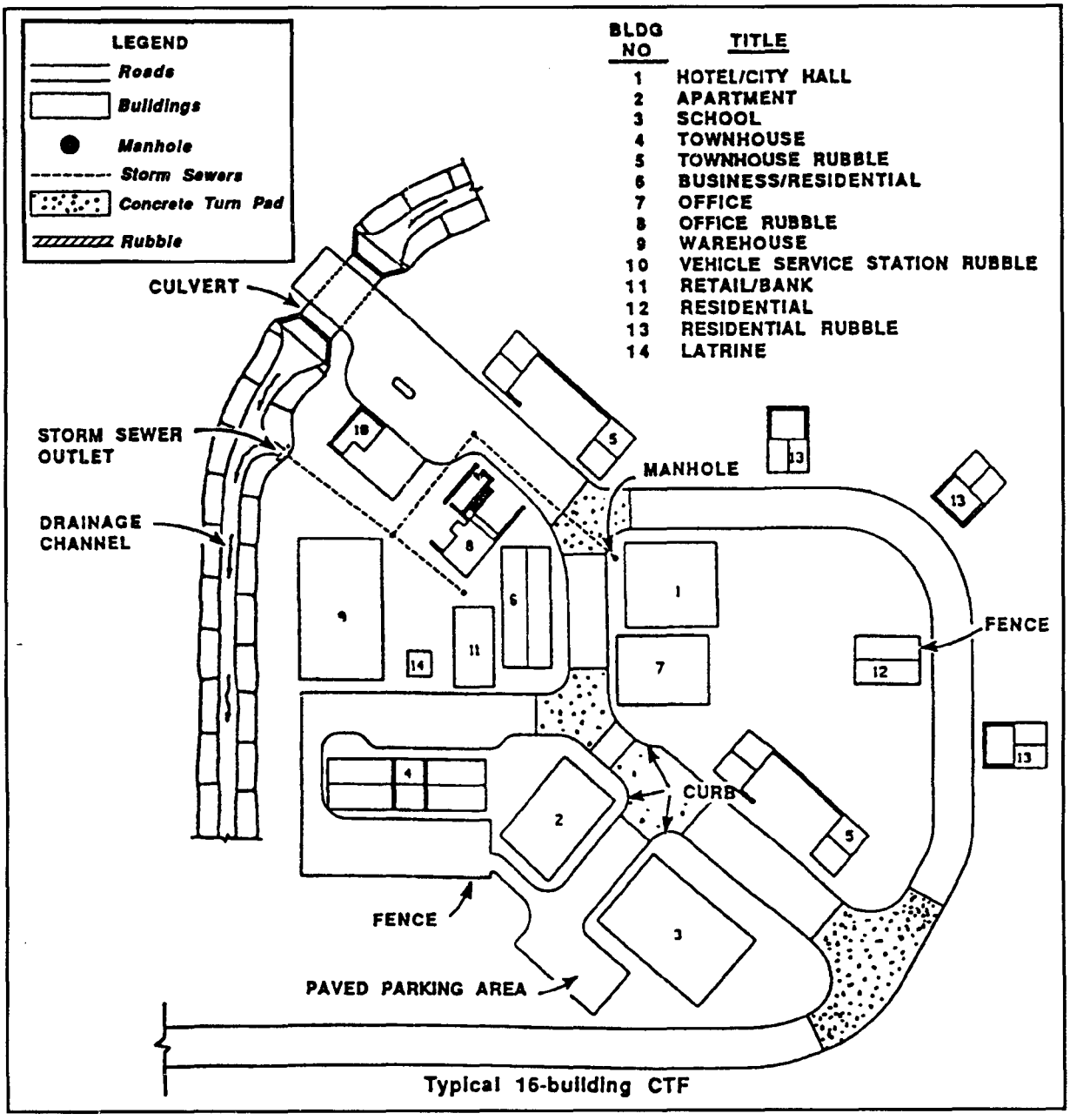
Machine gun mounts are secured to prevent movement from established firing positions.

Machine gun traverse and elevating stops are used to prevent firing beyond the limits of fire or below minimum elevation.

Berms are constructed according to AR 385-63.

This range is used only for basic training at Army training centers.

Figure 6-43. Platoon defense against aircraft range (cont)



Use: Units up to battalion task force use this facility to train and sustain unit proficiency in an urban environment using MILES.

Characteristics:

Number of buildings – 16 for platoon, 32 for company-size and larger units.

Firing point configuration – NA.

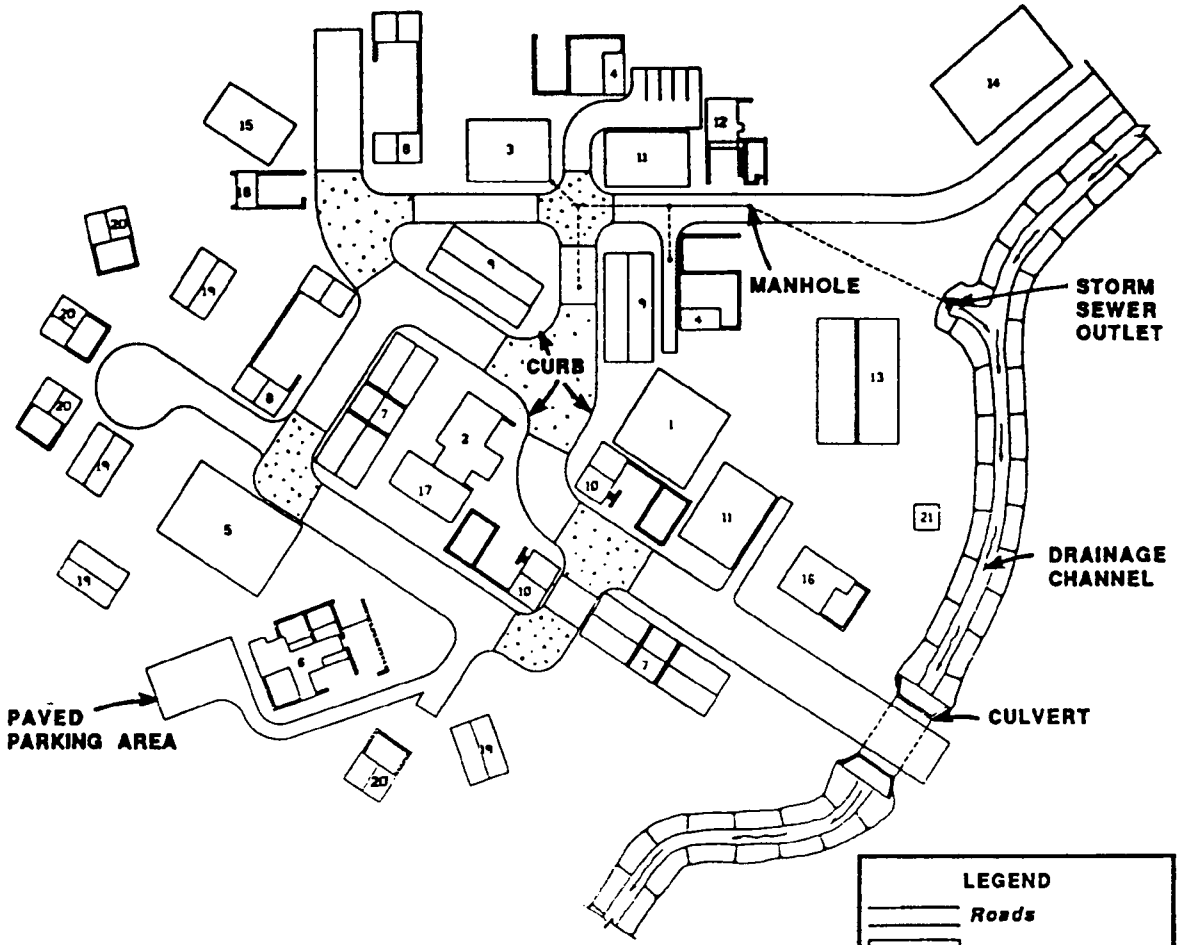
Target configuration – MILES or force-on-force.

Associated facilities – standard facilities.

References – FM 90-10(HTF), FM 90-10-1(HTF), ARTEP 71-2, HNDM 1110-1-7.

Additional Information: The MOUT facility is designed to support up to battalion-task-force-size elements. Training on this facility is normally accomplished after the unit has attained individual and low-level collective skill proficiency on the MOUT assault course (MAC).

Figure 6-44. Military operations on urbanized terrain collective training facilities (MOUT CTF)



BLDG NO	TITLE	BLDG NO	TITLE
1	HOTEL/CITY HALL	11	OFFICE
2	HOTEL/CITY HALL RUBBLE	12	OFICE RUBBLE
3	APARTMENT	13	WAREHOUSE
4	APARTMENT RUBBLE	14	WAREHOUSE RUBBLE
5	SCHOOL	15	VEHICLE SERVICE STATION
6	SCHOOL RUBBLE	16	VEHICLE SERVICE STATION RUBBLE
7	TOWNHOUSE	17	RETAIL/BANK
8	TOWNHOUSE RUBBLE	18	RETAIL/BANK RUBBLE
9	BUSINESS/RESIDENTIAL	19	RESIDENTIAL
10	BUSINESS/RESIDENTIAL RUBBLE	20	RESIDENTIAL RUBBLE
		21	LATRINE

Typical 32-building CTF

Figure 6-44. Military operations on urbanized terrain collective training facilities (MOUT CTF) (cont)

APPENDIX A

Range Selection

This appendix identifies primary and alternate ranges used for training and qualification with specific weapon systems and weapons, based on applicable field and gunnery manuals.

Table A-1. Range selection

WEAPON SYSTEM	TRAINING EVENT	RANGE	
		PRIMARY	ALTERNATE
M16A1/A2	Zero	25m Range	AFF/ARF/MRF with 25m boots
	Sustainment/ Pr actice/Record	AFF/ARF/MRF	25m Range
	Qualification	ARF/MRF	25m Range
	Night	AFF/ARF/MRF Night Fire	25m Range
	NBC Conditions	AFF/ARF/MRF	25m Range
	Squad/Platoon ARTEP LFX	ISBC/IPBC/ MPTR/MPRC	MPTR/MPRC
Cal .45/9mm/cal .38	Instructional Fire	CPQC	25m Alternate Pistol/Revolver Qualification Course
	Qualification	CPQC	25m Alternate Pistol/Revolver Qualification Course
	NBC Conditions	CPQC	25m Alternate Pistol/Revolver Qualification Course
	Military Police Qualification	MPFQC/CPQC	25m Alternate Pistol/Revolver Qualification Course
	Military Police Night Fire Arms Sustainment	MPFQC/CPQC	25m Alternate Pistol/Revolver Qualification Course

Table A-1. Range selection (cont)

WEAPON SYSTEM	TRAINING EVENT	RANGE	
		PRIMARY	ALTERNATE
M21 and M24 sniperrifle	Zero	Sniper Field Fire	25m Range
	Qualification	Sniper Field Fire	NA
	Night Fire	Sniper Field Fire	NA
	Squad/Platoon ARTEP LFX	Sniper Field Fire	MPTR/MPRC
	CALFEX/STX	MPRC	NA
M249 SAW	10m Practice	Machine Gun 10m	NA
	10m Record	MPMG	NA
	Transition Practice	MPMG	NA
	Transition Record	MPMG	NA
	NBC Conditions	MPMG	NA
	Squad/Platoon ARTEP LFX/STX	ISBC/IBPC/ MPTR/MPRC	NA
	CALFEX	MPRC	NA
M60/M2HB	10m Record	Machine Gun 10m	NA
	Transition Record	MPMG	NA
	Limited Visibility/ Predetermined Fire	MPMG	NA
	Squad/Platoon ARTEP LFX	ISBC/IPBC/ MPTR/MPRC	NA
	CALFEX	MPRC	NA
M203/M79	Instructional	Grenade Launcher	NA
	Qualification	Grenade Launcher	NA
	NBC	Grenade Launcher	NA
	Squad/Platoon ARTEP LFX	ISBC/IPBC/ MPTER/MPRC	NA
	CALFEX	MPRC	NA

Table A-1. Range selection (cont)

WEAPON SYSTEM	TRAINING EVENT	RANGE PRIMARY	RANGE ALTERNATE
Hand Grenade (HG)	Instructional	HG Qualification Course	NA
	Qualfication	HG Qualification Course	NA
	Live-Grenade Throw	HG Qualification Course	NA
Recoilless Rifle	Zero	AntiarmorTracking	NA
	Instructional Training	AntiarmorTracking	NA
	Qualification	AntiarmorTracking	NA
	Night Firing	Antiarmor Tracking	NA
	NBC Conditions	AntiarmorTracking	NA
	CALFEX/LFX	MPRC	NA
	HE Live-Fire	Impact Area	NA
LAW/AT-4	Training Event	Light Antitank Weapon	NA
	Instructional	Light Antitank Weapon	NA
	Qualification	Light Antitank Weapon	NA
	Squad/Platoon LFX/STX	ISBC/IPBC/ MPRC	NA
	CALFEX MPRC	NA	

Table A-1. Range selection (cont)

WEAPON SYSTEM	TRAINING EVENT	RANGE PRIMARY	RANGE ALTERNATE
MK-19 grenade machine gun	Practice Fire	MK-19 MG	
	Record Fire	MK-19 MG	
	NBC Condition	MK-19 MG	
	Night Firing	MK-19 MG	
	HE	MK-19 MG	
	MG Sustainment	MK-19 MG	
	LFX	MK-19 MG	
	CALFEX MPRC	NA	
60mm mortar	Crew/Section/ Platoon Training	Mortar	NA
	Evaluated ARTEP	Mortar	NA
	CALFEX	MPRC	NA
81mm mortar	Crew/Section/ Platoon Training Range (SMR)	Mortar	Scaled Mortar
	Crew/Section/ Platoon Training	Mortar	NA
	Evaluated ARTEP	Mortar	NA
	CALFEX Fire Control Exercise (FCX)		NA
107mm mortar	Crew/Section/ Platoon Training*	Mortar	SMR
	60mm Subcaliber Firing	Mortar	NA
	Crew/Section/ Platoon Training	Mortar	NA
	Evaluated ARTEP	Mortar	NA
	CALFEX	MPRC	NA

*USAREUR units only

Table A-1. Range selection (cont)

WEAPON SYSTEM	TRAINING EVENT	RANGE PRIMARY	RANGE ALTERNATE
M202A1 60mm rocket launcher/flame field expedient devices	Instructional	Flame Operations	NA
M60A3/M1/M1A1	Table I	UCOFT*	Scaled Gunnery Ranges (SGR) (1:5/1:10/1:30/1:60)
	Table II	UCOFT	NA
	Table III**	SGR	Maneuver Area Dayfire/TES***
	Table IV**	SGR	Maneuver Area Dayfire/TES
	Table V	MPTR	NA
	Calibration	Stationary Gunnery Range	MPTR
	Table VI	Stationary Gunnery Range	MPTR
	Table VII (Old)	MPTR	MPRC/Table VIII
	Table VIII (Old)	MPRC/MPTR	Table VIII
	Table IX	MPRC	MPTR
	Table X	MPRC	MPTR
	Table XI	MPRC	NONE
	Table XII	MPRC	NONE
*Unit Conduct of Fire Trainer **Tank Crew Proficiency Course (TCPC) ***Tactical Engagement System			
M2/M3 Bradley fighting vehicle	Tables I-IV	Scaled Gunnery Ranges (1:5/1:10/1:30/1:60)	NA
	Table V	MPTR	SGR (1:5)
	Zero	Stationary Gunnery Range	MPTR

Table A-1. Range selection (cont)

WEAPON SYSTEM	TRAINING EVENT	RANGE PRIMARY	RANGE ALTERNATE
	Table VI-A/B	Stationary Gunnery Range	MPTR
	Table VII-A/B	MPTR	MPRC
	Table VIII-A/B	MPRC/MPTR	Table VIII
	Infantry Squad Combat Exercise	MPRC/MPTR	Table VIII
	Squad Firing Port Exercises Stationary and Moving	MPRC	MPTR/MPMG
	Table IX*	MPRC	NONE
	Table IX-A/B**	MPRC	NONE
	Table X-A/B**	MPRC	NONE
	Table IX	MPRC	NONE
	Table XII	MPRC	NONE
	CALFEX	MPRC	NONE
*Vehicle Section Gunnery **Scout Section Gunnery			
Combat EngineerVehicle	Table I	CEV	NA
	Table II	CEV	NA
	Table III	CEV	MPTR/MPRC
	Table IV	CEV	MPTR/MPRC
	Table V	CEV	MPTR/MPRC
	LFX	MPTR*	MPRC*
*Stationary nonautomated targetry ONLY			
TOW/M901 ITV	Tables I-XII	Local Training Area	NA
	CALFEX	MPRC	NA
(All training is conducted using MILES)			

Table A-1. Range selection (cont)

WEAPON SYSTEM	TRAINING EVENT	RANGE PRIMARY	RANGE ALTERNATE
M47 Dragon and AT-4	Field Tracking	LTA	NA
	Advanced Tracking	LTA	NA
	Tracking Qualification	LTA	NA
CALFEX	MPRC		
(All training is conducted using MILES and ATWESS)			
AH-64	Commander's GunneryTables	Aerial Gunnery Range (AGR)	MPTR/MPRC
	Crew Gunnery Tables	AGR	MPRC
	Team Gunnery Tables	AGR	MPRC
	CALFEX/JAAT	Maneuver/ Impact Area	MPRC
(When using the MPRC for helicopter gunnery, confirm that target positions are constructed for direct-fire aerial gunnery weapon systems. Only non-dud-producing ammunition will be used.)			
AH-1	Commander's Gunnery Tables	AGR	MPTR/MPRC
	Crew Gunnery Tables	AGR	MPTR/MPRC
	Team Gunnery Tables	AGR	MPRC
	CALFEX/JAAT	Manuever/ Impact Area	MPRC
UH-1M	Commander's Gunnery Tables	AGR	MPRC
	Crew Gunnery Tables	AGR	MPRC
Door gunner training (CH-47,UH-60, UH-1H)	Tables I-IV	MPMG	Machine Gun 10m
	Table V	AGR	MPMG/MPTR/MPRC
	Table VI	AGR	MPMG/MPTR/ MPRC
	Table VII	AGR	MPMG/MPTR/MPRC

Table A-1. Range selection (cont)

WEAPON SYSTEM	TRAINING EVENT	RANGE	
		PRIMARY	ALTERNATE
Vulcan	Tables I-VIII	Air Defense Firing (ADF)	MPRC
	Tables IX-XII	MPRC	NA
Duster	Tables I-VIII	ADF	MPTR/MPRC
	Tables IX-XIII	MPTR	MPRC
Redeye/Stinger/ Chaparral	LFX	ADF	MPTR

APPENDIX B

RANGE EQUIPMENT

Figures B-1 through B-85 illustrate targets and targetry equipment currently used to support ranges. Marksmanship targets are discussed further in FM 23-9, armor targets in FM 17-2-7. For additional information, contact USATSC Directorate for Ranges, Targets, and STRAC, ATTN: ATIC-RTSR, Fort Eustis, Virginia 23604-5166, AUTOVON 927-2084/2970.

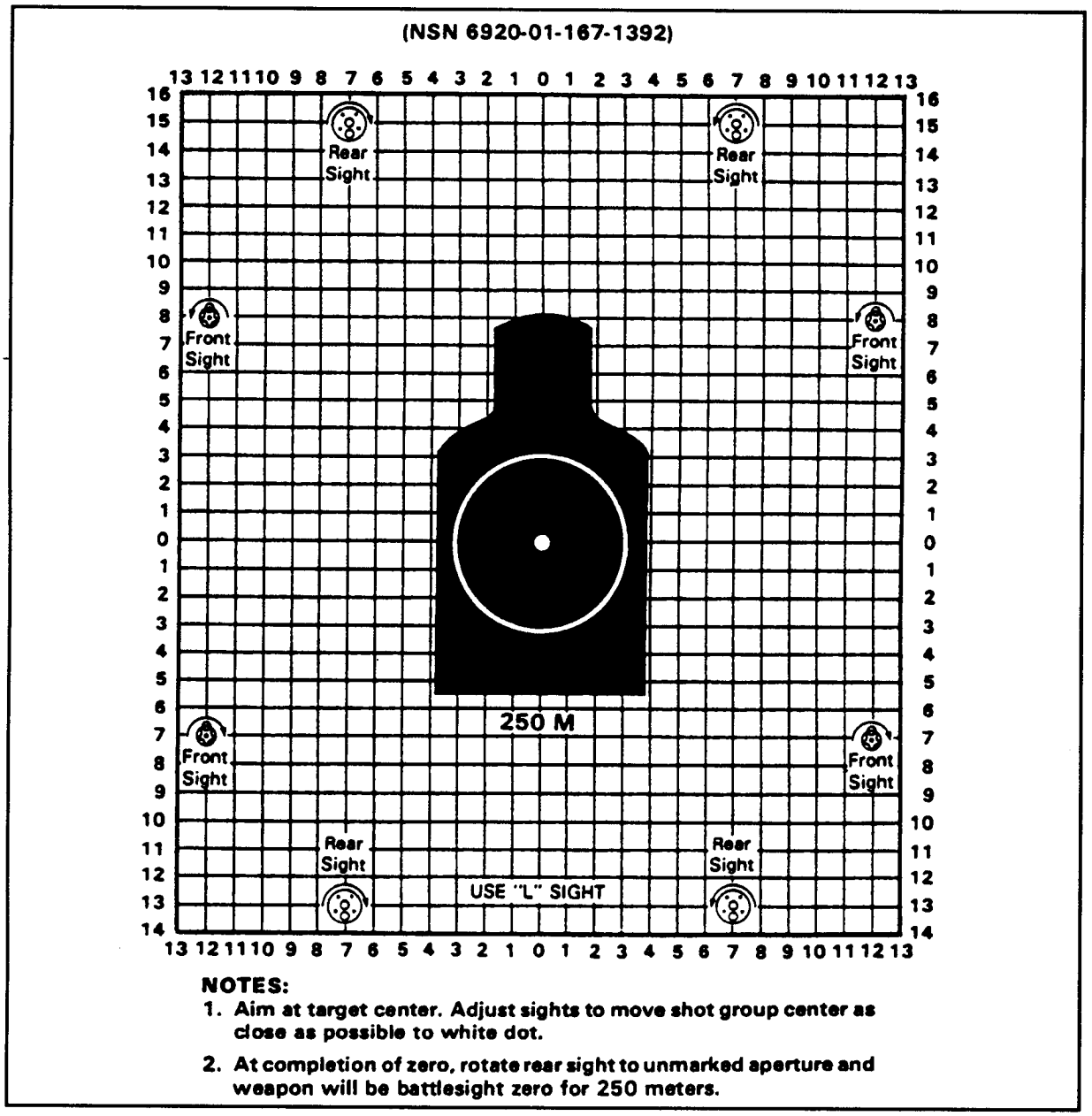
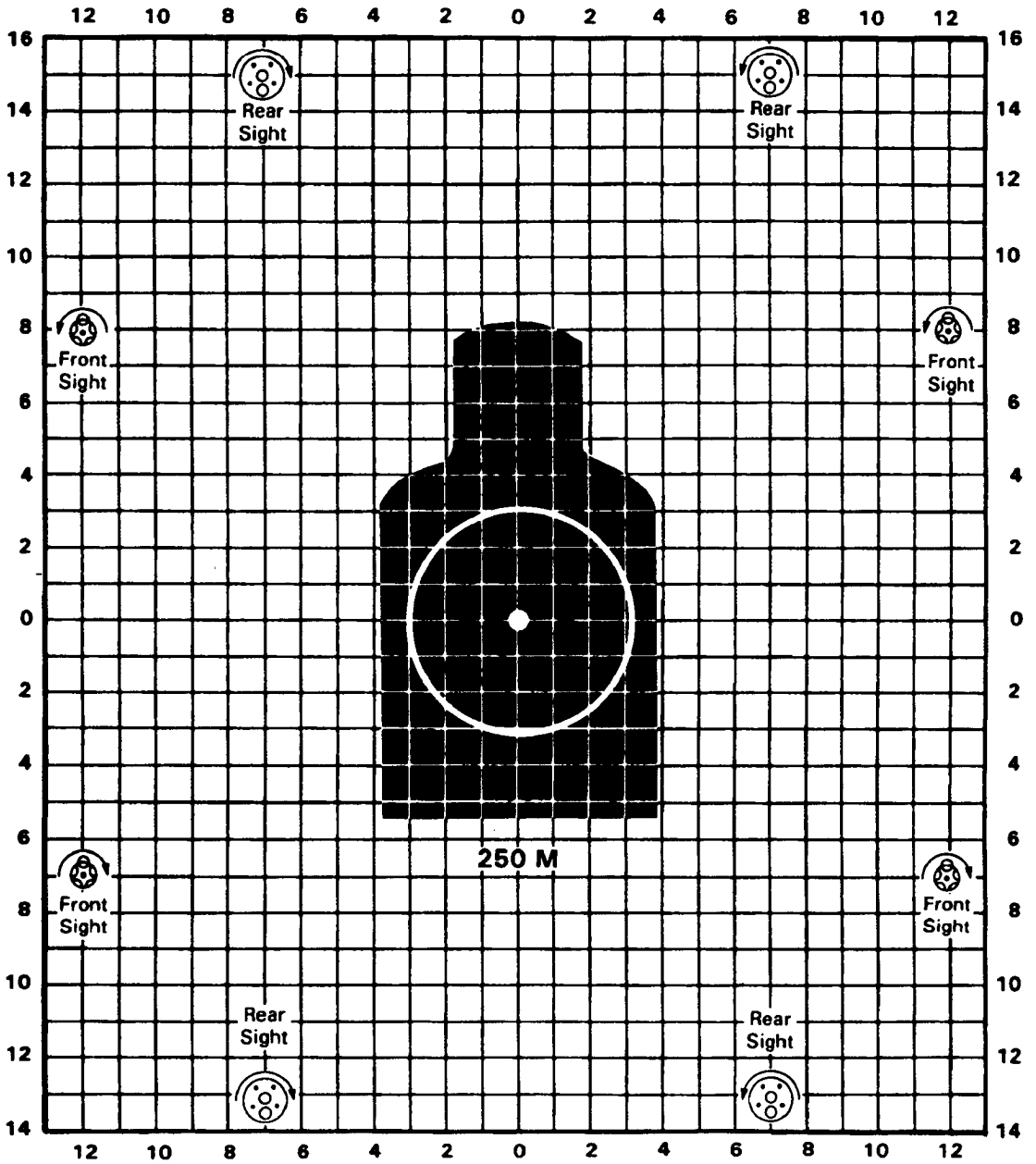


Figure B-1. 25-meter zeroing target for M16A1 rifle (standard sights)

(NSN 6920-01-167-1396)



NOTES:

1. Aim at target center. Adjust sights to move shot group center as close as possible to white dot.
2. Use unmarked aperture with standard sights.
3. Use "L" sight with low light level sight system (LLLSS).

Figure B-2. 15-meter qualification zero target

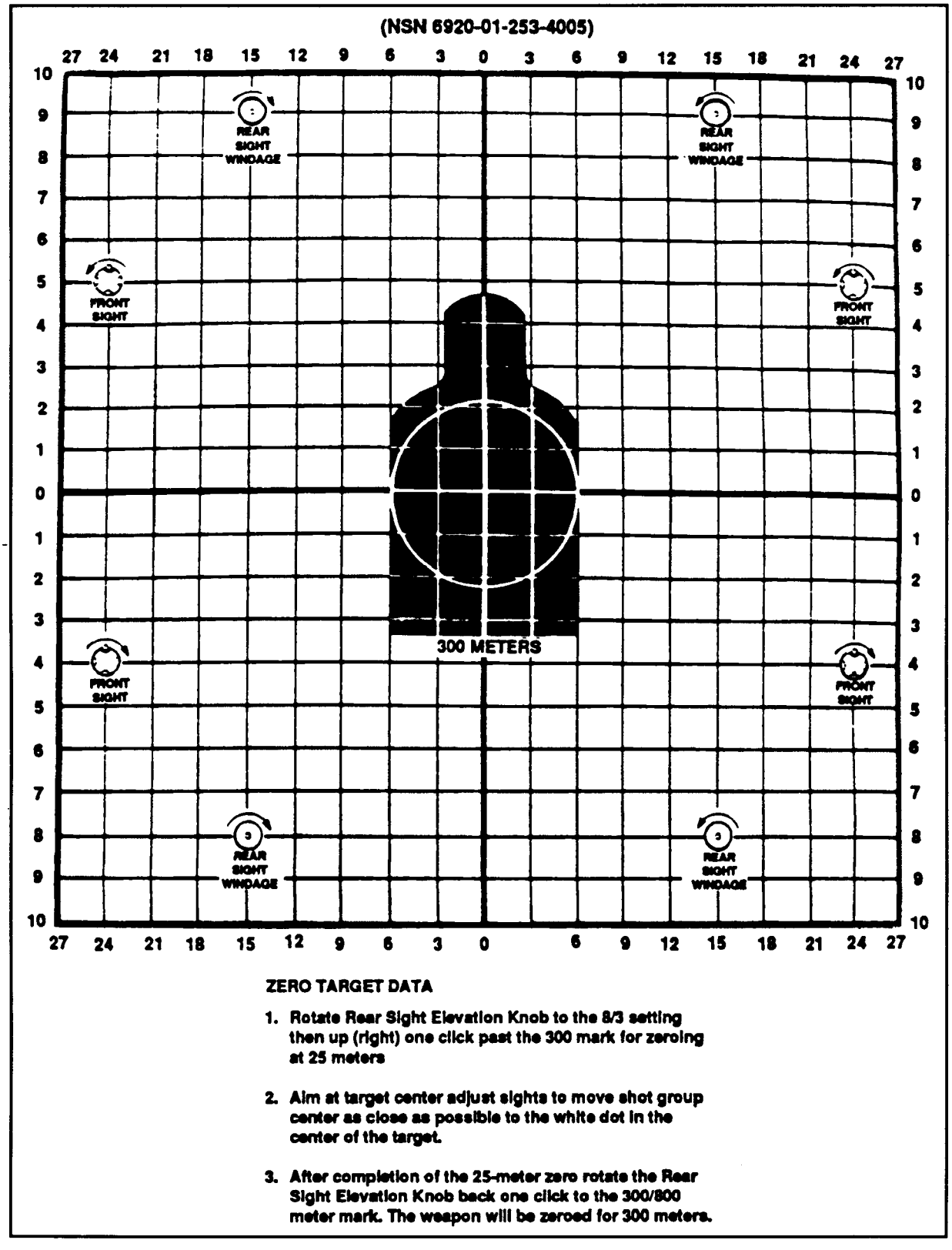


Figure B-3. 25-meter zeroing target M16A2

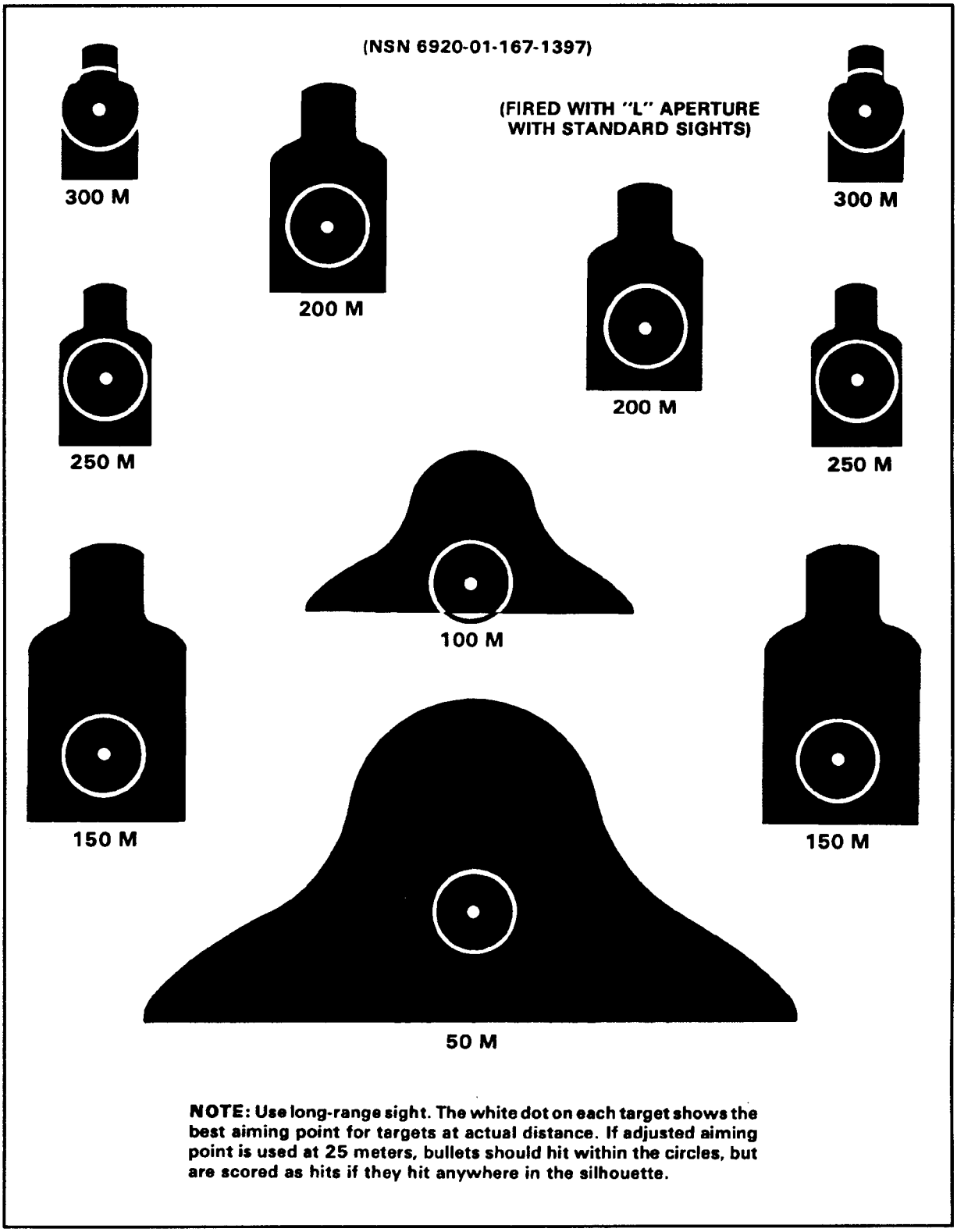


Figure B-4. 25-meter scaled silhouette timed-fire target

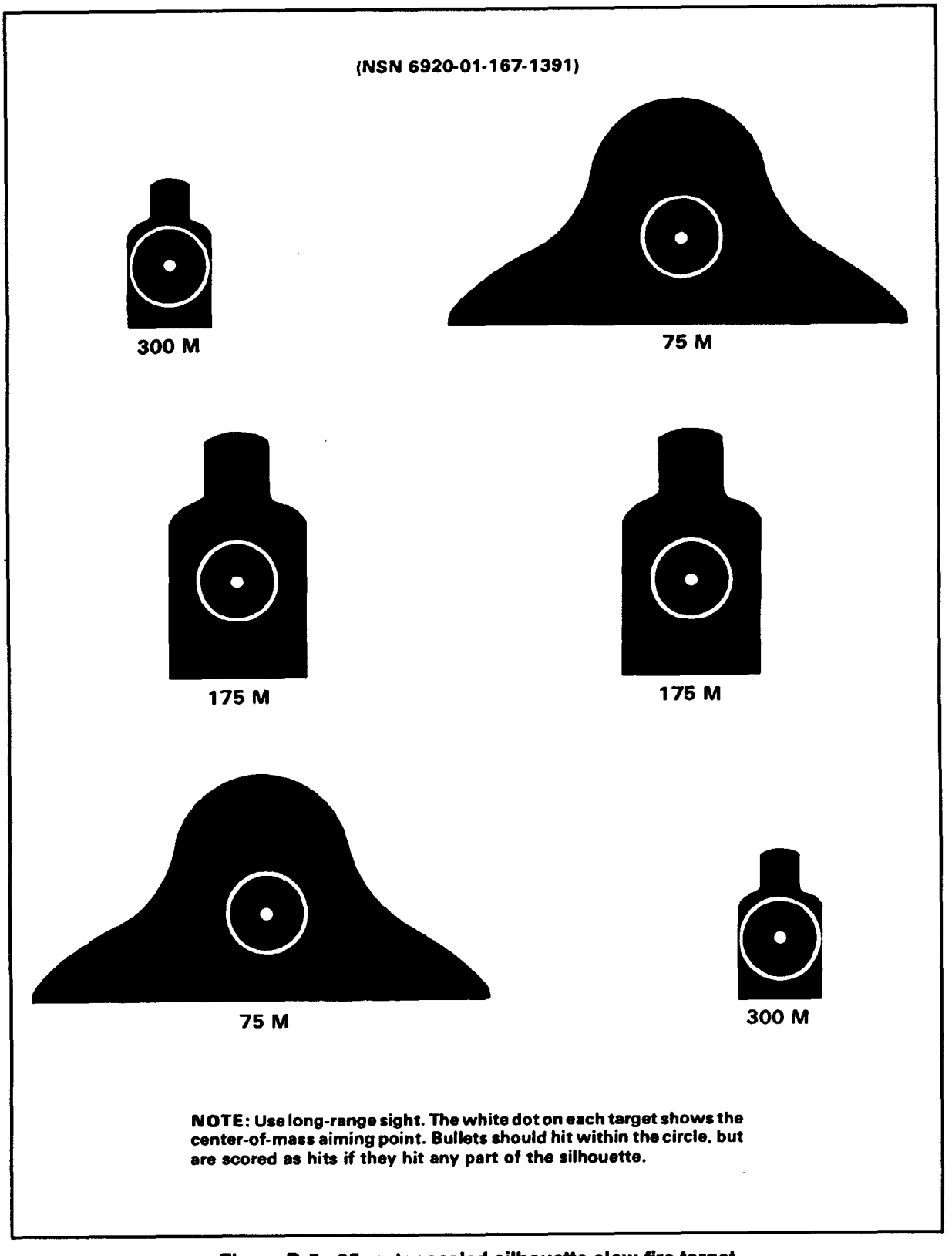


Figure B-5. 25-meter scaled silhouette slow-fire target

(NSN 6920-01-169-6921)

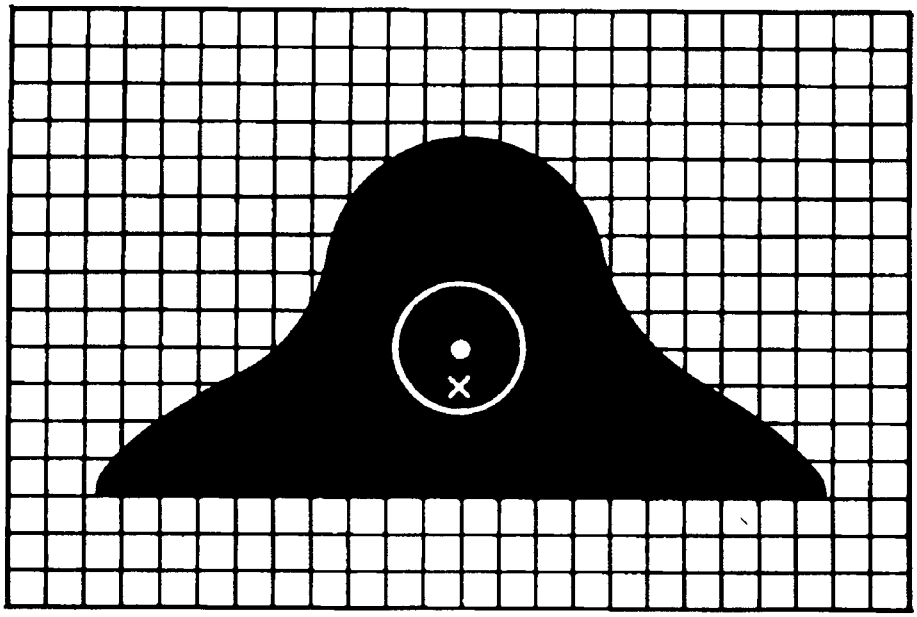
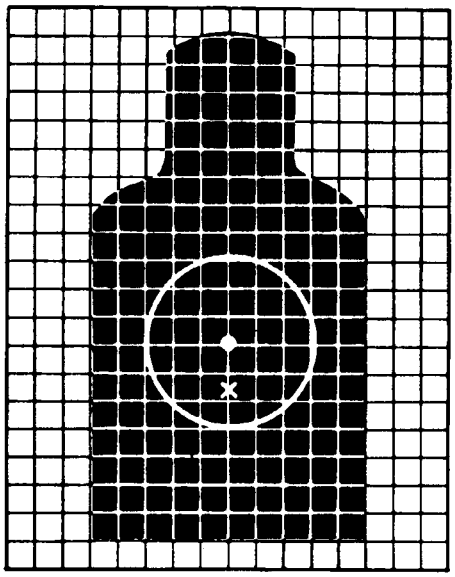


Figure B-6. 75-meter feedback target

(NSN 6920-01-167-1395)



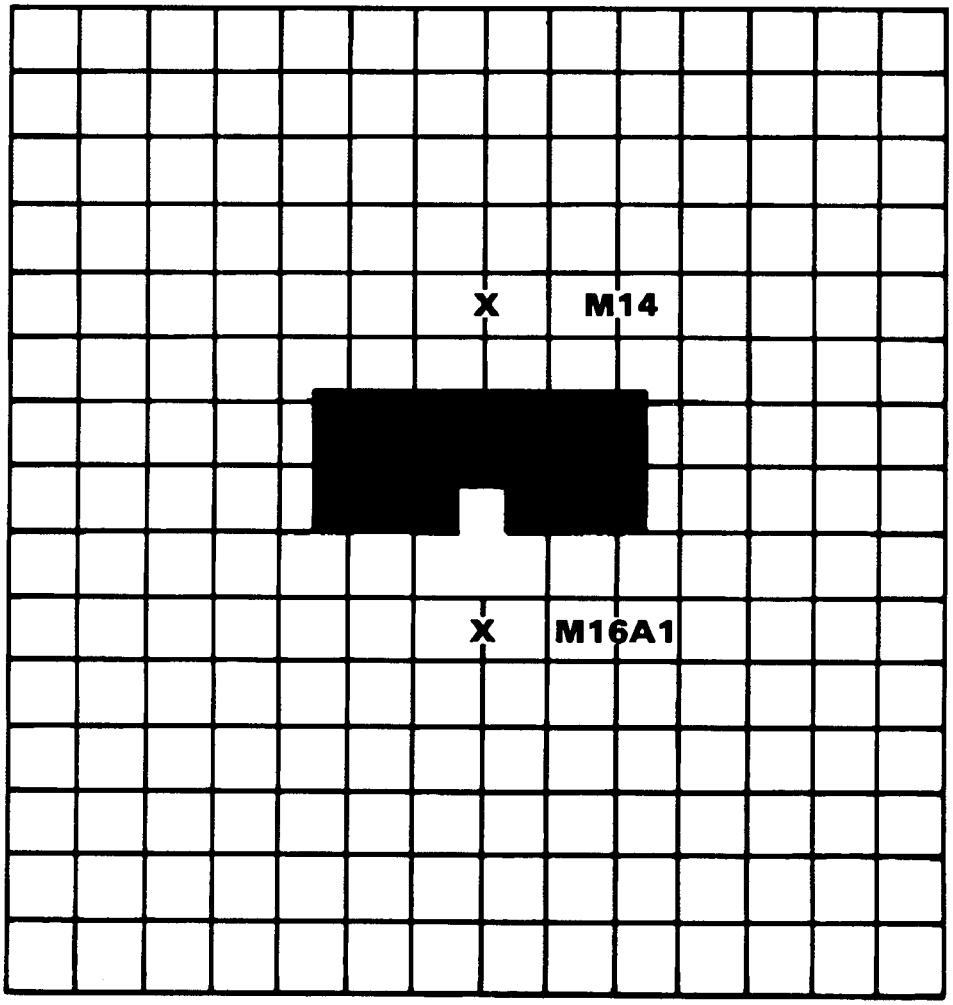
NOTE: Aim at the X, move shot group to center, and click each sight the number of times marked on line. Allow for wind before making sight adjustments.

Figure B-7. 175-meter feedback target

(NSN 6920-01-164-9625)

Figure B-8. 3D personnel target

(NSN 6920-00-906-0169)



NOTES:

1. Two clicks of elevation or windage will move the strike of the bullet one square on this target.
2. To convert centimeters to feet, multiply centimeters by .0328.

Figure B-9. Basic 25-meter firing range (zero) target

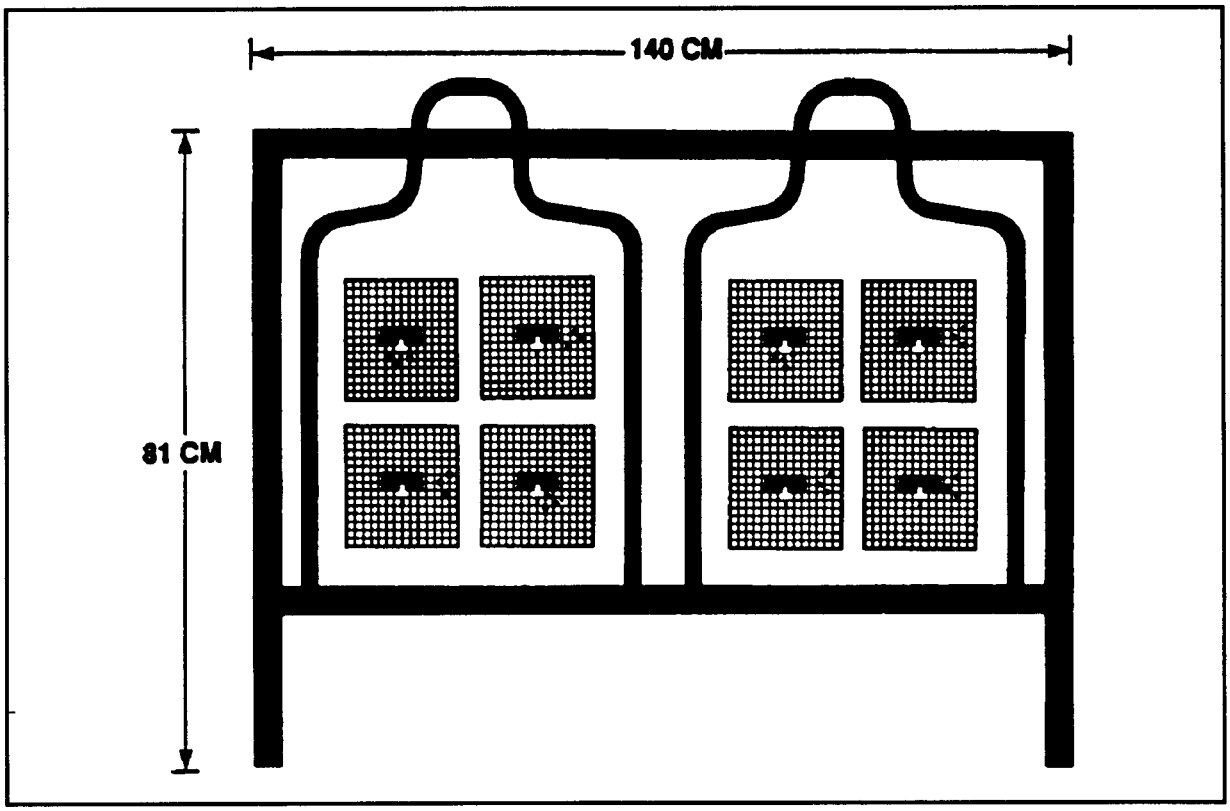


Figure B-10. Zero targets (4) on E-type silhouettes in locally manufactured frame

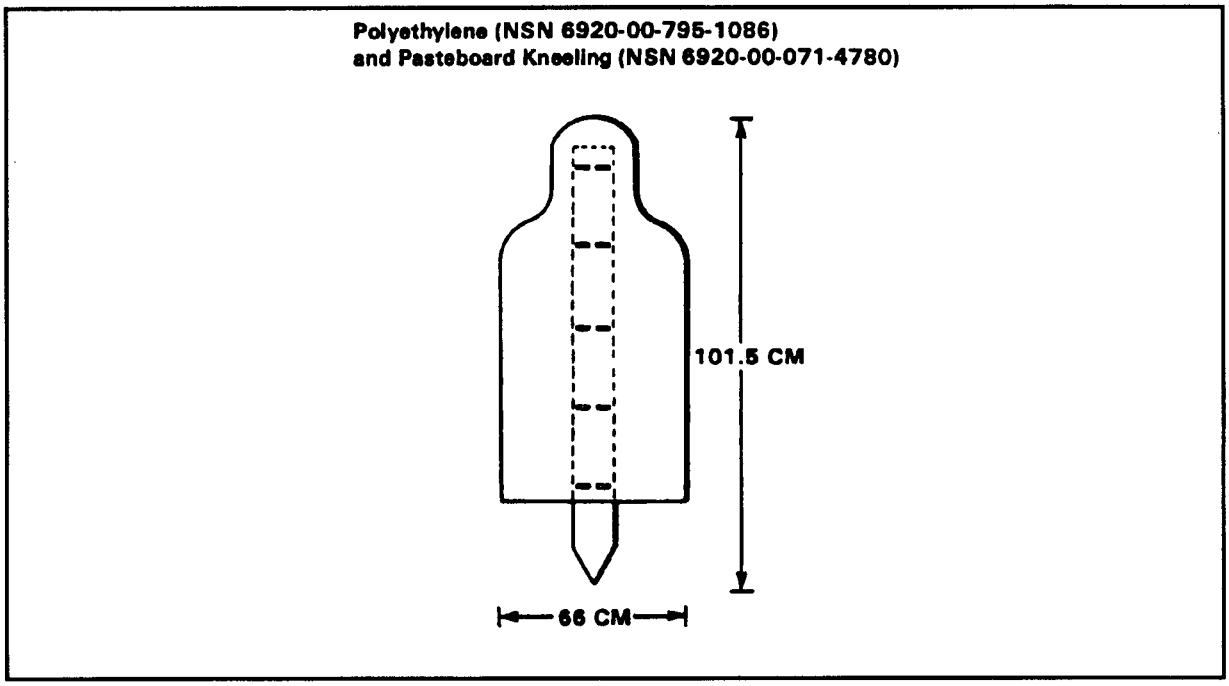


Figure B-11. E-type silhouette

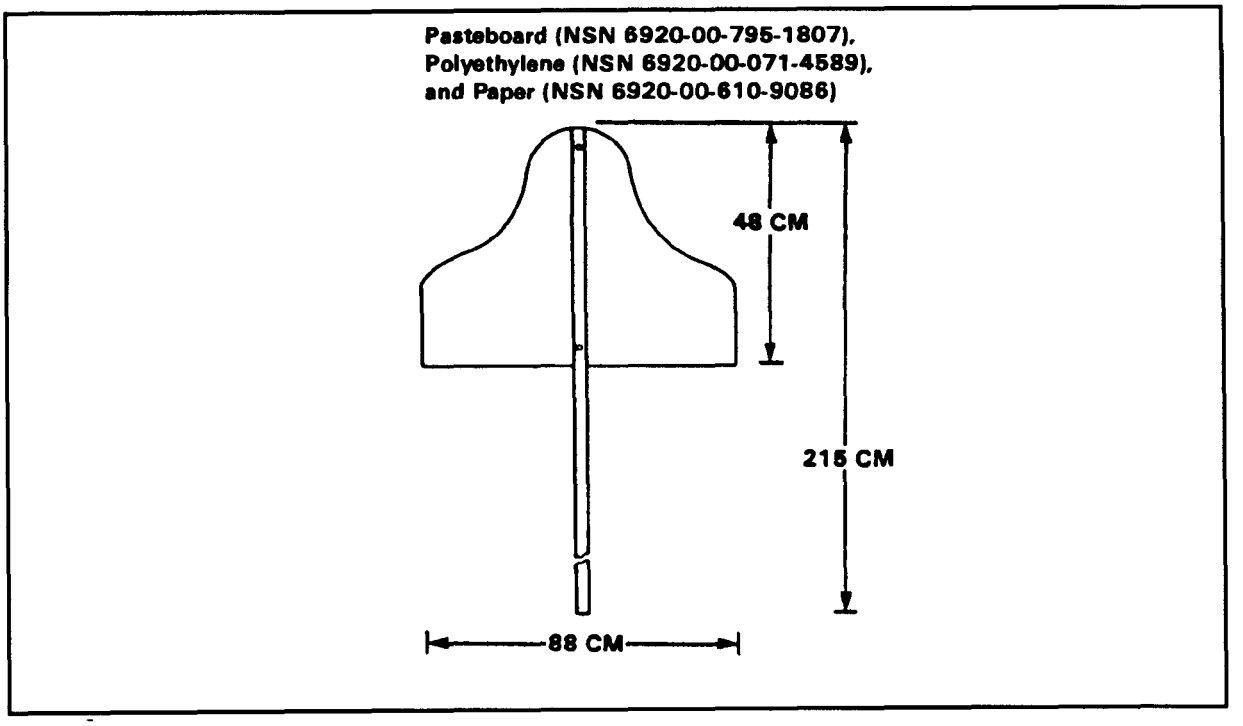


Figure B-12. F-type silhouette

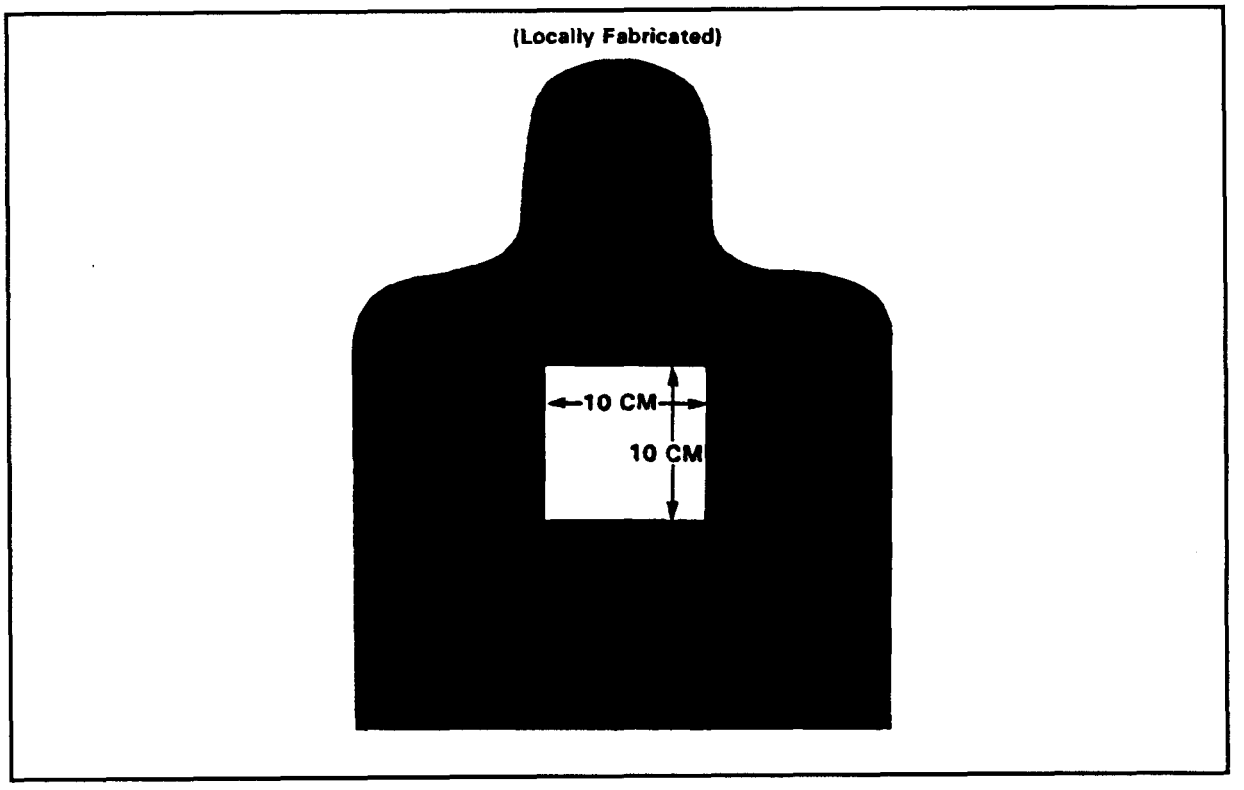


Figure B-13. E-type silhouette with reflective material

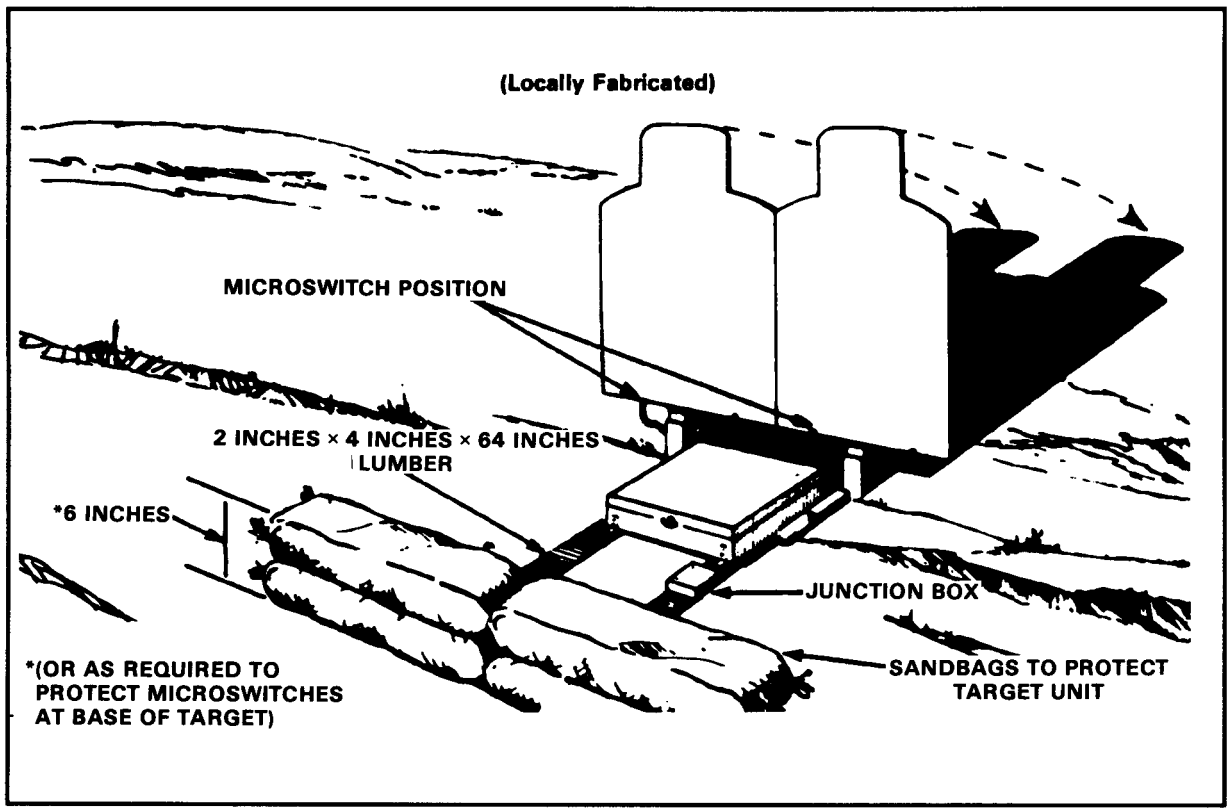


Figure B-14. Small area target

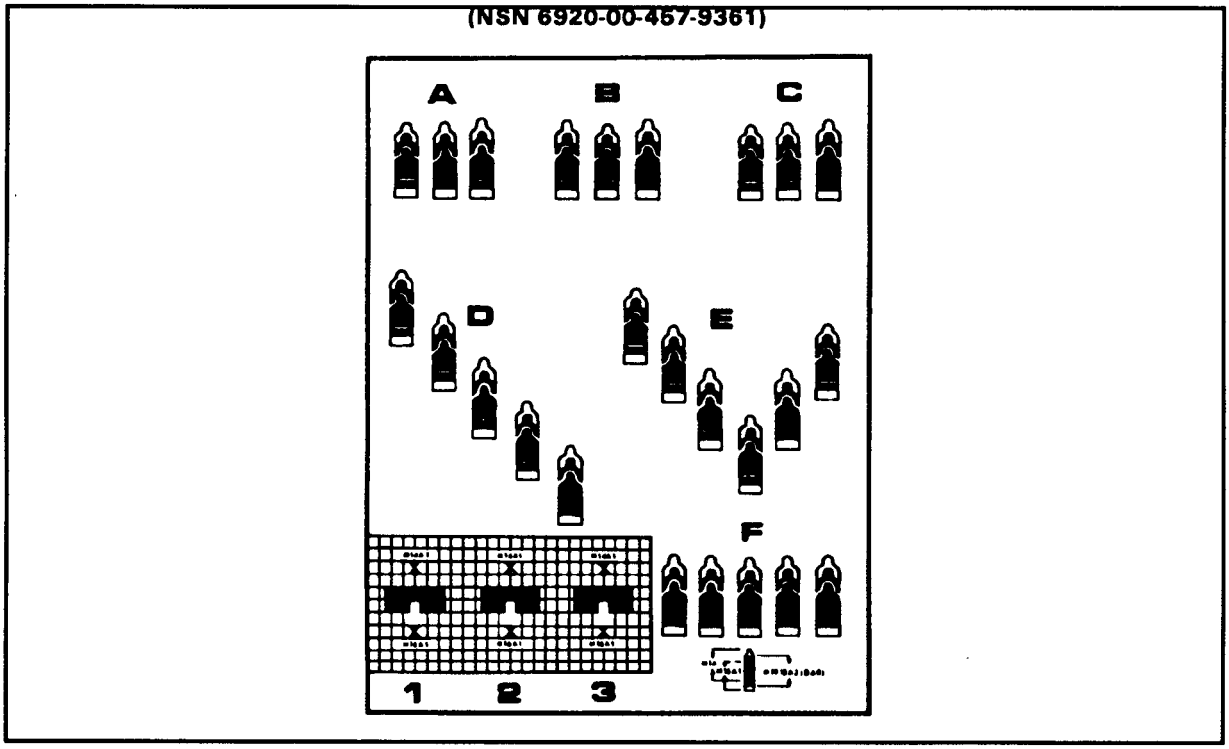
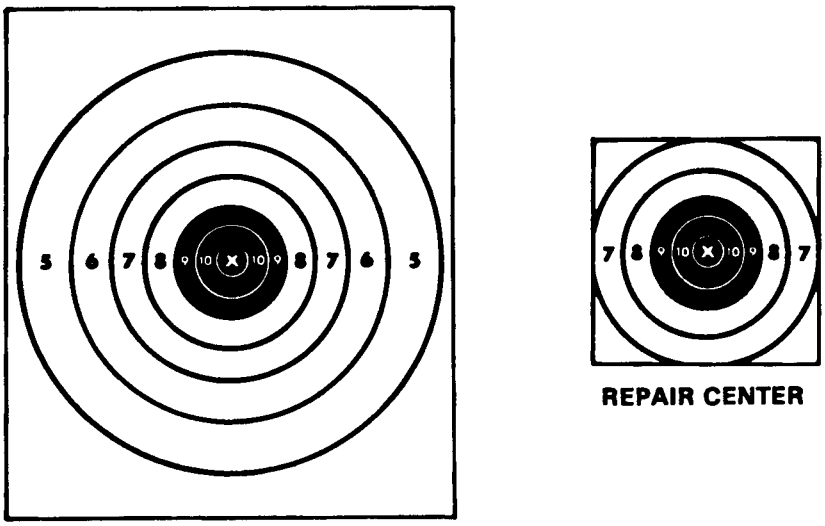


Figure B-15. Standard 25-meter automatic rifle target

(NSN 6920-00-554-5054)



NOTES:
1. Stock number for the repair center is NSN 6920-00-562-0901.
2. This target is a replacement for the 1,000-inch rifle target.

Figure B-16. 25-yard pistol range bull's eye paper target

(NSN 6920-00-906-0170)

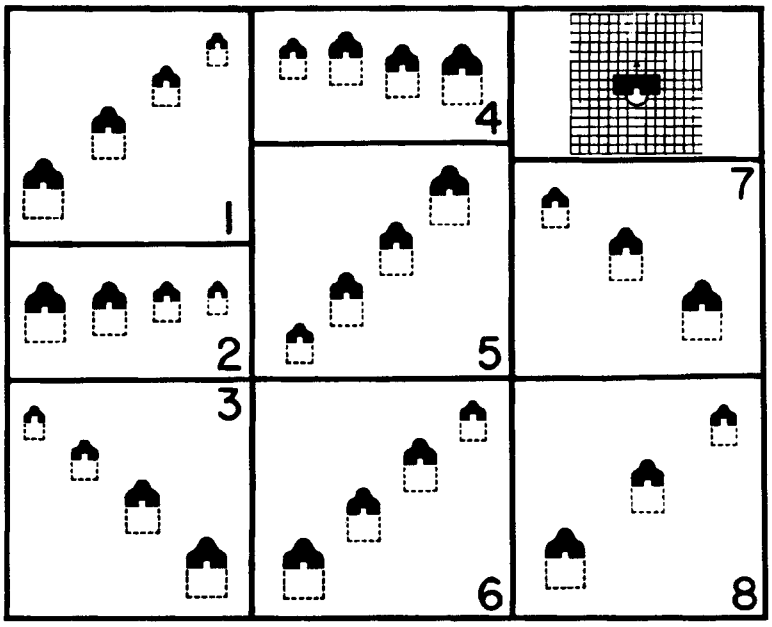


Figure B-17. 25-meter alternate course "C" record fire

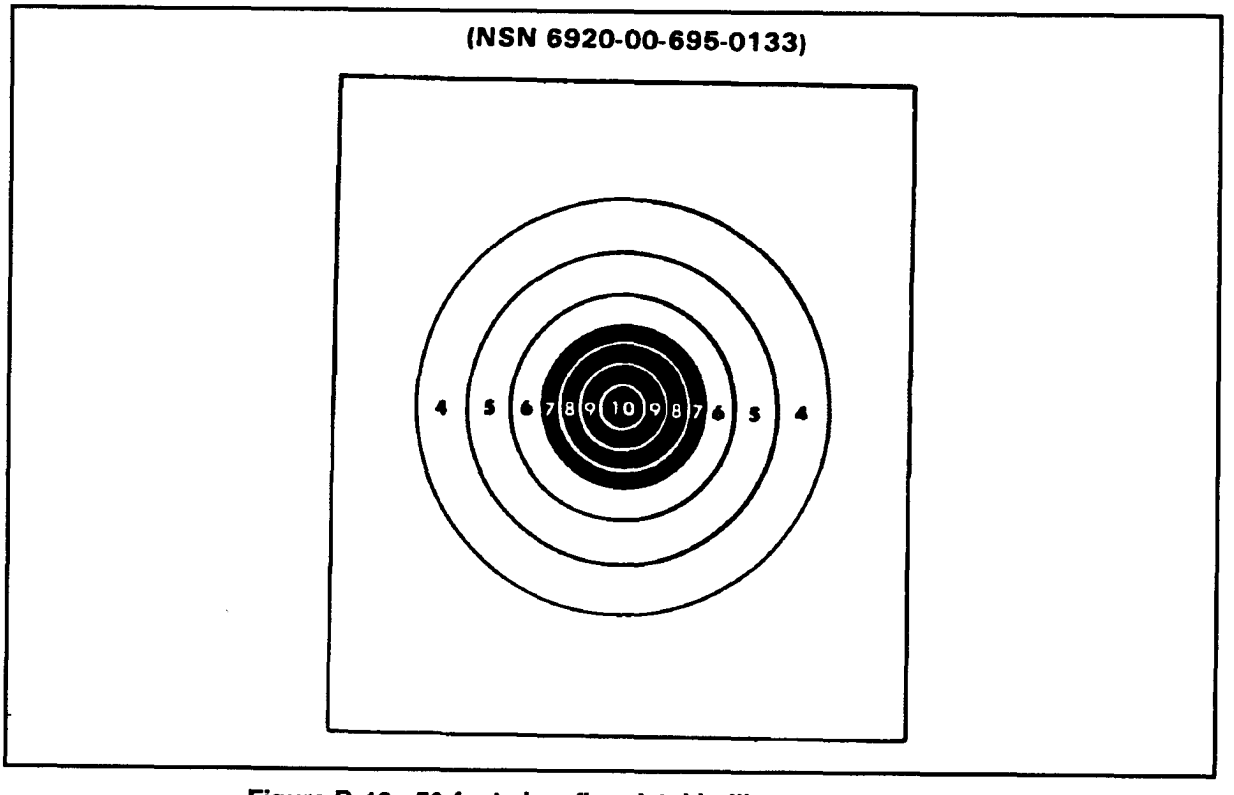


Figure B-18. 50-foot slow-fire pistol bull's eye paper target

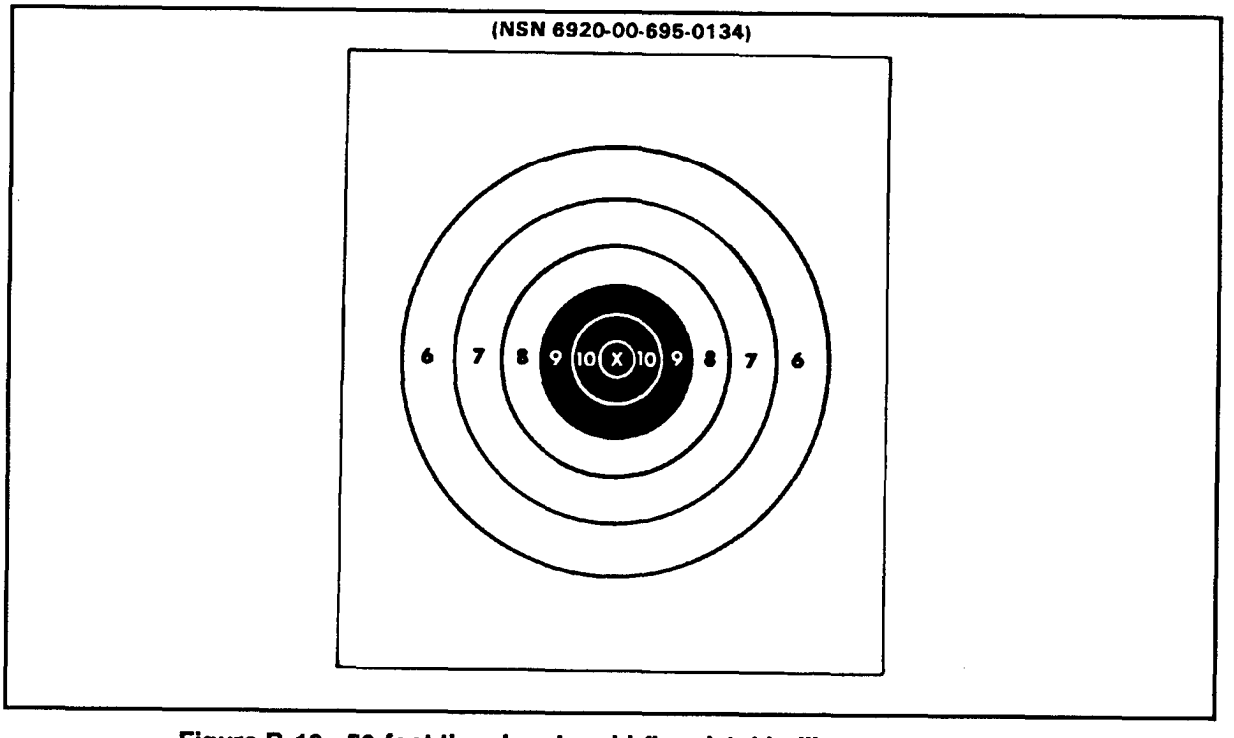
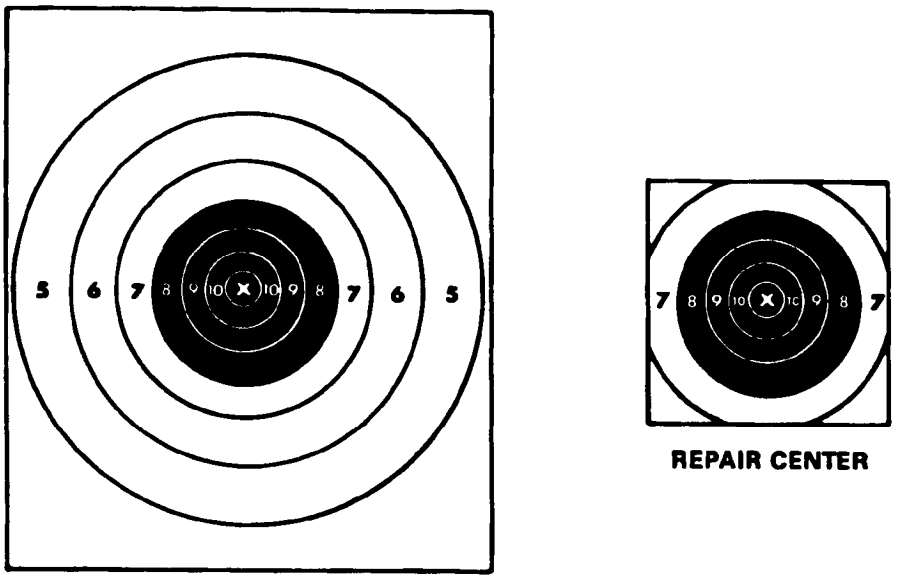


Figure B-19. 50-foot timed and rapid-fire pistol bull's eye paper target

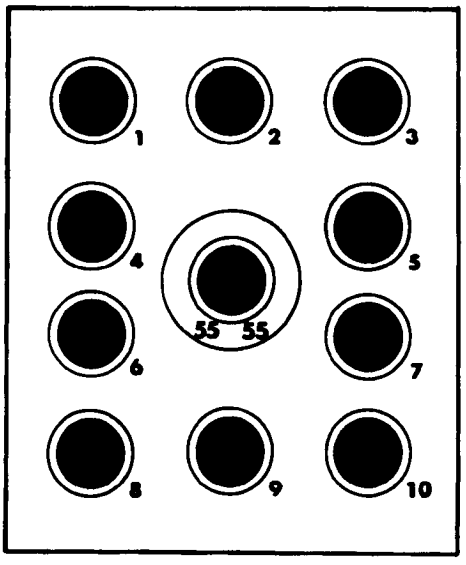
(NSN 6920-00-550-9330)



NOTE: Stock number for the repair center is NSN 6920-00-562-0900.

Figure B-20. 50-yard pistol target

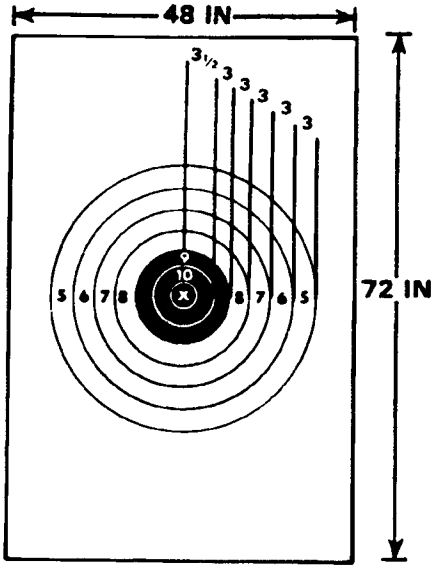
(NSN 6920-00-973-0583)



NOTE: Stock number for the repair center is NSN 6920-00-557-4606.

Figure B-21. 50-foot indoor rifle target

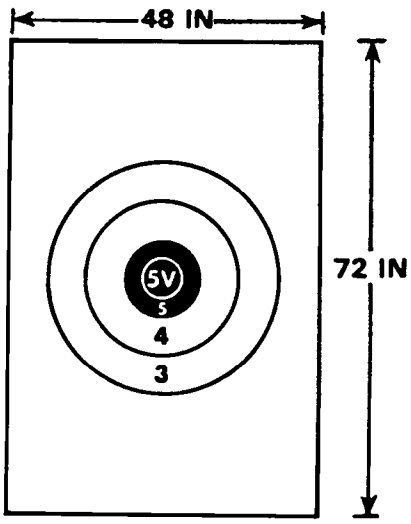
(NSN 6920-00-900-8204)



NOTE: Stock number for the repair center is NSN 6920-00-999-1436.

Figure B-22. Army Rifle Target A, 200-300 yards

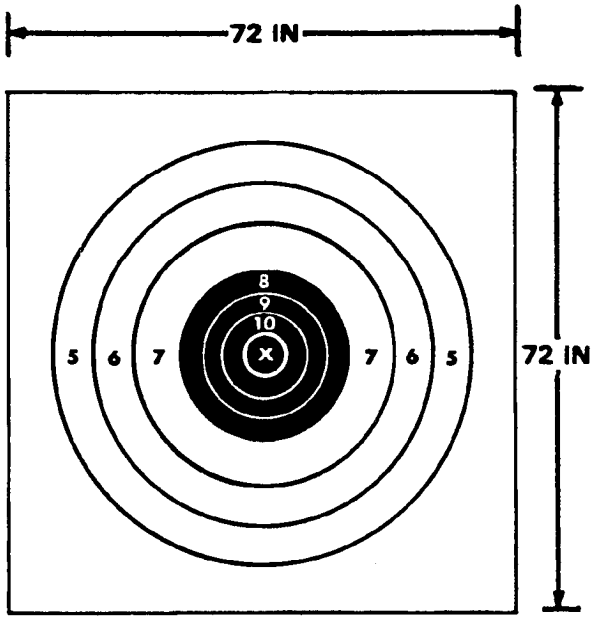
(NSN 6920-00-627-4071)



NOTE: Stock number for the repair center is NSN 6920-00-627-4072.

Figure B-23. Navy and Marine Corps Rifle Target A, 200-300 yards

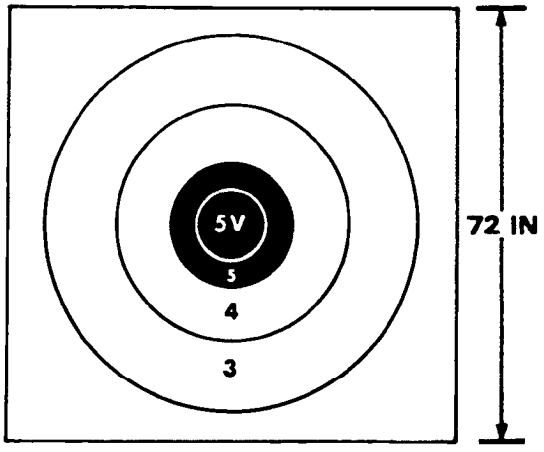
(NSN 6920-00-900-8205)



NOTE: Stock number for the repair center is NSN 6920-00-999-1437.

Figure B-24. Army Rifle Target B, 600 yards

(NSN 6920-00-716-2769)



NOTE: Stock number for the repair center is NSN 6920-00-714-0237.

Figure B-25. Navy and Marine Corps Rifle Target B, 600 yards

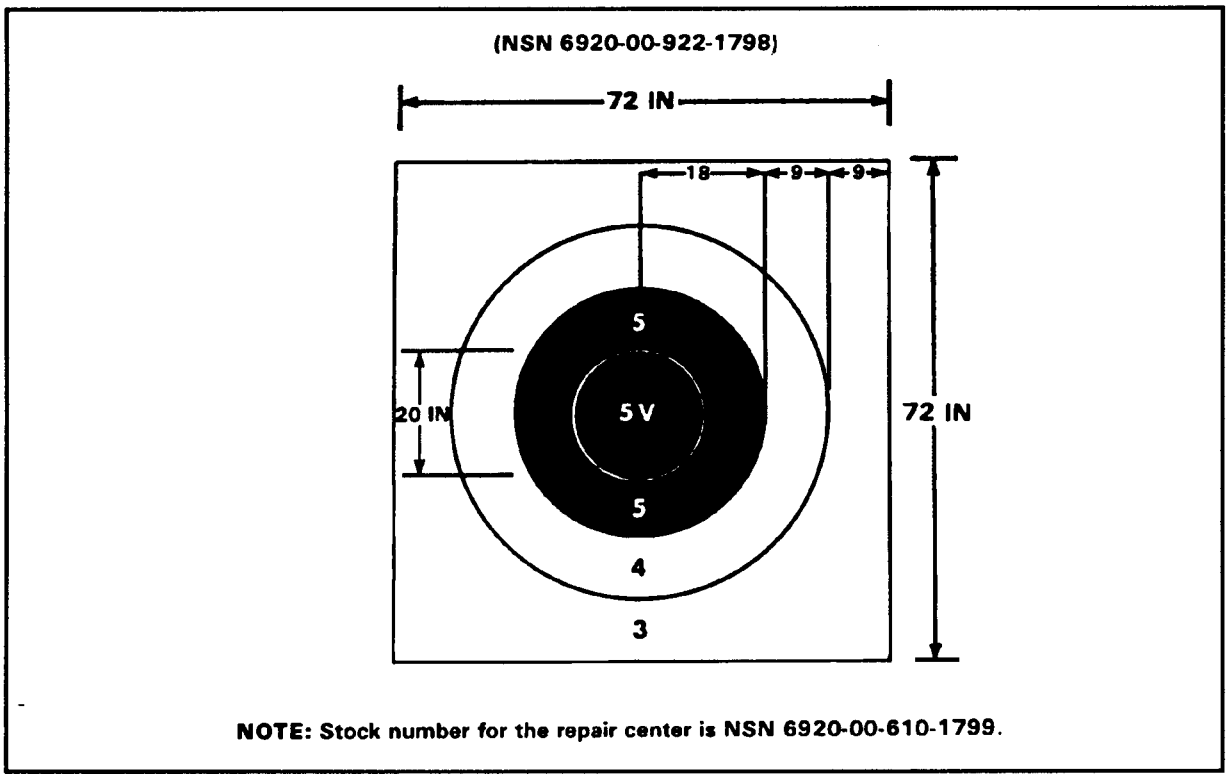


Figure B-26. Army Rifle Target C, 1000 yards

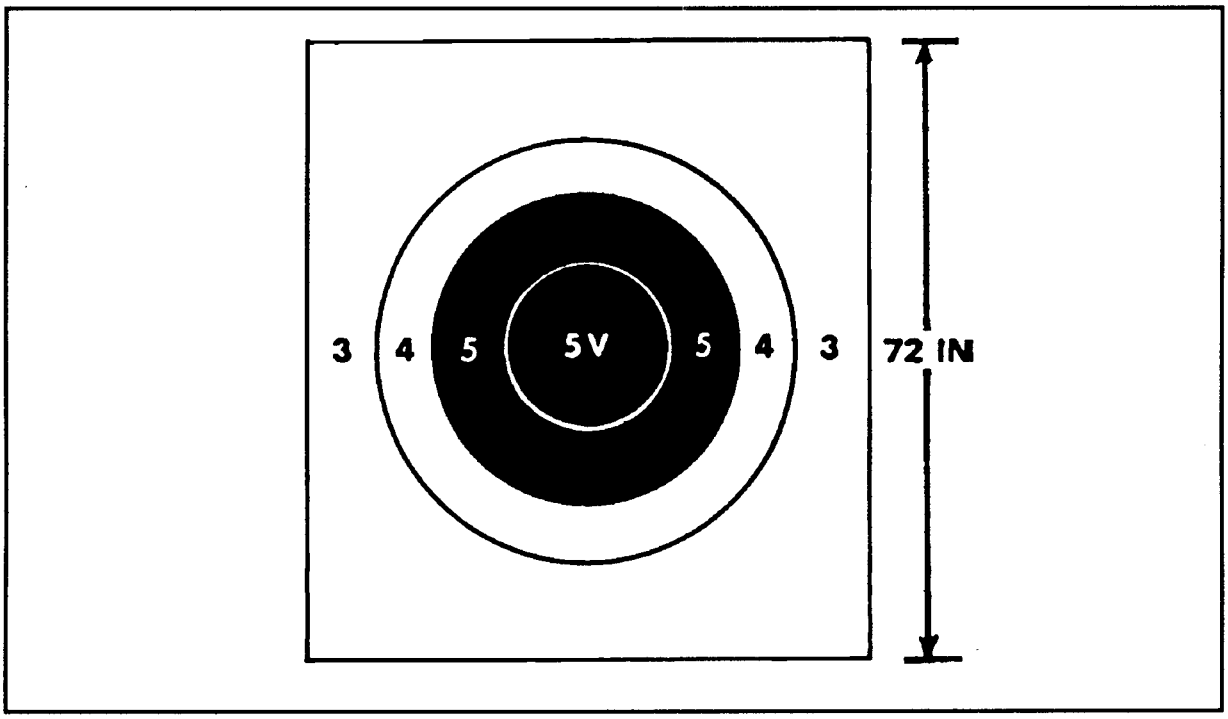
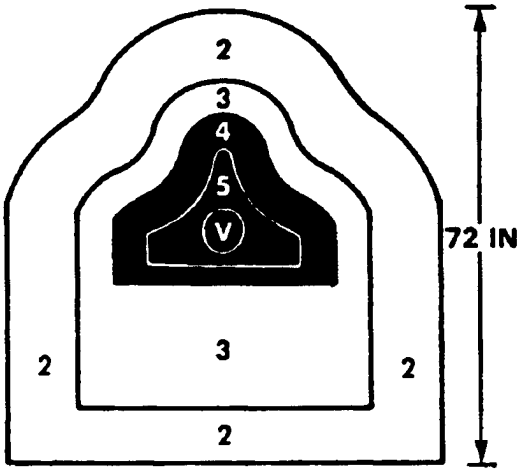


Figure B-27. Navy and Marine Corps Rifle Target C, 1000 yards

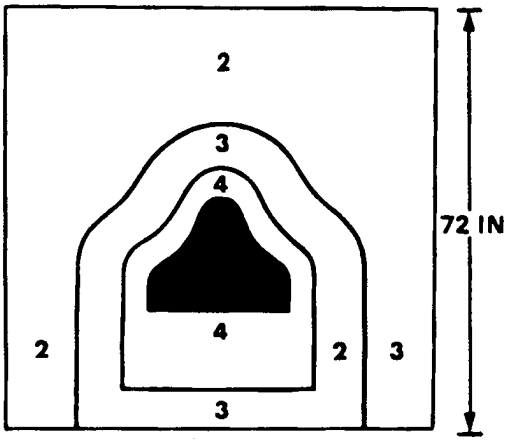
(NSN 6920-00-922-7450



NOTE: Stock number for the repair center is NSN 6920-00-922-7451.

Figure B-28. Army Rifle Target D, prone

(NSN 6920-00-550-7900)



NOTE: Stock number for the repair center is NSN 6920-00-555-9847.

Figure B-29. Navy and Marine Corps Target D, prone

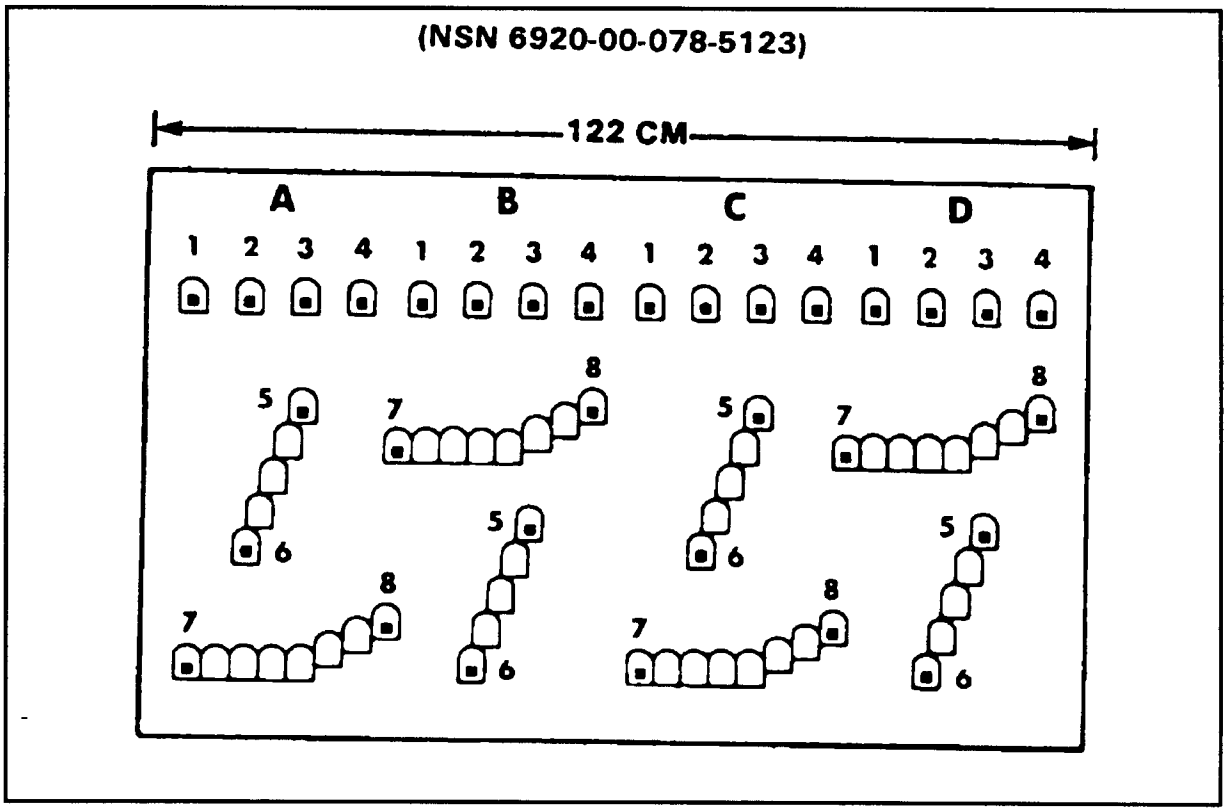


Figure B-30. Basic M60 machine gun marksmanship target

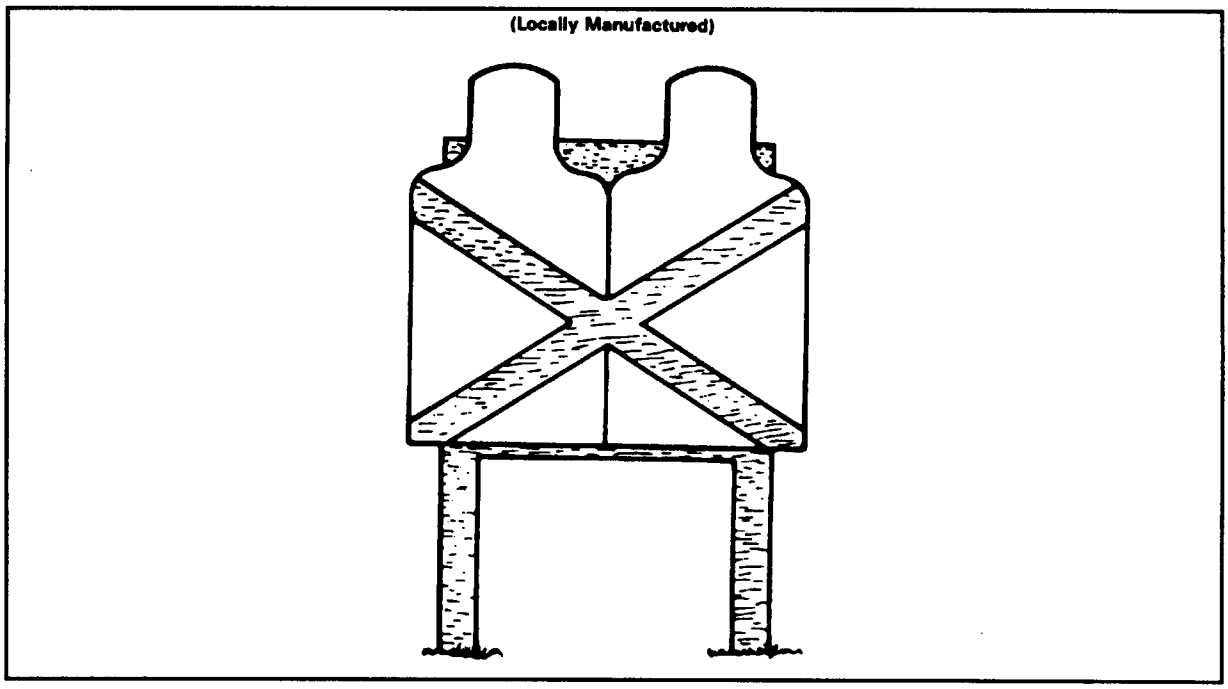
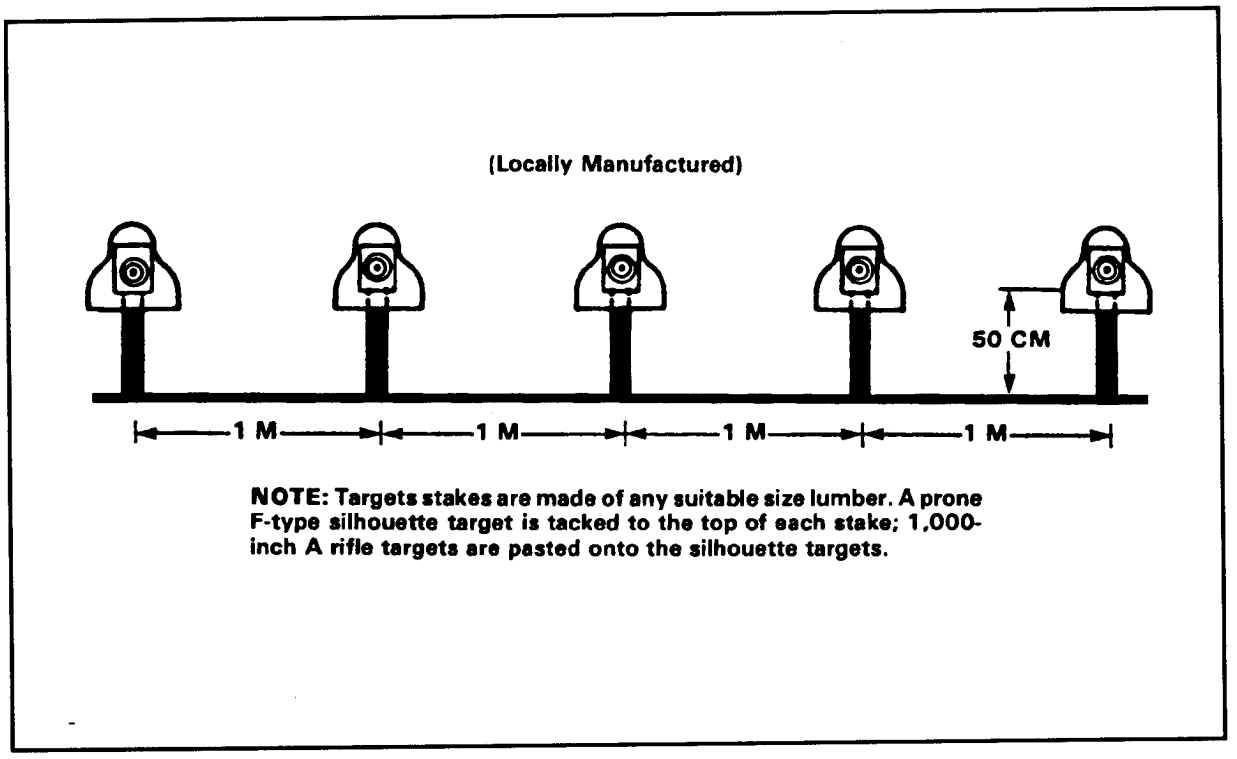


Figure B-31. Double E-type silhouette



NOTE: Targets stakes are made of any suitable size lumber. A prone F-type silhouette target is tacked to the top of each stake; 1,000-inch A rifle targets are pasted onto the silhouette targets.

Figure B-32. Recoilless rifle targets

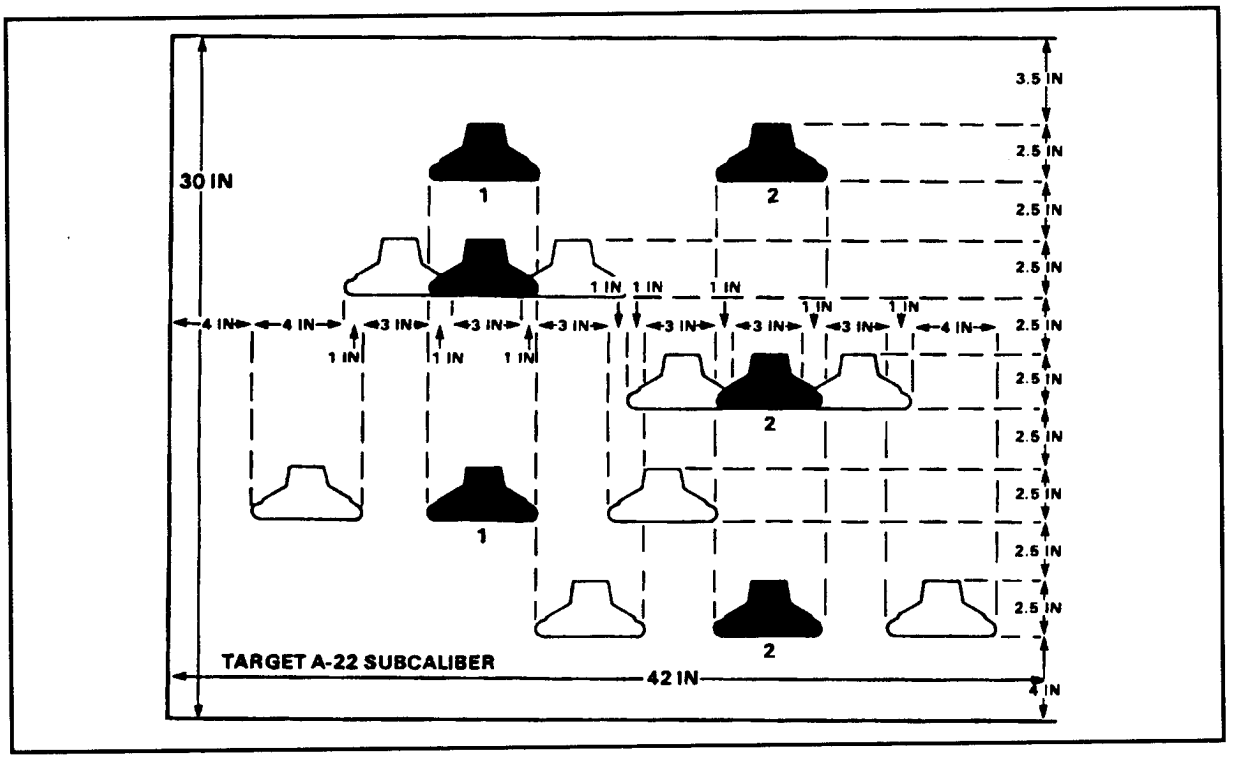


Figure B-33. 25-meter recoilless rifle subcaliber-firing moving target

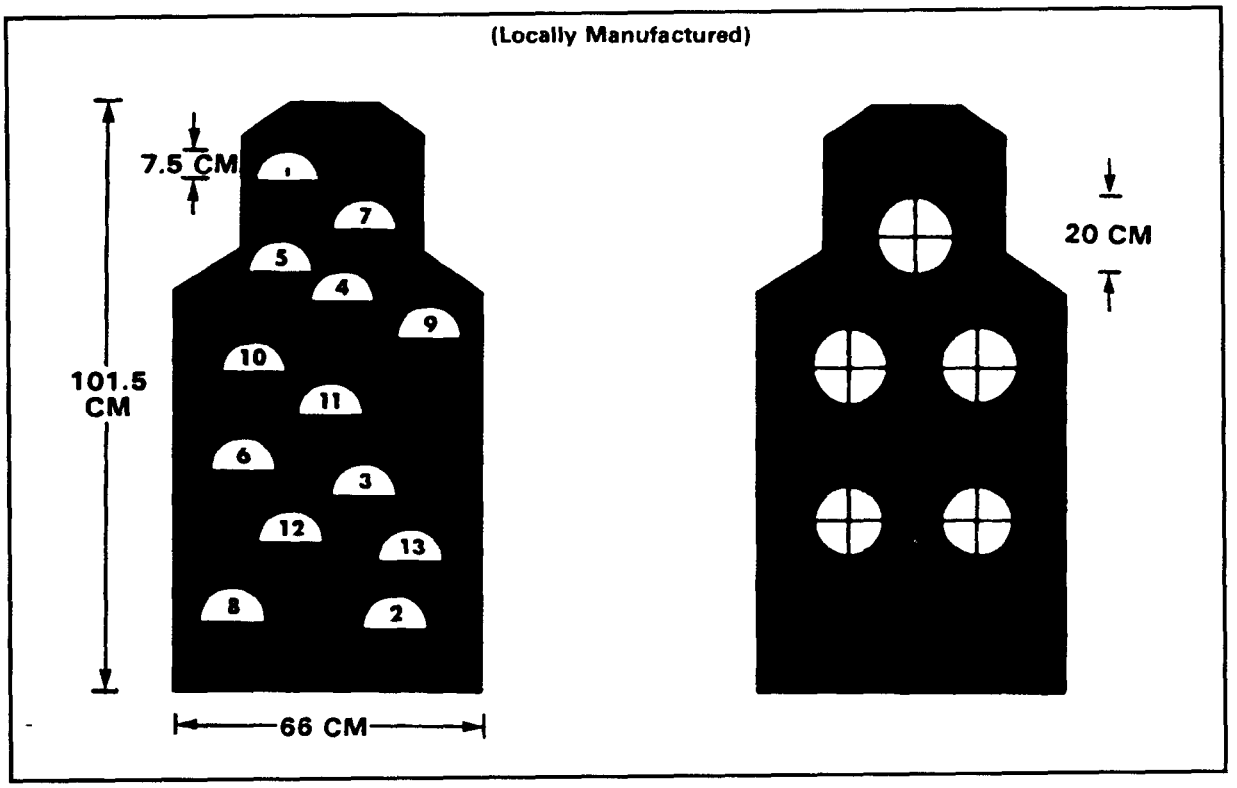


Figure B-34. Target for zeroing exercises (Table I)

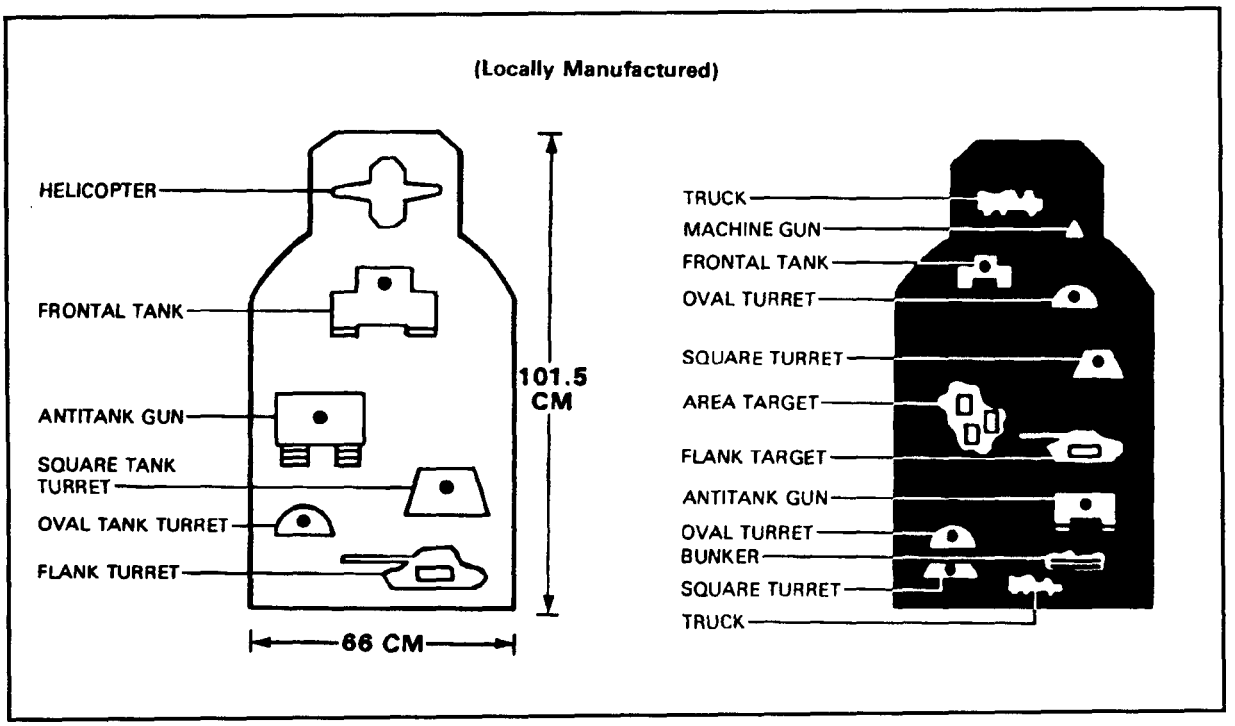


Figure B-35. Target for fire adjustment exercises (Table II)

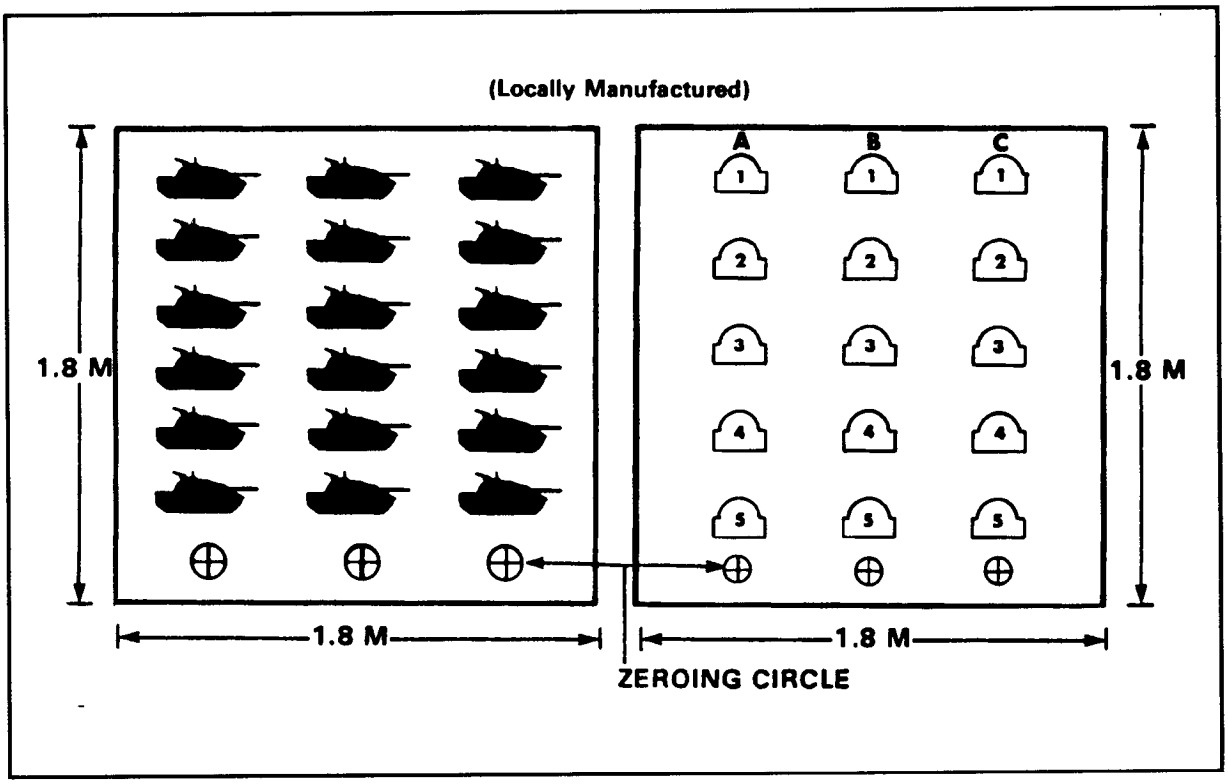


Figure B-36. Target for Table III

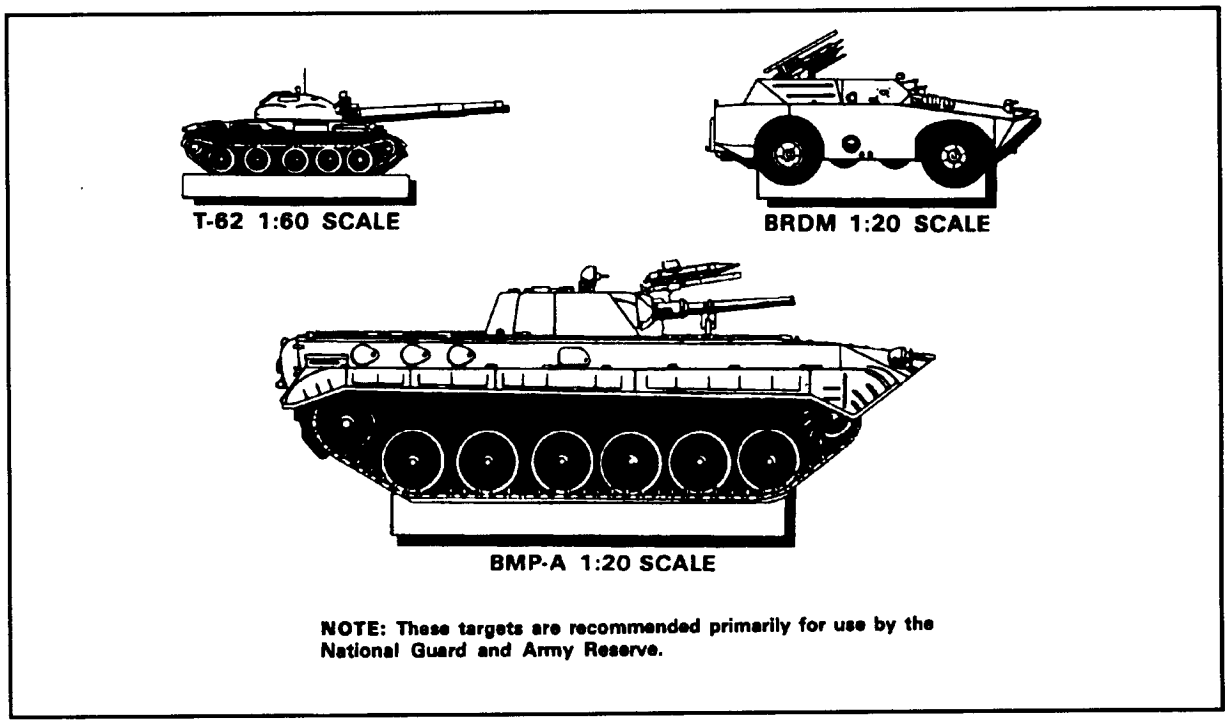


Figure B-37. Samples of impact targets in 1:20, 1:30, and 1:60 scale

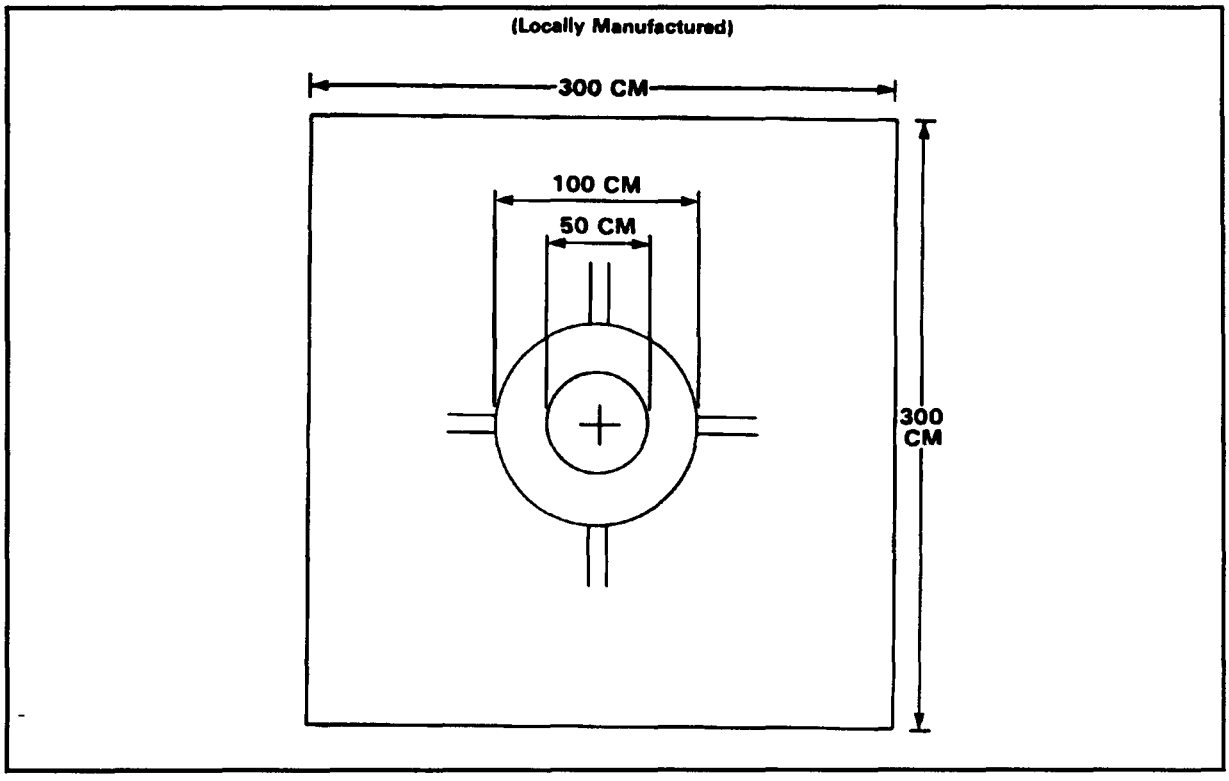


Figure B-38. Zero and boresight panel

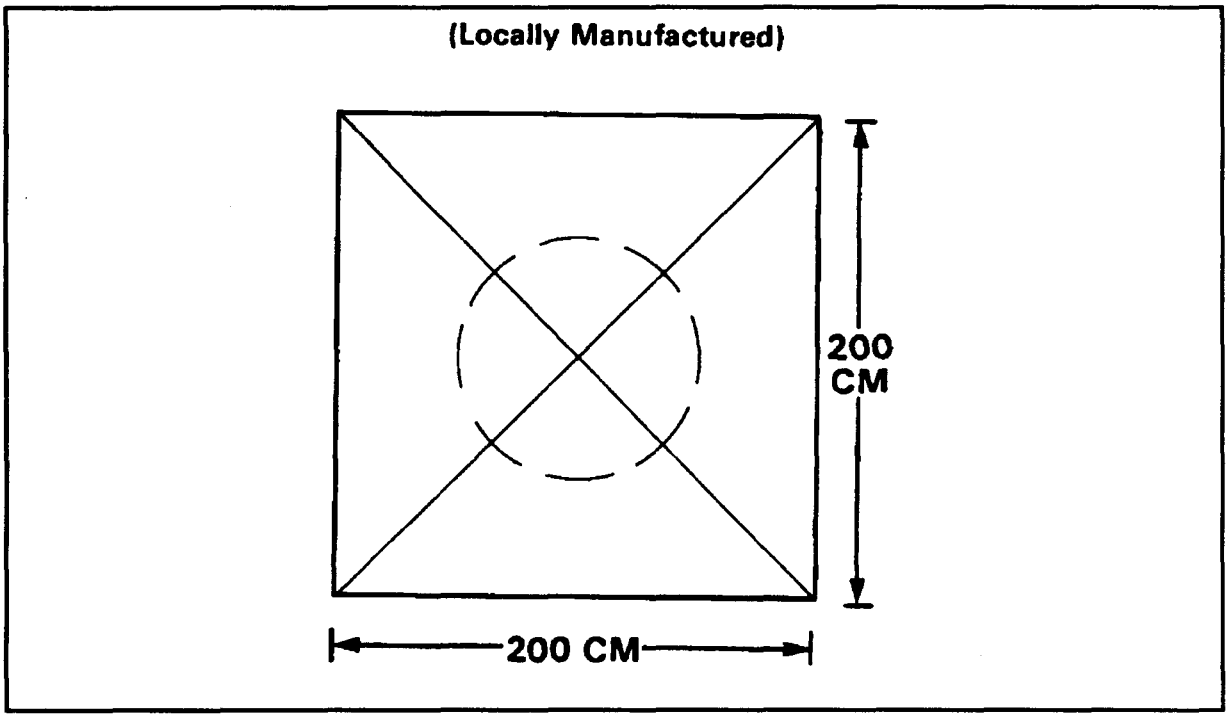
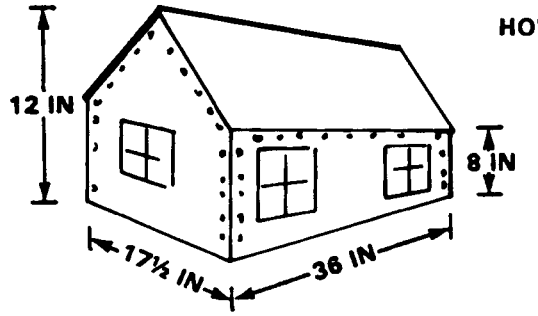
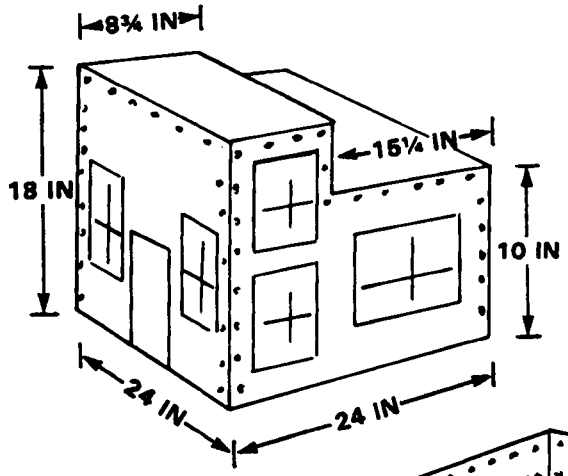


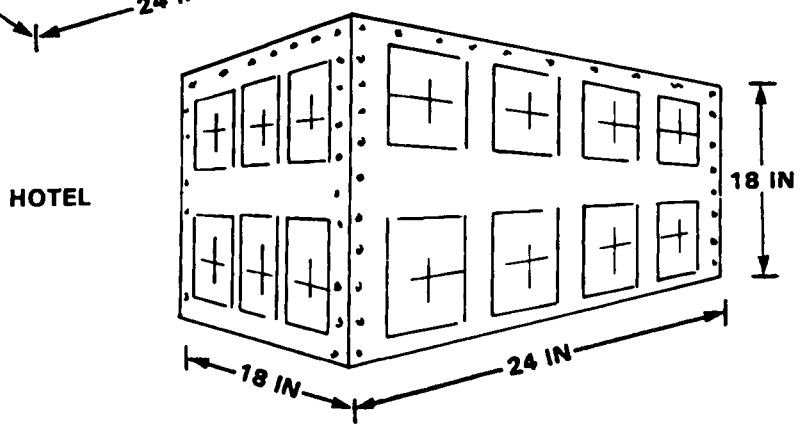
Figure B-39. Boresight and zero target for the cupola-mounted machine gun

(Locally Manufactured)



SIMPLE 1-IN FOLDED EDGE FASTENED WITH POP RIVETS; FOR VARIATION, ADD A STEEPLE OR PLACE THEM IN DIFFERENT POSITIONS.

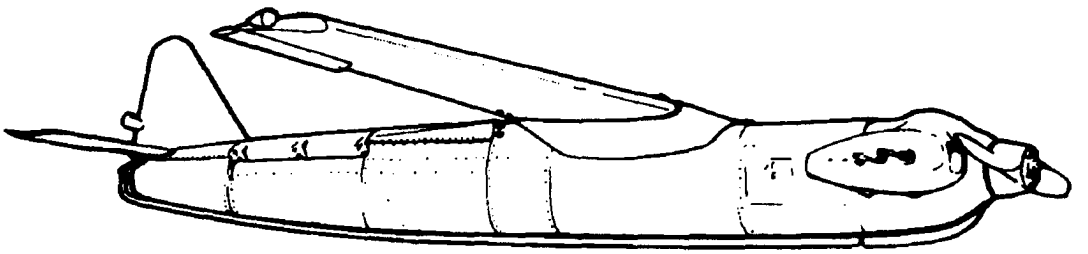




FOR VARIATIONS, INCREASE OR DECREASE DIMENSIONS (24 IN TO 36 IN) (18 IN TO 24 IN). MAKE NO MORE THAN 50 PERCENT CHANGE IN DIMENSIONS.

NOTE: These targets can be constructed by TASC in place of cinder block, fiberboard, or plywood targets. Pop-riveted, galvanized sheet metal is used for these structures. Fifty-five gallon drums, cut in half, may also be used to supplement the targets.

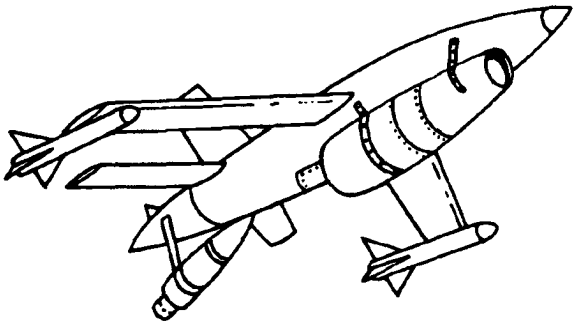
Figure B-40. Reference points and targets for scaled ranges



NOTE: This missile is a high-wing monoplane remotely contolled by radio and powered by a four-cylinder, two-cycle, air-cooled engine. It is used for the training and evaluation of Duster gun systems. The missile will become obsolete when current stocks are exhausted. It has the following characteristics:

Speed - 206 knots
Altitude - up to 23,000 feet
Endurance - 68 minutes (maximum)

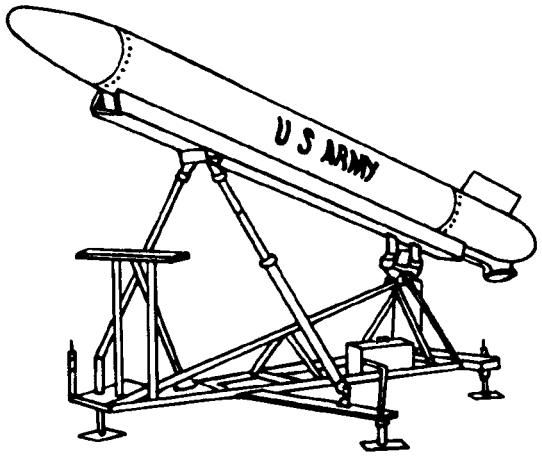
Figure B-41. RCAT MQM-33 (OQ-19) light target missile (Creeper)



NOTE: The Firebee is a mid-wing, high-speed, subsonic, remotely controlled guided missile. It is propelled by a single turbojet engine. During flight, the missile is controlled from the ground during all normal flight maneuvers. It is recovered by a parachute system. The mission of the Firebee is to support the evaluation of air defense artillery missile and gun systems. It has the following characteristics:

Speed - 500 knots
Altitude - 100 to 61,000 feet
Endurance - 90 minutes

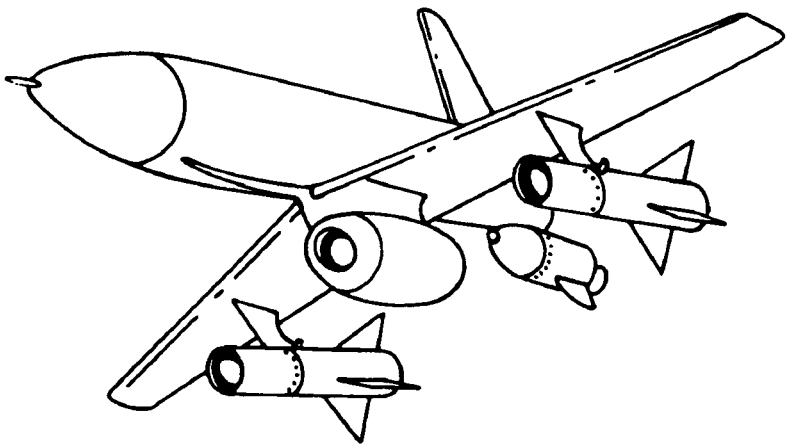
Figure B-42. MQM-34D (Firebee)



NOTE: BATS is a low-cost, one-time flight (expendable) target that is completely operated from the ground. It provides the firing unit with an on-call target and simulates the trajectory of a high-performance Threat aircraft. BATS is used in support of Vulcan, Chaparral, and Redeye training. It has the following characteristics:

Speed - 550 knots
Altitude - 8,000 feet
Endurance - 47 seconds

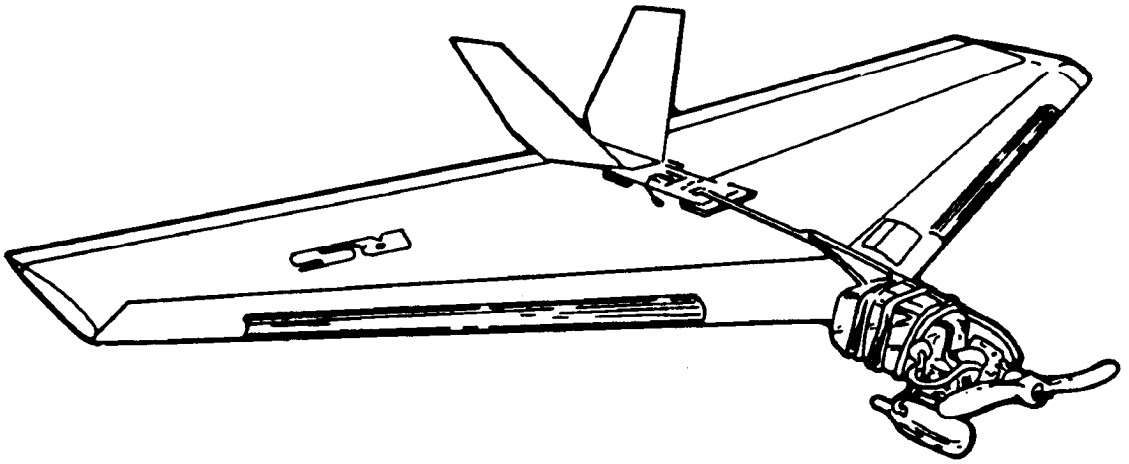
Figure B-43. Ballistic aerial target system (BATS)

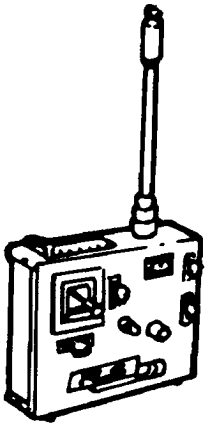


NOTE: The Streaker is a drone target that provides the altitude, speed, and maneuver capability required for supporting the training of Hawk units. It is a low-cost, air transportable system which can be used in both domestic and overseas training areas. The target has the following characteristics:

Speed - 250 to 500 knots
Altitude - 100 to 12,200 meters

Figure B-44. MQM-107 variable-speed training target (Streaker)

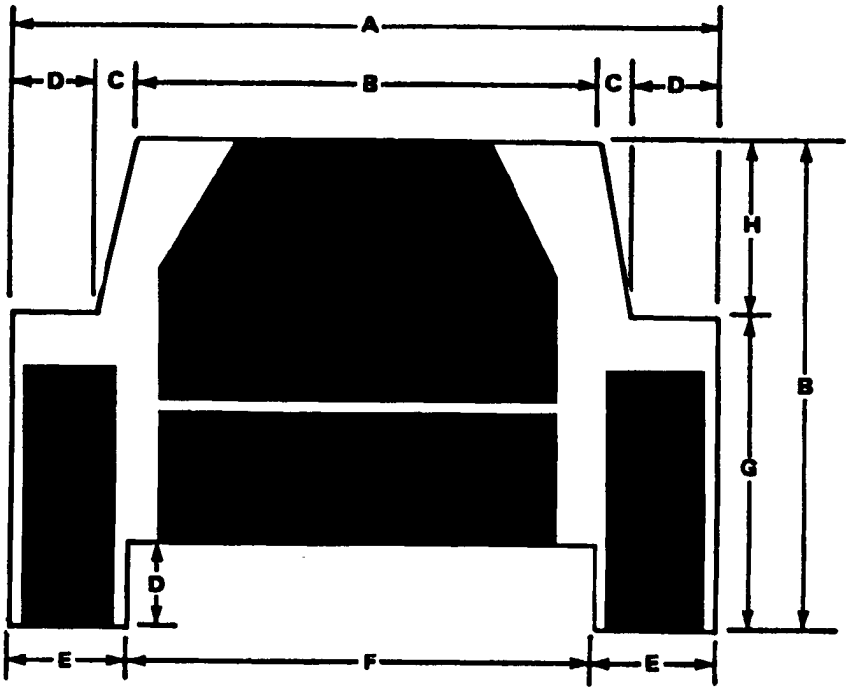




NOTE: RCMAT is used in Chaparral, Redeye, Vulcan, and Duster air defense training. It can be tracked at ranges up to 1,000 meters. At short ranges, RCMAT can easily exceed the tracking rates of both Chaparral and Vulcan systems, depending on the throttle setting. The targets have a 100-percent recoverability rate (when landing under radio control) and a 15-minute endurance time.

Figure B-45. Radio-controlled miniature aerial target (RCMAT)

(Locally Manufactured)



THERMAL MODULE PLACEMENT

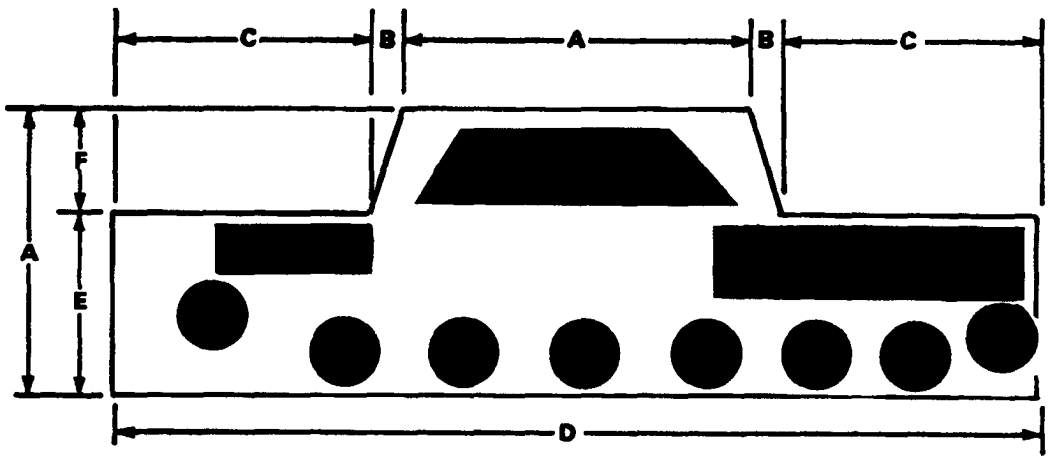
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	132	335	67	33.5	11.2	5.6
B	87	220	44	22	7.3	3.7
C	6.5	17.5	3.5	1.75	.6	.3
D	16	40	8	4	1.3	.7
E	20	50	10	5	1.7	.8
F	92	235	47	23.5	7.8	3.9
G	55	140	28	14	4.7	2.3
H	32	80	16	8	2.7	1.3

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-46. T-72 front target

(Locally Manufactured)



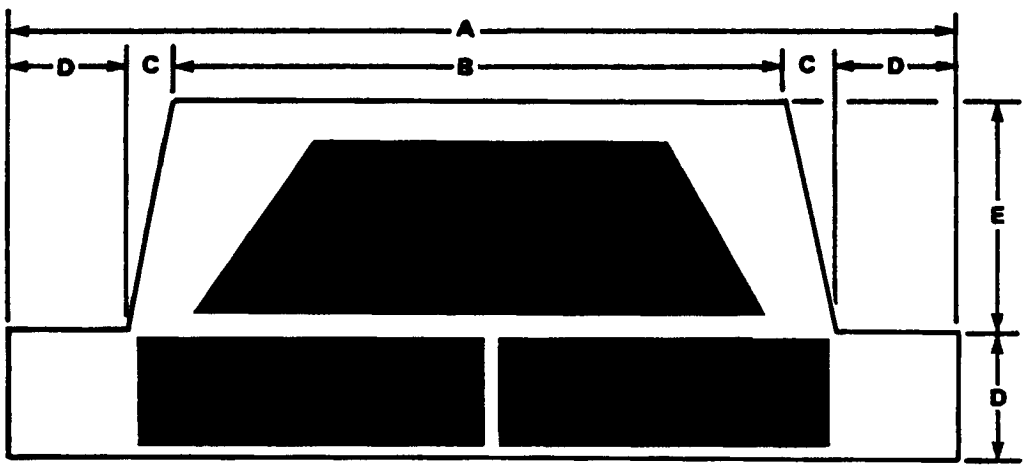
THERMAL MODULE PLACEMENT

TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	86	220	44	22	7.3	3.7
B	16	40	8	4	1.3	.7
C	79	200	40	20	6.7	3.3
D	276	700	140	70	23.3	11.7
E	55	140	28	14	4.7	2.3
F	31	80	16	8	2.7	1.3

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-47. T-72 flank target



THERMAL MODULE PLACEMENT

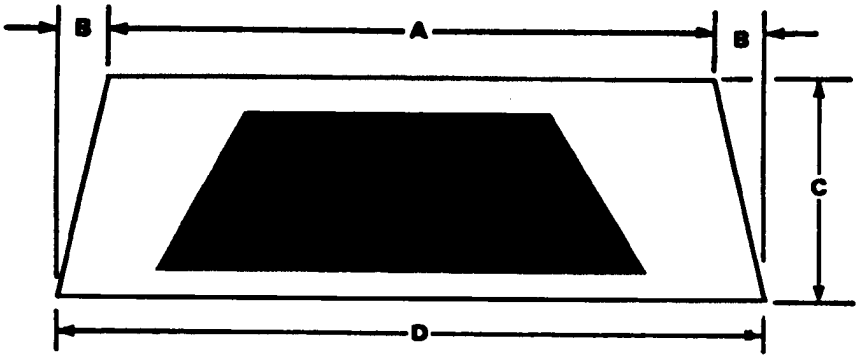
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	132	335	67	33.5	11.2	5.6
B	87	220	44	22	7.3	3.7
C	6.5	17.5	3.5	1.7	.6	.3
D	16	40	8	4	1.3	.7
E	32	80	16	8	2.7	1.3

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-48. T-72 partial defilade target

(Locally Manufactured)



THERMAL MODULE PLACEMENT

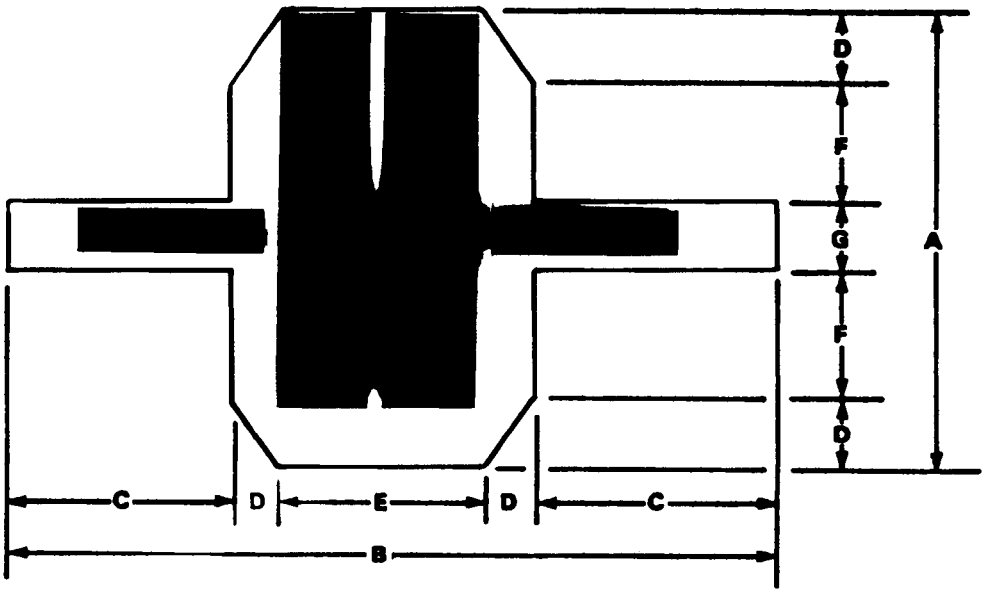
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	87	220	44	22	7.3	3.7
B	5.5	15	3	1.5	.5	.3
C	32	80	16	8	2.7	1.3
D	98	250	50	25	8.3	4.2

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-49. T-72 turret target

(Locally Manufactured)



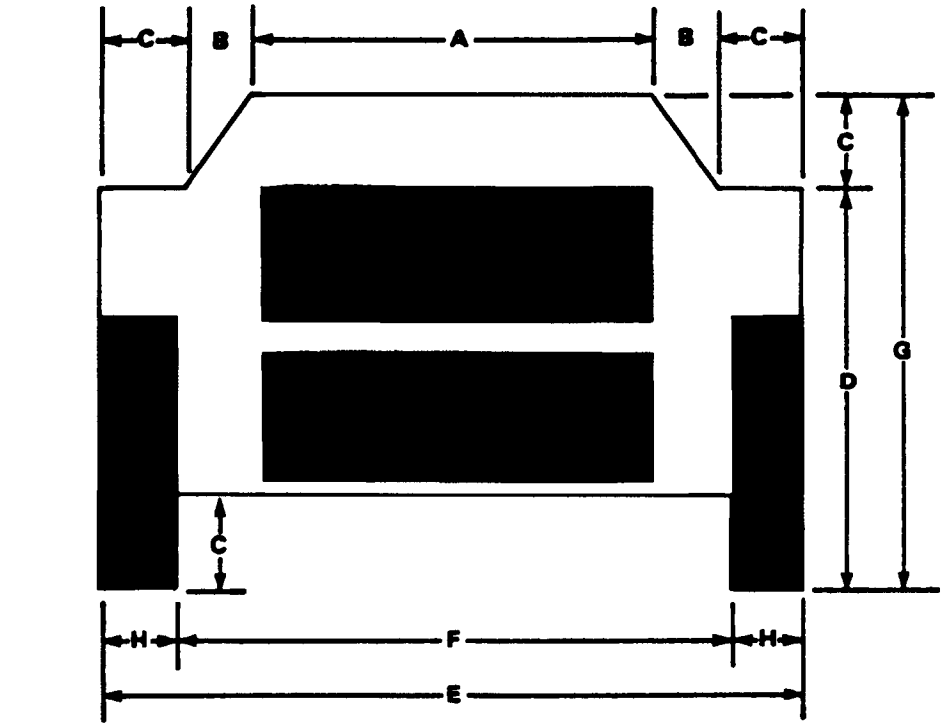
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	120	305	61	30.5	10.2	5.1
B	192	488	97.6	48.8	16.3	8.1
C	60	152	30.4	15.2	5.1	2.5
D	12	31	6.2	3.1	1	.5
E	48	122	24.4	12.2	4.1	2
F	36	91	18.2	9.1	3	1.5
G	24	61	12.2	6.1	2	1

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-50. HIND front target

(Locally Manufactured)



THERMAL MODULE PLACEMENT

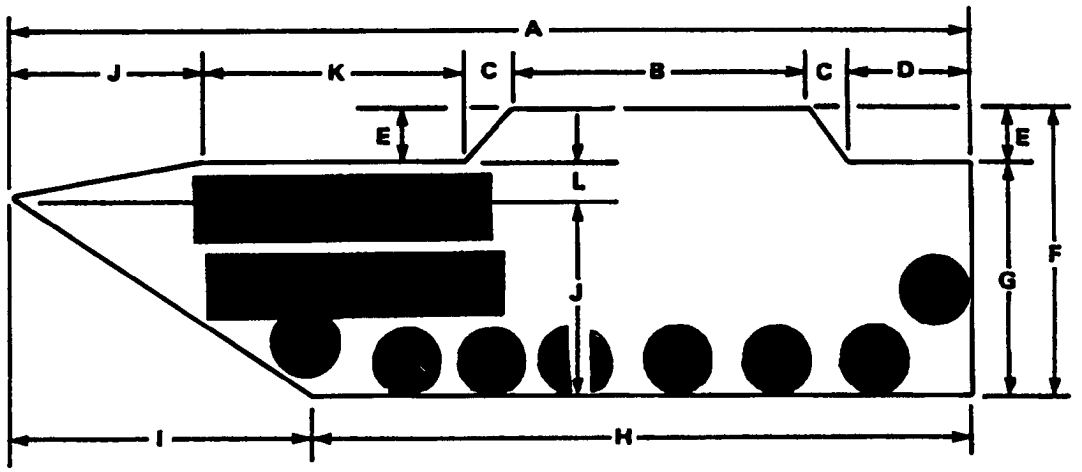
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	70	179	35.8	17.9	6	3
B	10	25.5	5.1	2.6	.9	.4
C	16	40	8	4	1.3	.7
D	71	180	36	18	6	3
E	122	310	62	31	10.3	5.2
F	98	250	50	25	8.3	4.2
G	87	220	44	22	7.3	3.7
H	12	30	6	3	1	.5

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-51. BMP 1981 front target

(Locally Manufactured)



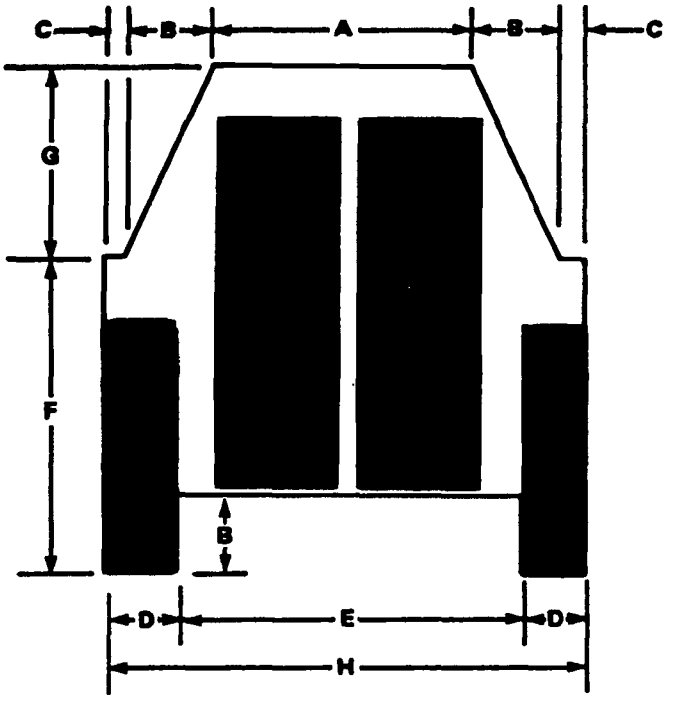
THERMAL MODULE PLACEMENT

TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	268	680	136	68	22.7	11.3
B	67	170	34	17	5.7	2.8
C	12	30	6	3	1	.5
D	39	100	20	10	3.3	1.7
E	18	45	9	4.5	1.5	.8
F	87	220	44	22	7.3	3.7
G	69	175	35	17.5	5.8	2.9
H	173	440	88	44	14.7	7.3
I	95	240	48	24	8	4
J	61	155	31	15.5	5.2	2.6
K	77	195	39	19.5	6.5	3.3
L	8	20	4	2	.7	.3

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-52. BMP 1981 flank target



THERMAL MODULE PLACEMENT

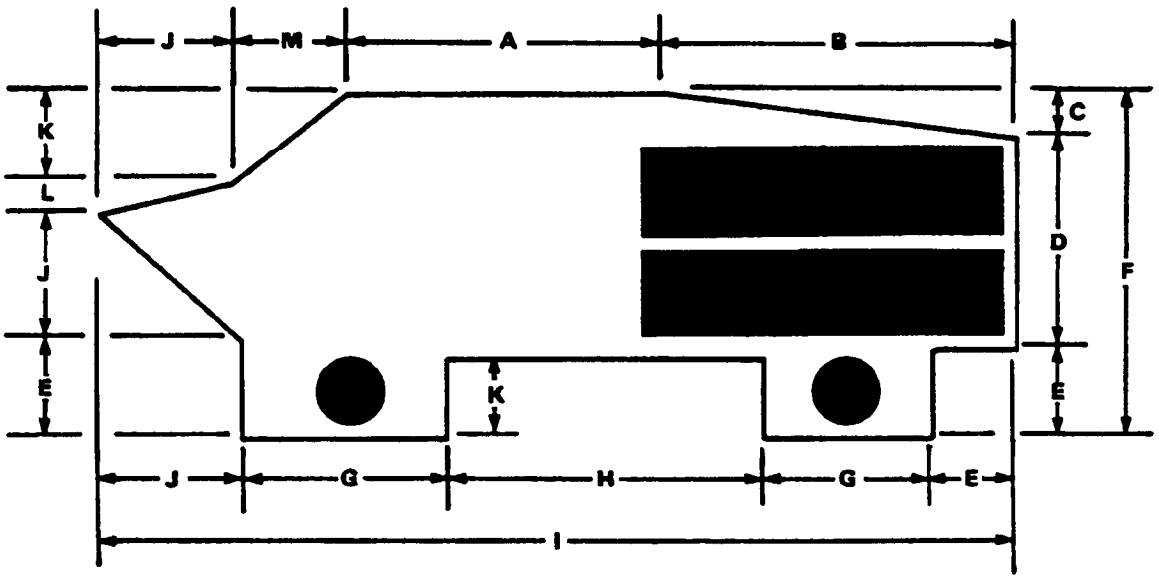
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	47	120	24	12	4	2
B	16	40	8	4	1.3	.7
C	4	10	2	1	.3	.2
D	12	30	6	3	1	.5
E	63	160	32	16	5.3	2.7
F	59	150	30	15	5	2.5
G	35	90	18	9	3	1.5
H	87	220	44	22	7.3	3.7

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-53. BRDM front target

(Locally Manufactured)



THERMAL MODULE PLACEMENT

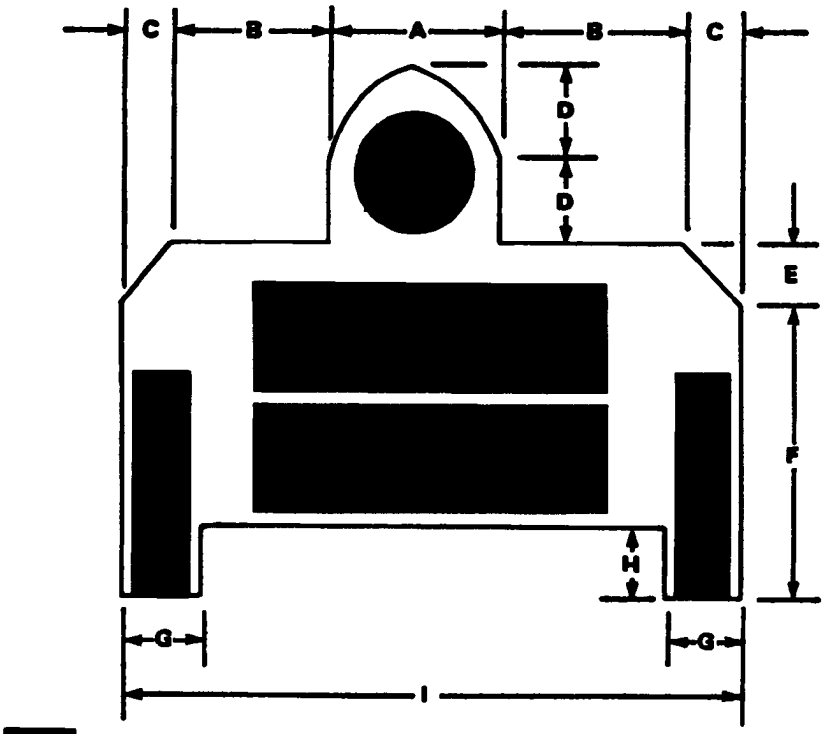
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	87	221	44.2	22.1	7.4	3.7
B	81	206	41.2	20.6	6.9	3.4
C	11	28	5.6	2.8	.9	.5
D	48	122	24.4	12.2	4.1	2
E	24	61	12.2	6.1	2	1
F	83	211	42.2	21.1	7	3.5
G	47	120	24	12	4	2
H	75	190	38	19	6.3	3.2
I	224	570	114	57	19	9.5
J	31	79	15.8	7.9	2.6	1.3
K	20	51	10.2	5.1	1.7	.9
L	8	20	4	2	.7	.3
M	25	64	12.8	6.4	2.1	1.1

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-54. BRDM flank target

(Locally Manufactured)



THERMAL MODULE PLACEMENT

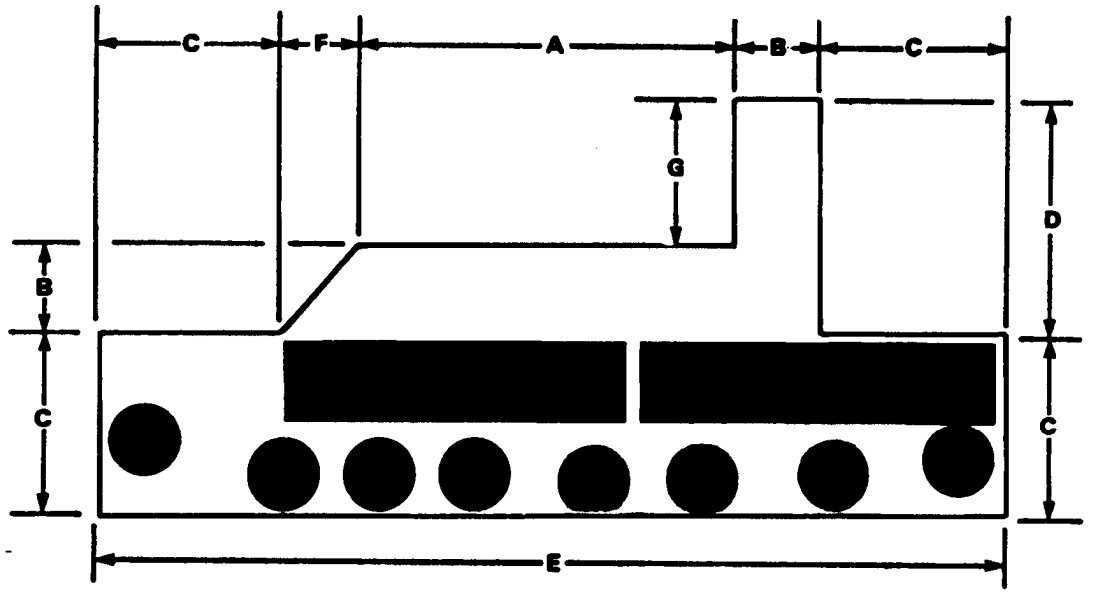
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	35	90	18	9	3	1.5
B	33.5	85	17	8.5	2.8	1.4
C	8	20	4	2	.7	.3
D	20	50	10	5	1.7	.8
E	12	30	6	3	1	.5
F	59	150	30	15	5	2.5
G	14	35	7	3.5	1.2	.6
H	16	40	8	4	1.3	.7
I	118	300	60	30	10	5

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-55. ZSU-23/4 front target

(Locally Manufactured)



THERMAL MODULE PLACEMENT

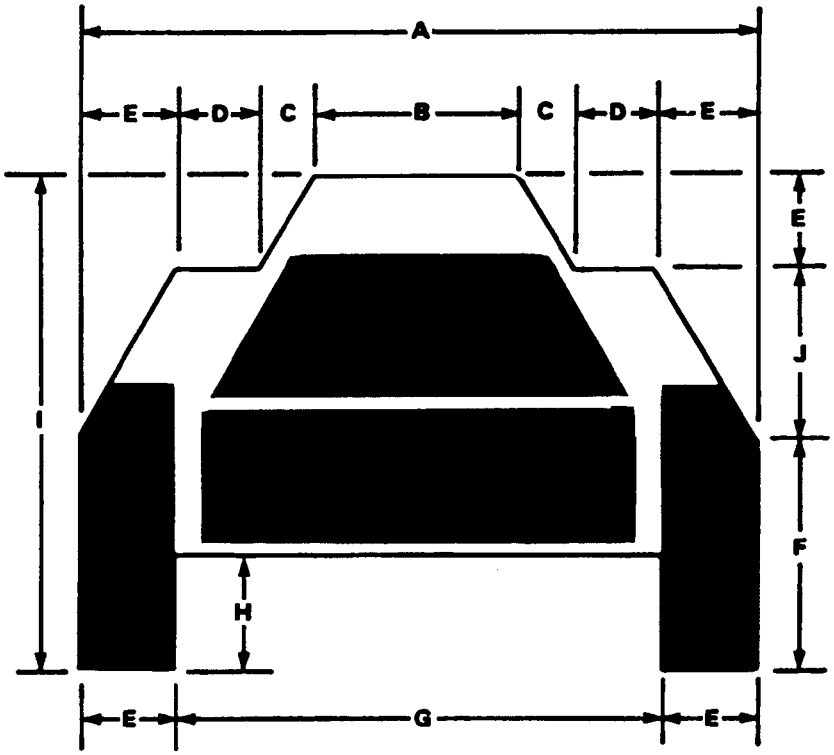
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	98	250	50	25	8.3	4.2
B	24	60	12	6	2	1
C	47	120	24	12	4	2
D	63	160	32	16	5.3	2.7
E	236	600	120	60	20	10
F	20	50	10	5	1.7	.8
G	39	100	20	10	3.3	1.7

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-56. ZSU-23/4 flank target

(Locally Manufactured)



THERMAL MODULE PLACEMENT

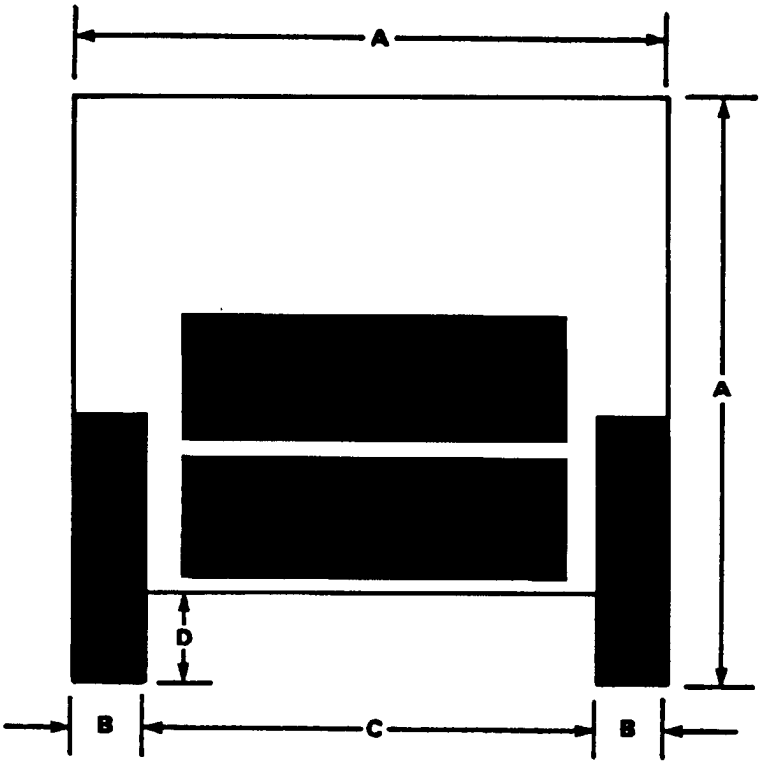
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	110	280	56	28	9.3	4.7
B	30	80	16	8	2.7	1.3
C	10	25	5	2.5	.8	.4
D	14	35	7	3.5	1.2	.6
E	16	40	8	4	1.3	.7
F	39	100	20	10	3.3	1.7
G	78	200	40	20	6.7	3.3
H	20	50	10	5	1.7	.8
I	86	220	44	22	7.3	3.7
J	31	80	16	8	2.7	1.3

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-57. BTR-series front target

(Locally Manufactured)



THERMAL MODULE PLACEMENT

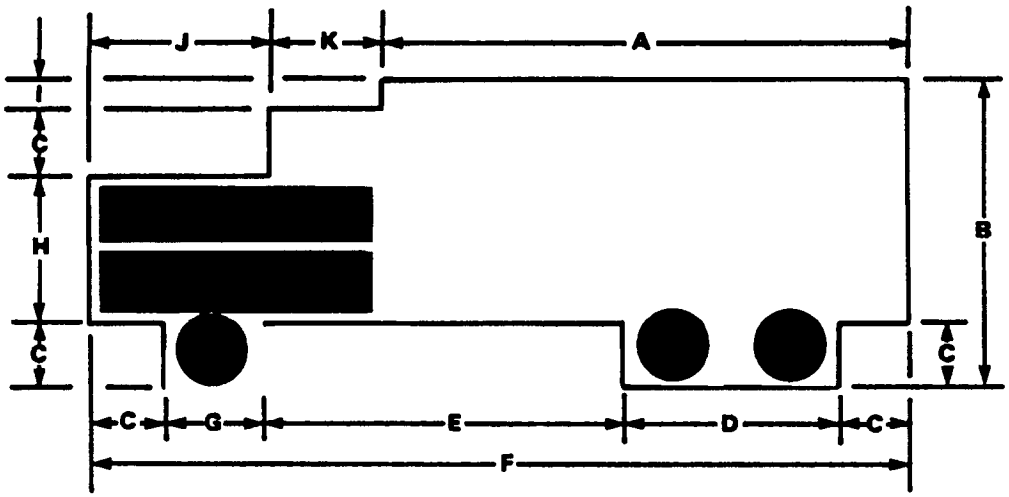
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	102	260	52	26	8.7	4.3
B	12	30	6	3	1	.5
C	78	200	40	20	6.7	3.3
D	16	40	8	4	1.3	.7

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-58. Truck U-375 front target

(Locally Manufactured)



THERMAL MODULE PLACEMENT

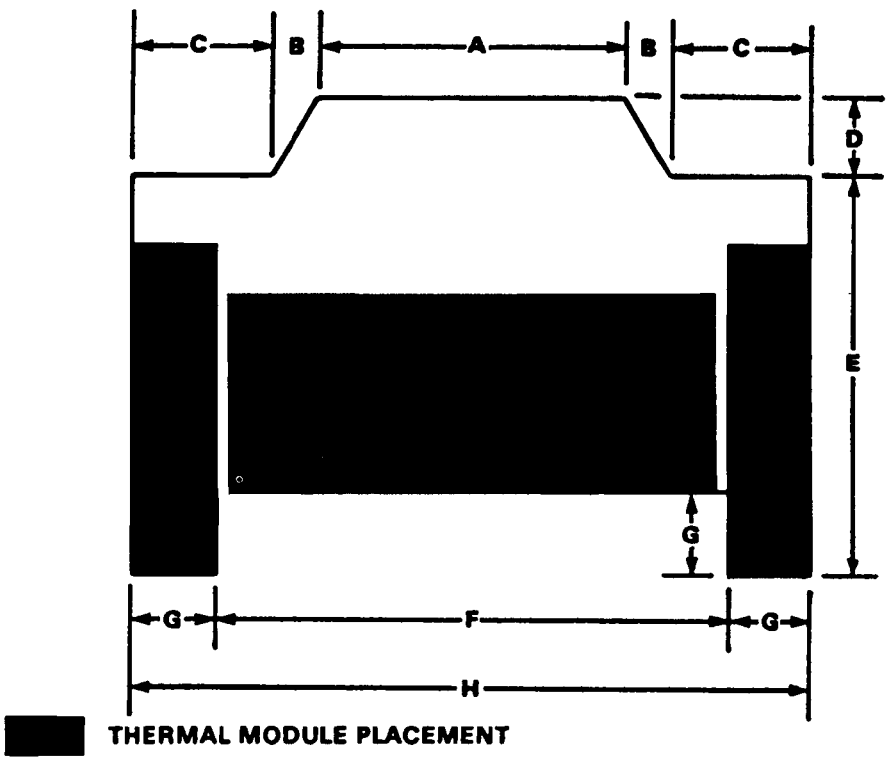
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	177	450	90	45	15	7.5
B	102	260	52	26	8.7	4.3
C	24	60	12	6	2	1
D	71	180	36	18	6	3
E	126	320	64	32	10.7	5.3
F	276	700	140	70	23.3	11.7
G	31	80	16	8	2.7	1.3
H	47	120	24	12	4	2
I	7	20	4	2	.7	.3
J	59	150	30	15	5	2.5
K	40	100	20	10	3.3	1.7

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-59. Truck U-375 flank target

(Locally Manufactured)



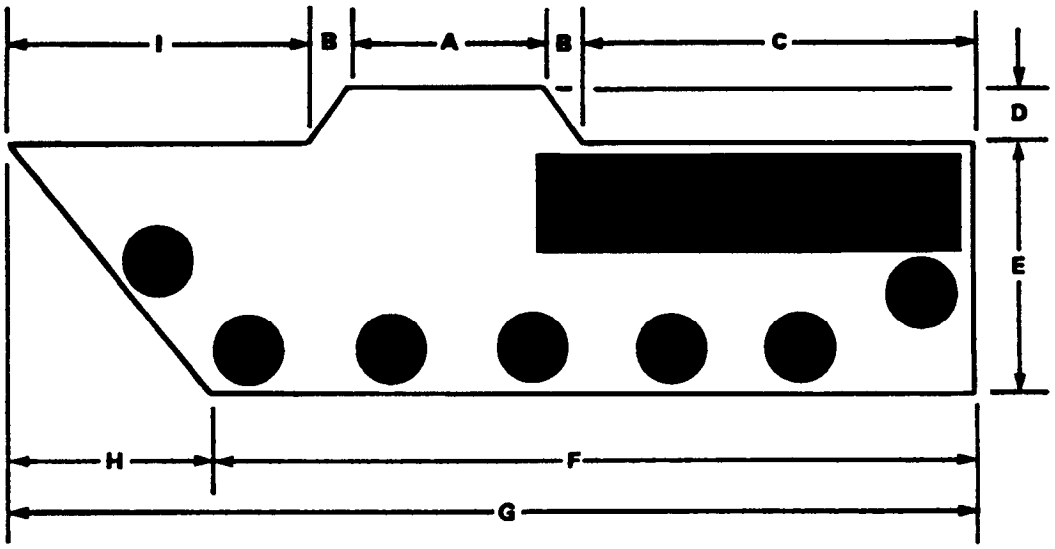
TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	43	110	22	11	3.7	1.8
B	8	20	4	2	.7	.3
C	20	50	10	5	1.7	.8
D	12	30	6	3	1	.5
E	55	140	28	14	4.7	2.3
F	83	210	42	21	7	3.5
G	16	40	8	4	1.3	.7
H	99	250	50	25	8.3	4.2

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-60. BMD front target

(Locally Manufactured)



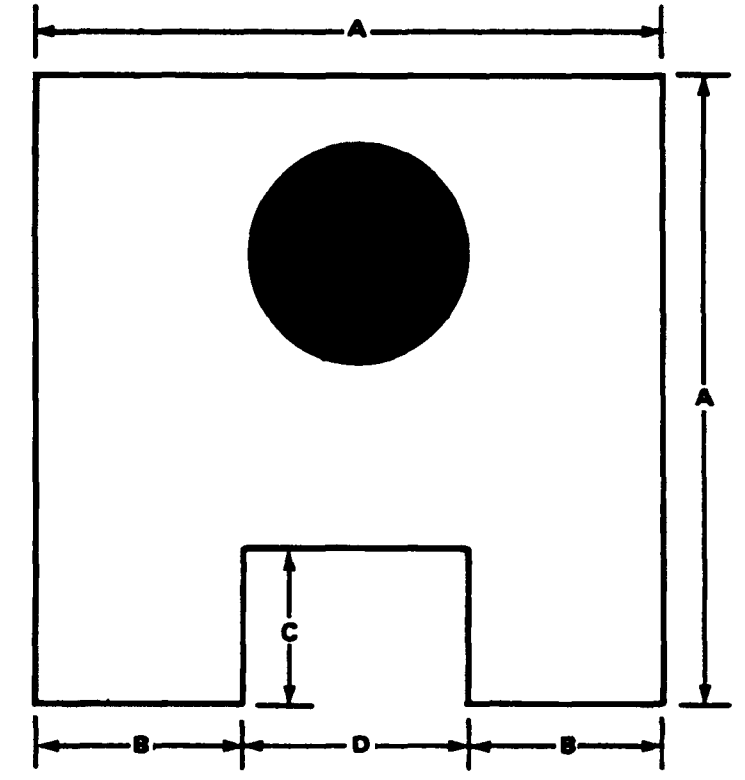
THERMAL MODULE PLACEMENT

TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	45	114	22.8	11.4	3.8	1.9
B	7	18	3.6	1.8	.6	.3
C	87	220	44	22	7.3	3.7
D	12	30	6	3	1	.5
E	55	140	28	14	4.7	2.3
F	173	438	87.6	43.8	14.6	7.3
G	213	540	108	54	18	9
H	40	102	20.4	10.2	3.4	1.7
I	67	170	34	17	5.7	2.8

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-61. BMD flank target



TARGET DIMENSIONS

	FULL-SCALE INCHES	FULL-SCALE CENTIMETERS	1:5 SCALE CENTIMETERS	1:10 SCALE CENTIMETERS	1:30 SCALE CENTIMETERS	1:60 SCALE CENTIMETERS
A	48	122	24.4	12.2	4.1	2
B	12	30.5	6.1	3.1	1	.5
C	18	46	9.2	4.6	1.5	.8
D	24	61	12.2	6.1	2	1

NOTE: When made of plywood, full-scale targets must have vertical plywood panels in order for the Remoted Target System (RETS) to operate properly.

Figure B-62. T-12 antitank gun front target

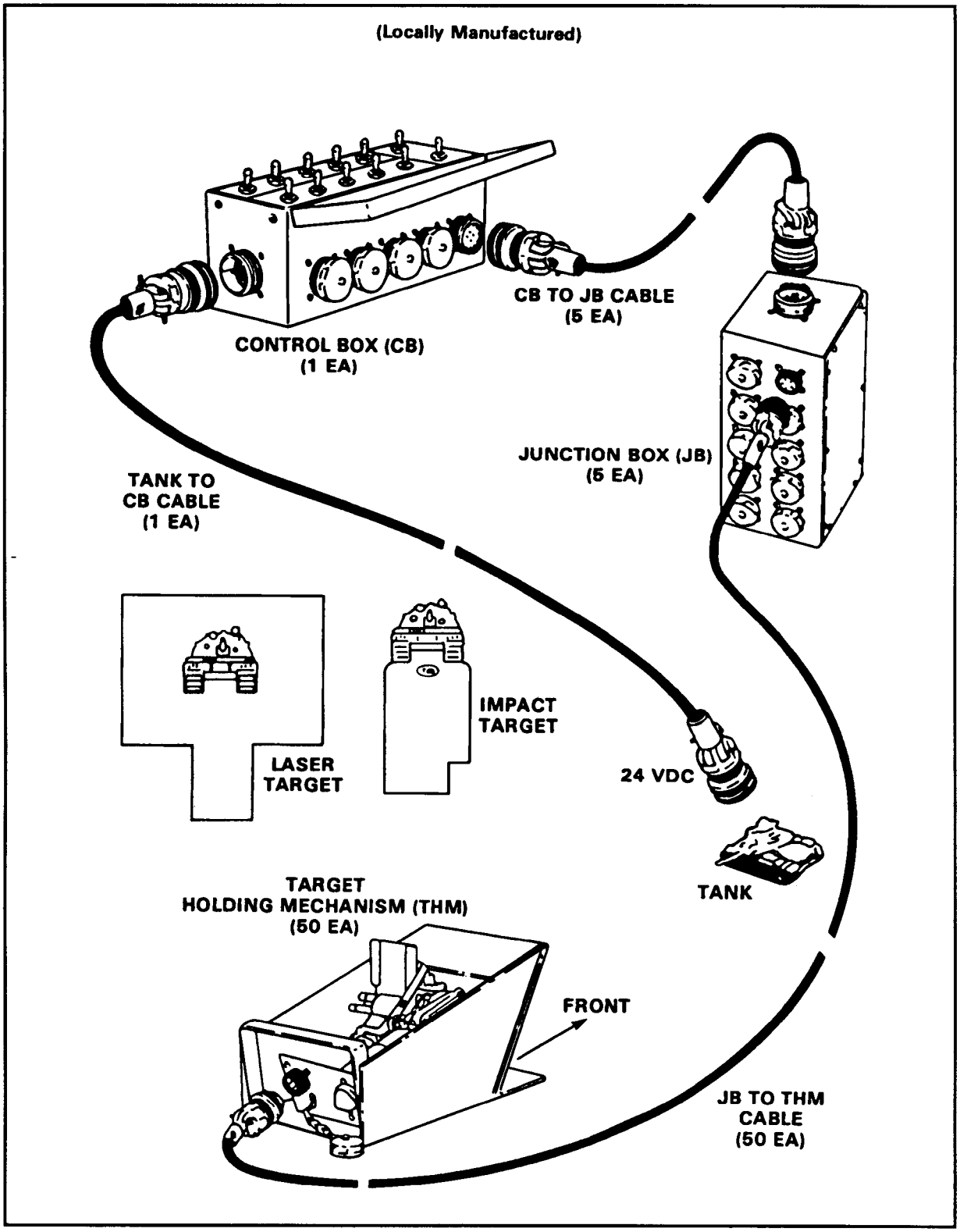


Figure B-63. Composition of scaled range target portable system for 1:30 and 1:60 scale

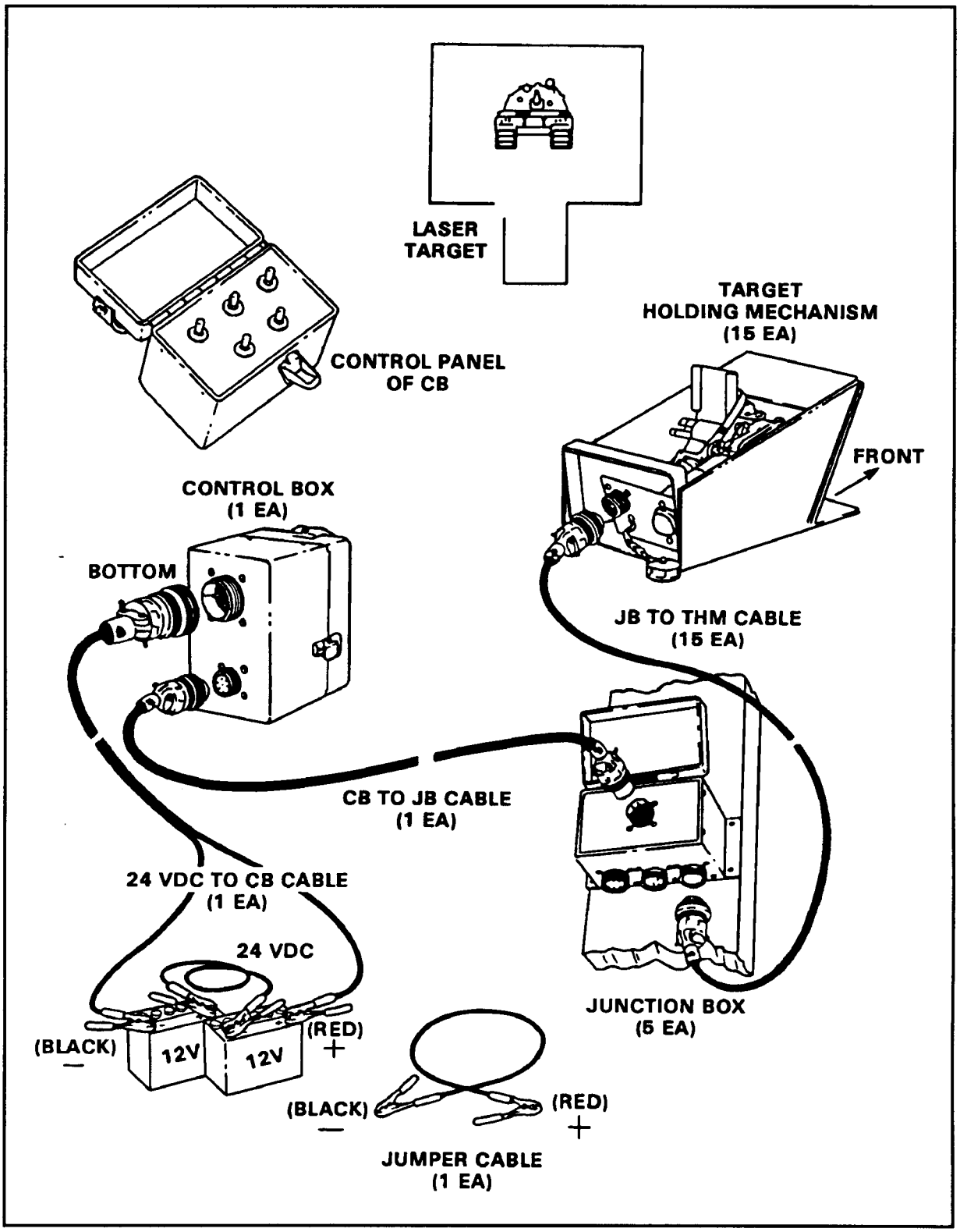
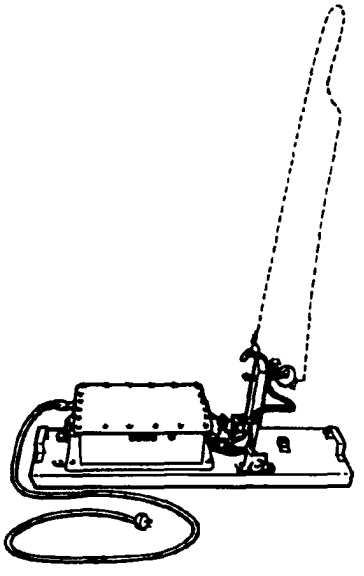


Figure B-64. Composition of scaled range target portable system for 1:20 scale

(NSN 6920-00-657-7533)



NOTE: This mechanism replaces the Standard A Trainfire mechanism, M31 mechanism. It has a primary voltage (input) of 120 and 240 VAC and a secondary operating voltage of 12 to 16 VDC. Additional information can be found in TM 9-6920-203-40&P.

Figure B-65. Target-holding mechanism, Trainfire

(NSN 6920-00-657-7533)

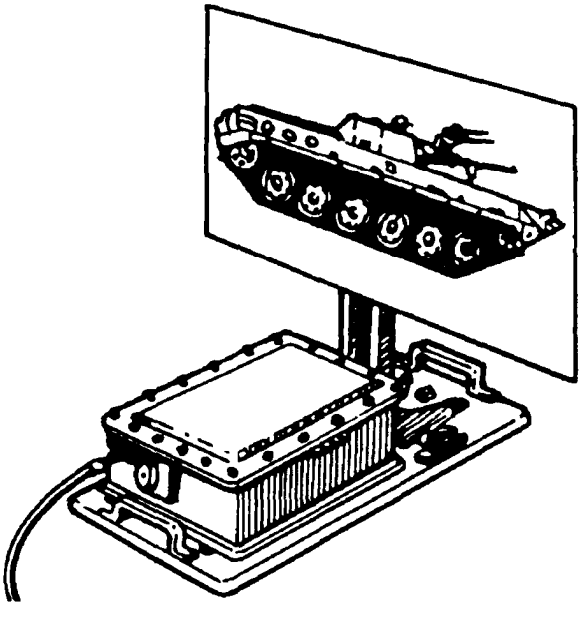


Figure B-66. M31A1 target mechanism for 1:15 and 1:10 scale

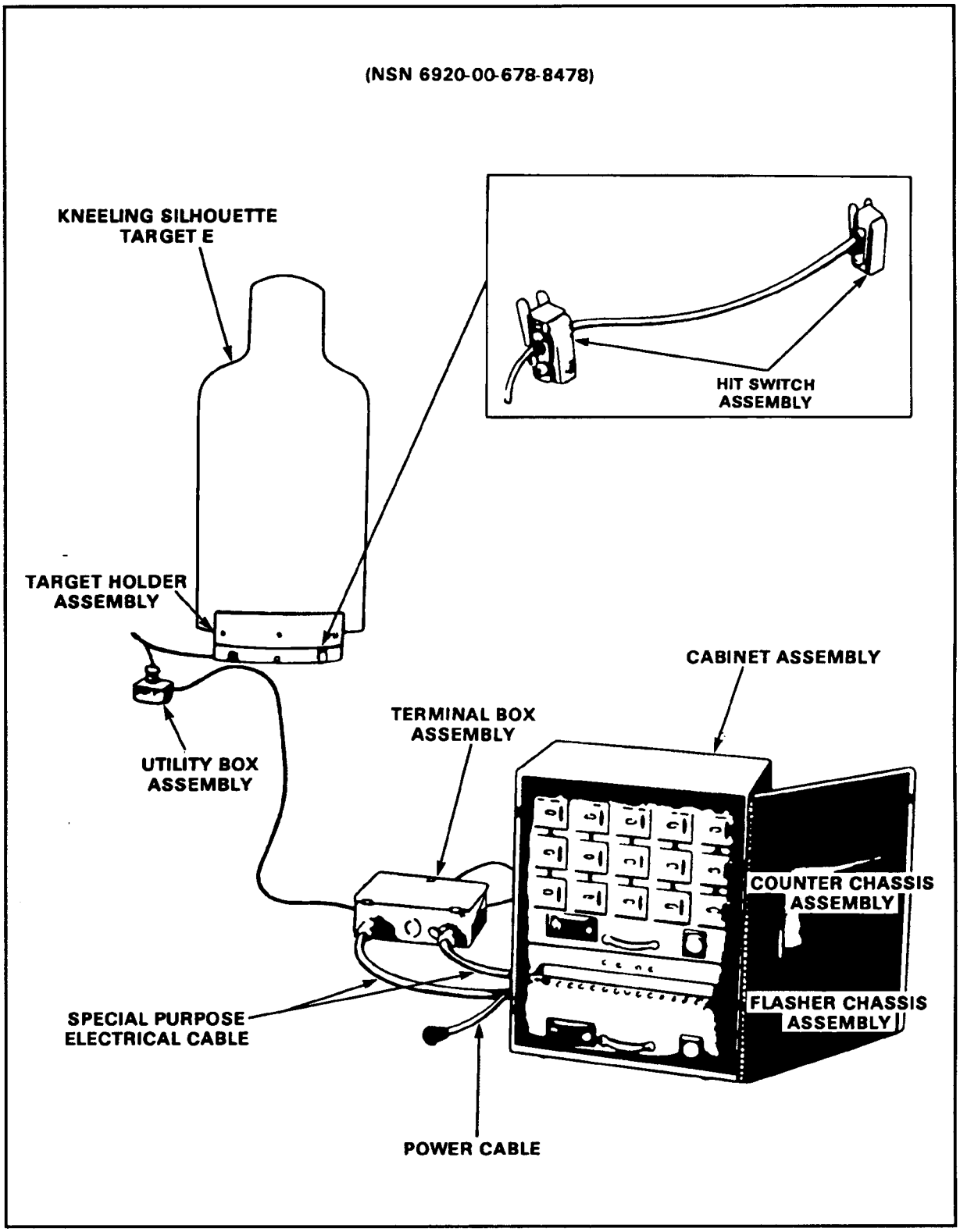
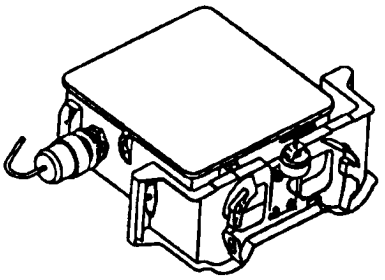


Figure B-67. Small-arms, night-firing target mechanism, M41

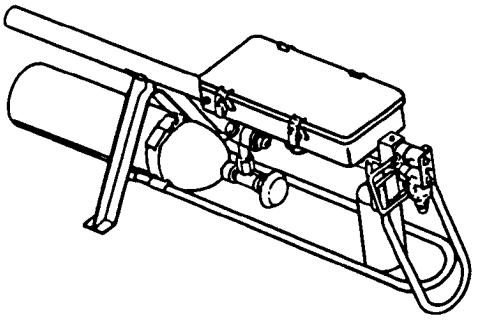
(NSN 6920-01-2858)



NOTE: This mechanism mounts either three- or two- dimensional E and F silhouette targets. It raises a target in less than a second. It is automatically or manually controlled from the RETS range control station. It has a laser interface and mounts on RETS moving target carrier or stationary emplacement.

Figure B-68. Infantry target mechanism (RETS)

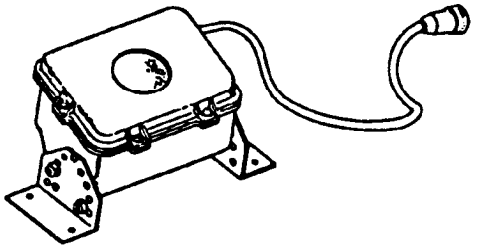
(NSN 6920-01-146-3050)



NOTE: This device simulates small arms automatic weapon sound and sight. It fires 12,000 rounds per charge and interfaces with the RETS target mechanism.

Figure B-69. Infantry hostile-fire simulator (RETS)

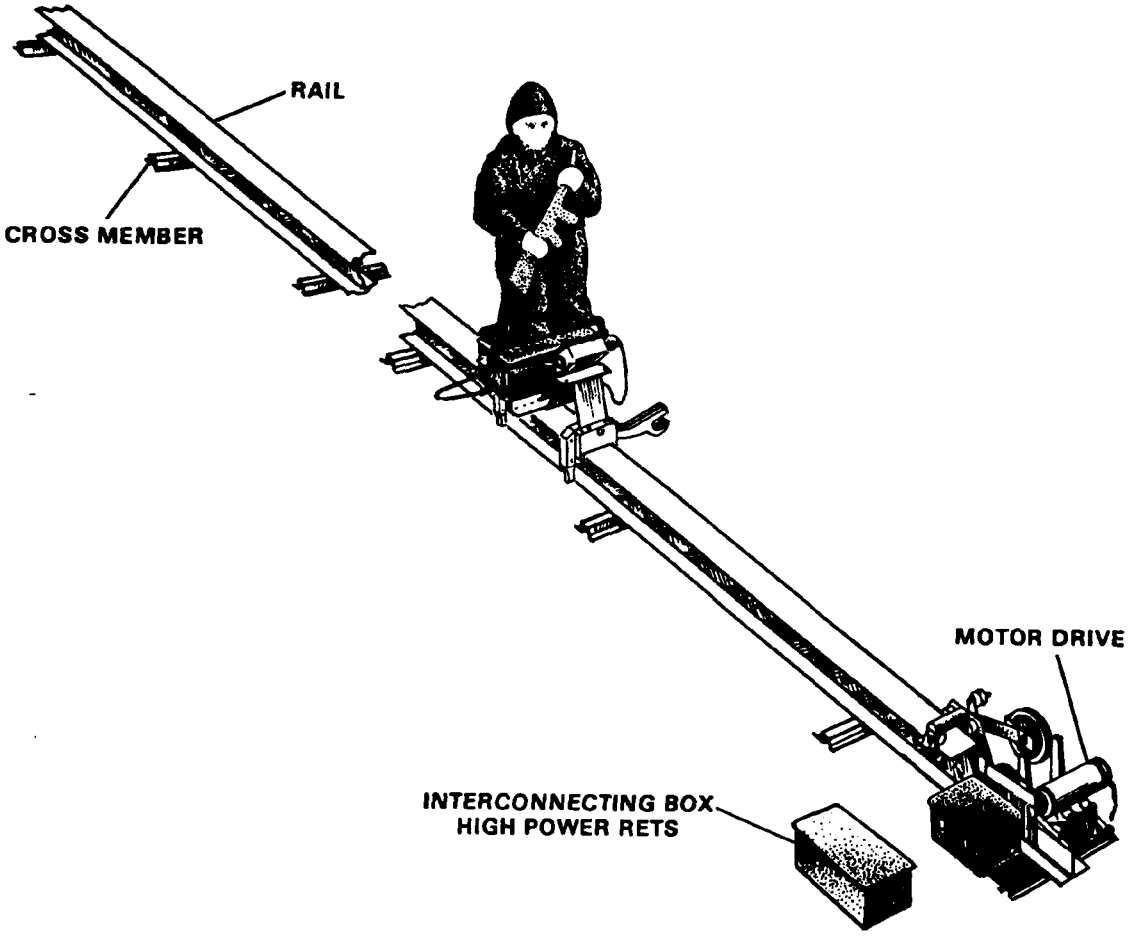
(NSN 6920-01-148-3474)



NOTE: This device simulates AK muzzle flash. It flashes 600 times per minute. It directs light into the target reflective surface. The simulator is controlled by the RETS target mechanism. It uses reliable solid state emitting devices to generate the flash.

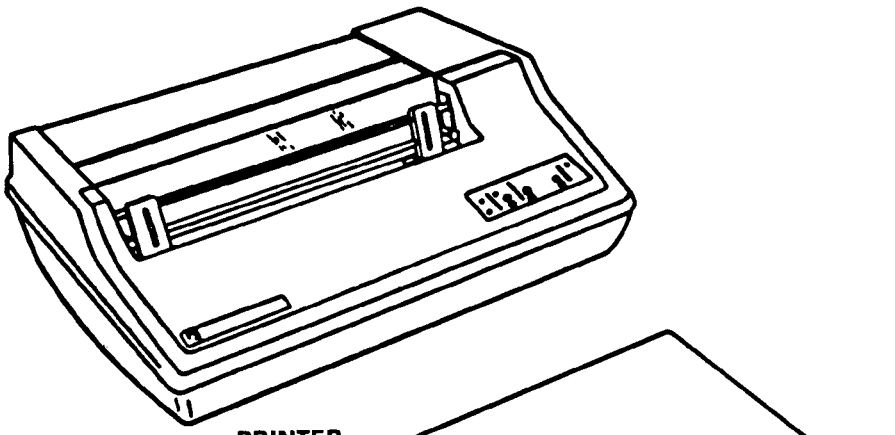
Figure B-70. Night muzzle flash simulator (RETS)

(NSN 6920-01-147-8589)

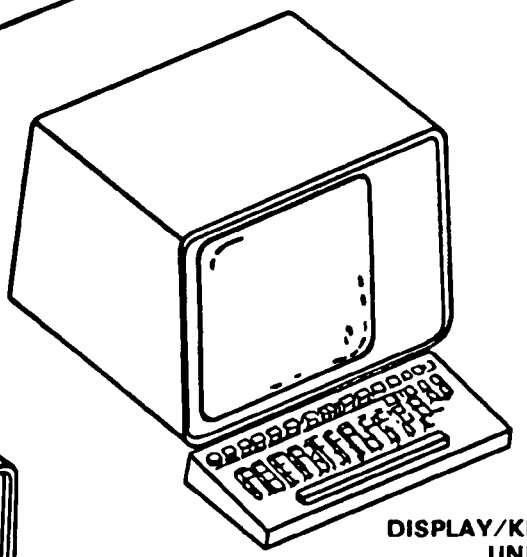


NOTE: This device carries the RETS target mechanism. It operates at three preselectable speeds: 1.8 kmh (walk), 2.7 kmh (jog), and 3.7 kmh (run). The speed is manually set at the IMTC. The target simulates a walking or running man. The target carrier is controlled by the RETS range control station.

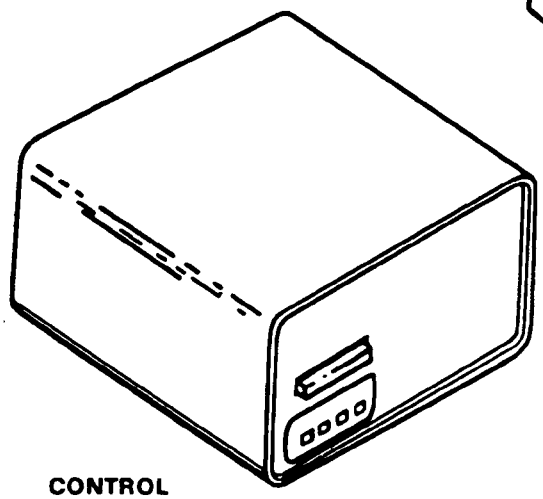
Figure B-71. Infantry moving-target carrier (RETS)



PRINTER



DISPLAY/KEYBOARD UNIT



CONTROL TAPE UNIT

NOTE: This system controls up to 512 targets automatically. The scenario is stored on cassette tape. A multiple format is used for printing scores. The operator is prompted by the display. The total assembly is tabletop-mounted.

Figure B-72. Range control system (RETS)

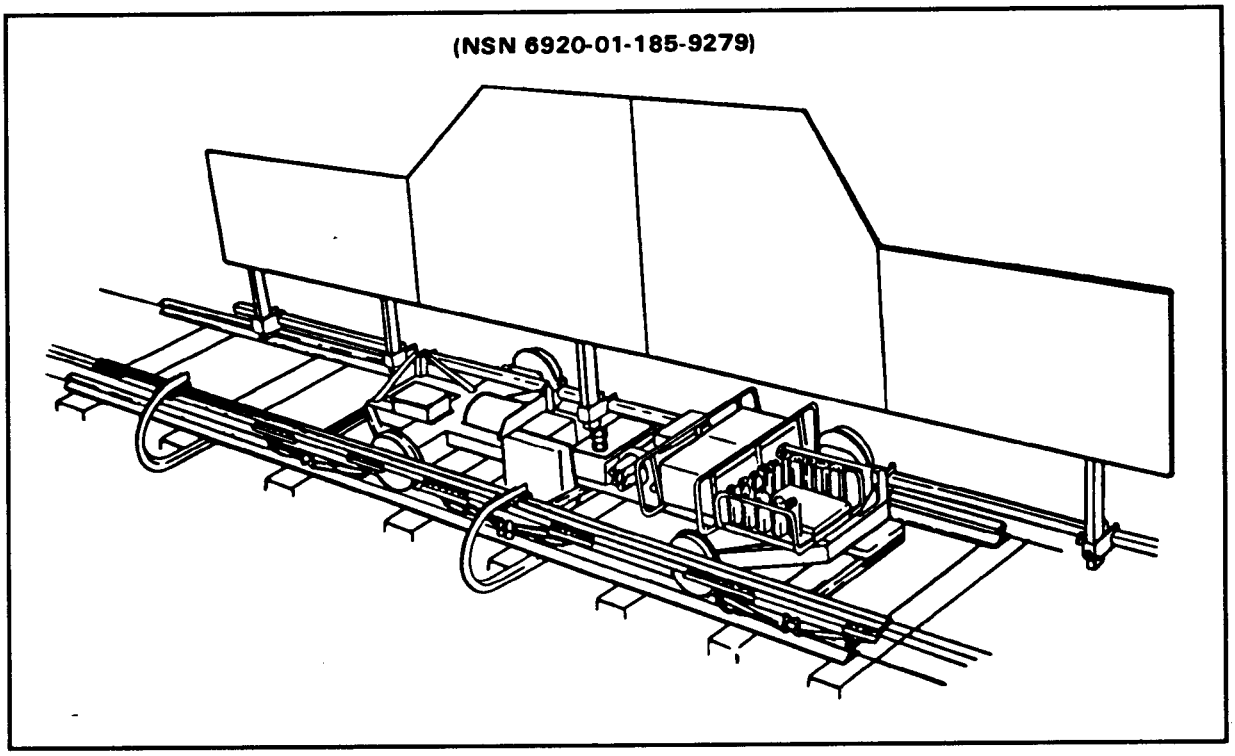


Figure B-73. Armor moving-target carrier with lifting device

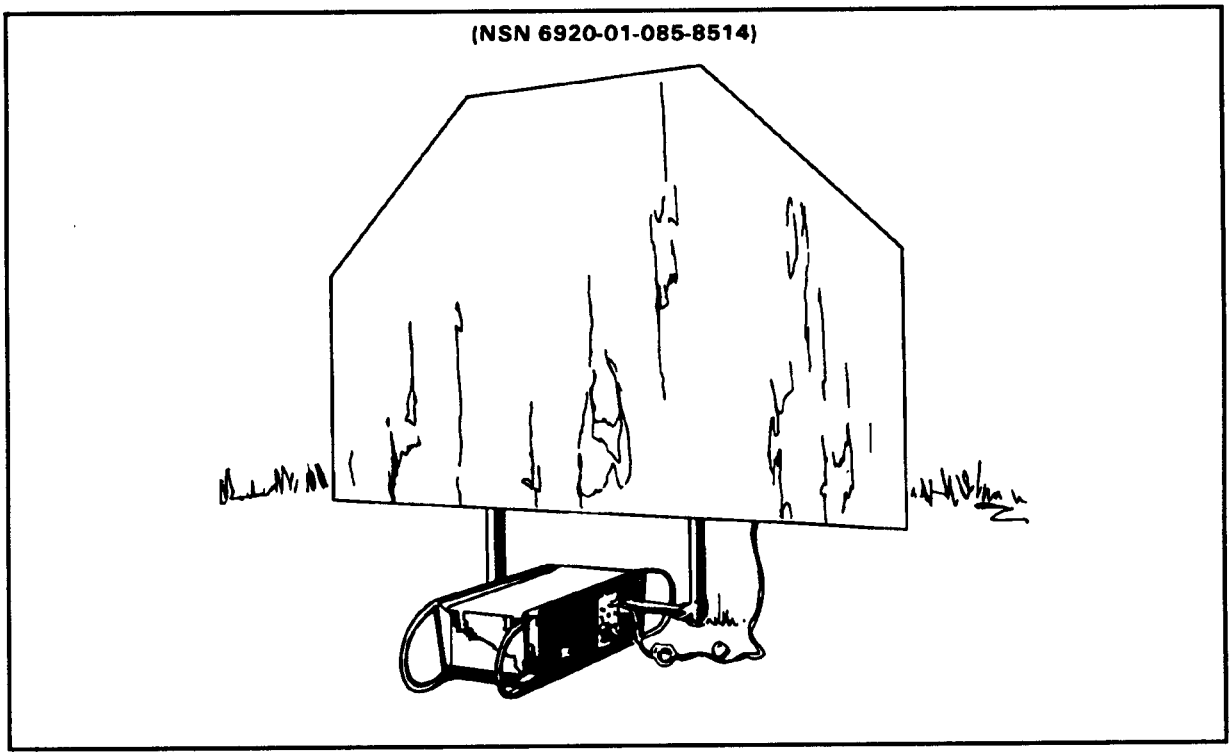


Figure B-74. Target-holding mechanism, tank gunnery

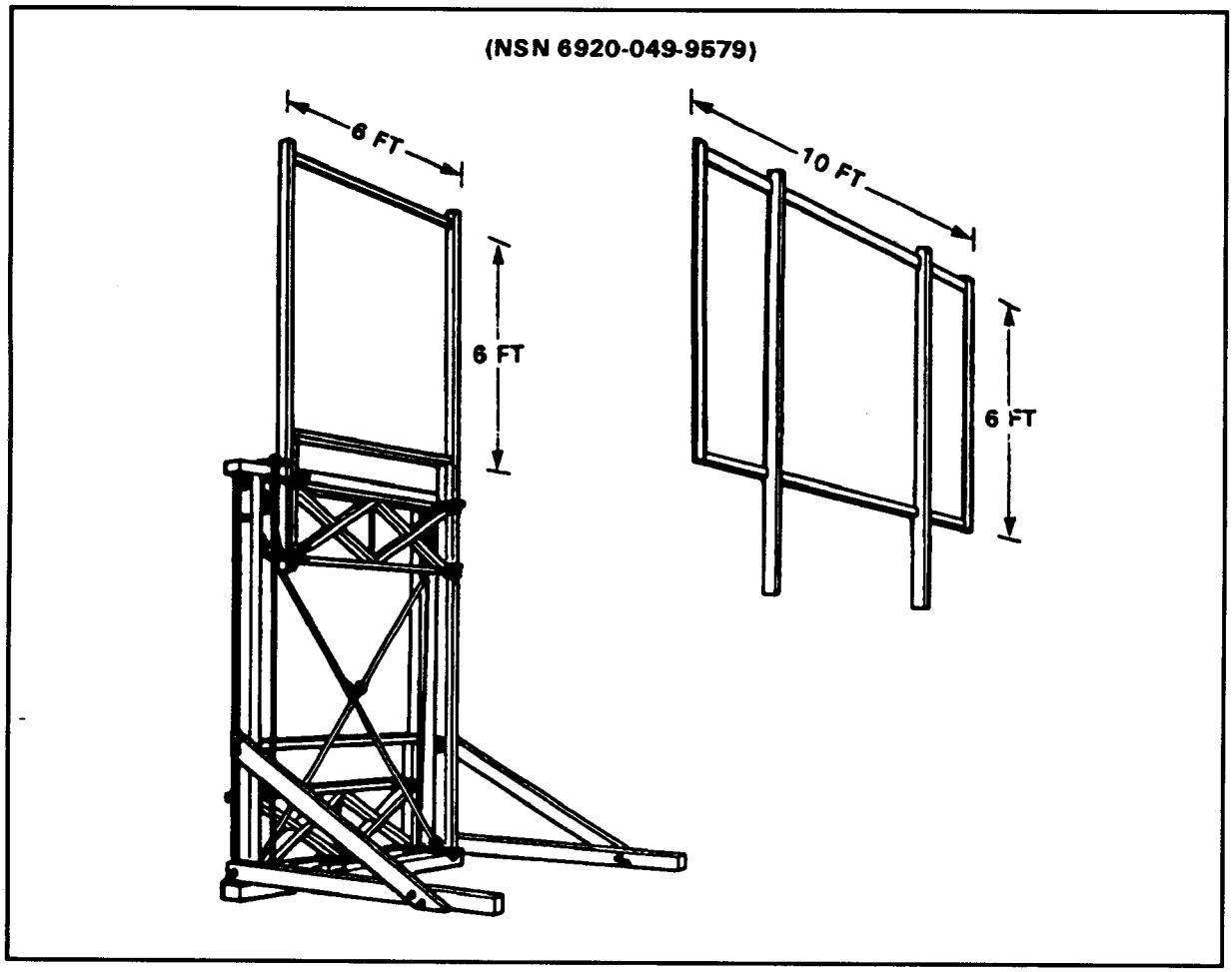


Figure B-75. Sliding combination target frame for known-distance range

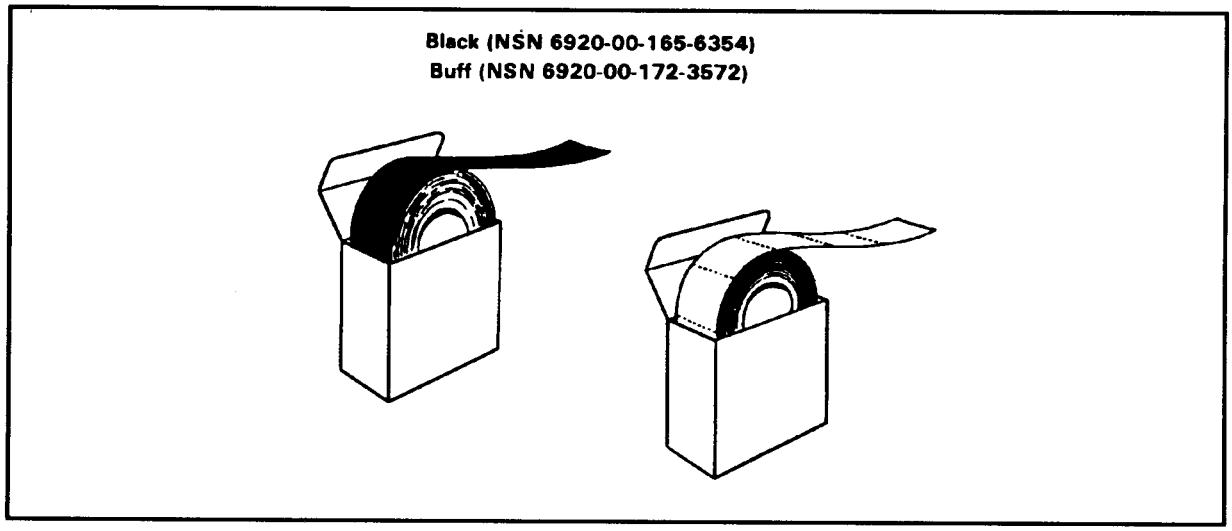
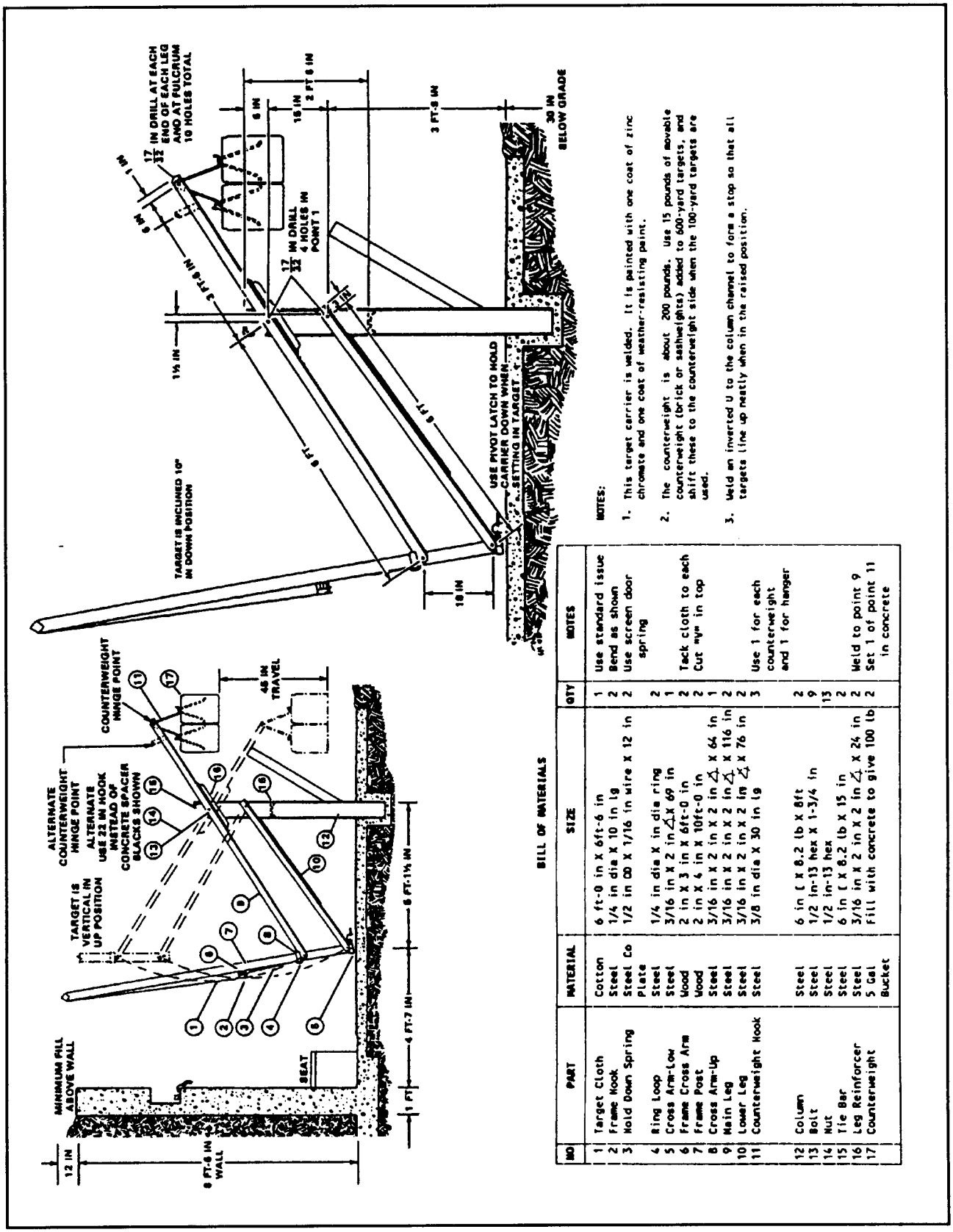


Figure B-76. Target pasters



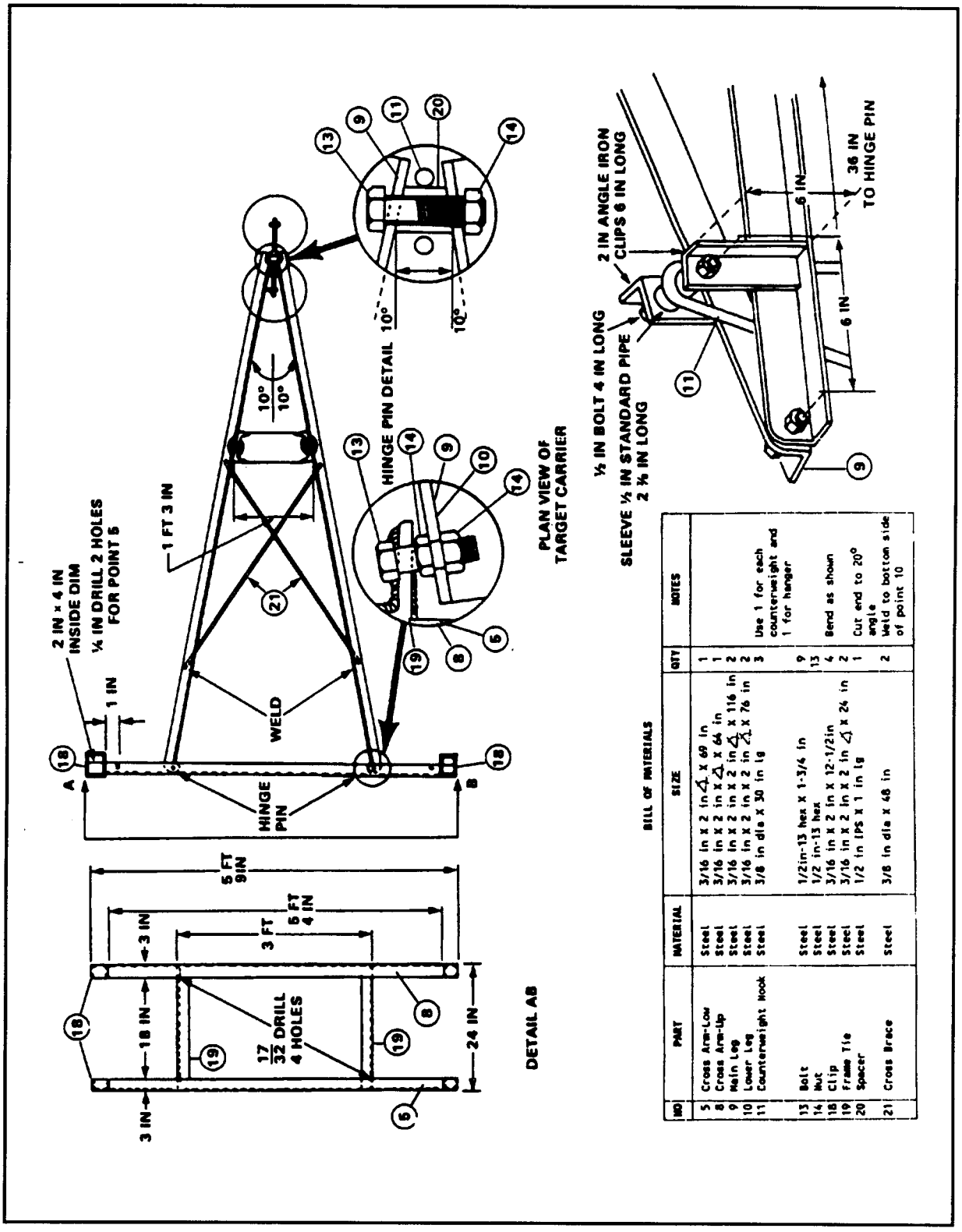
BILL OF MATERIALS

NO	PART	MATERIAL	SIZE	QTY	NOTES
1	Target Cloth	Cotton	6 ft-0 in X 6ft-6 in	1	Use standard issue
2	Frame Hook	Steel	1/4 in dia X 10 in lg	2	Bend as shown
3	Hold Down Spring	Steel Co	1/2 in OD X 1/16 in wire X 12 in	2	Use screen door spring
		Plate			
4	Ring Loop	Steel	1/4 in dia X in dia ring	2	
5	Cross Arm-Low	Steel	3/16 in X 2 in ∠ X 69 in	1	
6	Frame Cross Arm	Wood	2 in X 3 in X 6ft-0 in	2	Tack cloth to each
7	Frame Post	Wood	2 in X 4 in X 10ft-0 in	2	Cut "V" in top
8	Cross Arm-Up	Steel	3/16 in X 2 in X 2 in ∠ X 64 in	1	
9	Main Leg	Steel	3/16 in X 2 in X 2 in ∠ X 116 in	2	
10	Lower Leg	Steel	3/16 in X 2 in X 2 in ∠ X 76 in	2	
11	Counterweight Hook	Steel	3/8 in dia X 30 in lg	3	Use 1 for each counterweight and 1 for hanger
12	Column	Steel	6 in [X 8.2 lb X 8ft	2	
13	Bolt	Steel	1/2 in-13 hex X 1-3/4 in	9	
14	Nut	Steel	1/2 in-13 hex	13	
15	Tie Bar	Steel	6 in [X 8.2 lb X 15 in	2	
16	Leg Reinforcer	Steel	3/16 in X 2 in X 2 in ∠ X 24 in	2	Weld to point 9
17	Counterweight	5 Gal	Fill with concrete to give 100 lb	2	Set 1 of point 11 in concrete
		Bucket			

NOTES:

1. This target carrier is welded. It is painted with one coat of zinc chromate and one coat of weather-resisting paint.
2. The counterweight is about 200 pounds. Use 15 pounds of movable counterweight (brick or sashweights) added to 600-yard targets, and shift these to the counterweight side when the 100-yard targets are used.
3. Weld an inverted U to the column channel to form a stop so that all targets line up neatly when in the raised position.

Figure B-77. Paraleg target carrier for known-distance range



BILL OF MATERIALS

NO	PART	MATERIAL	SIZE	QTY	NOTES
5	Cross Arm-Low	Steel	3/16 in x 2 in ∠ x 69 in	1	
8	Cross Arm-Up	Steel	3/16 in x 2 in ∠ x 64 in	1	
9	Main Leg	Steel	3/16 in x 2 in x 2 in ∠ x 116 in	2	
10	Lower Leg	Steel	3/16 in x 2 in x 2 in ∠ x 76 in	2	
11	Counterweight Hook	Steel	3/8 in dia x 30 in lg	3	Use 1 for each counterweight and 1 for hanger
13	Bolt	Steel	1/2in-13 hex x 1-3/4 in	9	
14	Nut	Steel	1/2 in-13 hex	13	
18	Clip	Steel	3/16 in x 2 in x 12-1/2in	4	Bend as shown
19	Frame Tie	Steel	3/16 in x 2 in x 2 in ∠ x 24 in	2	
20	Spacer	Steel	1/2 in IPS x 1 in lg	1	Cut end to 20° angle
21	Cross Brace	Steel	3/8 in dia x 48 in	2	Weld to bottom side of point 10

Figure B-78. Details of paraleg target carrier

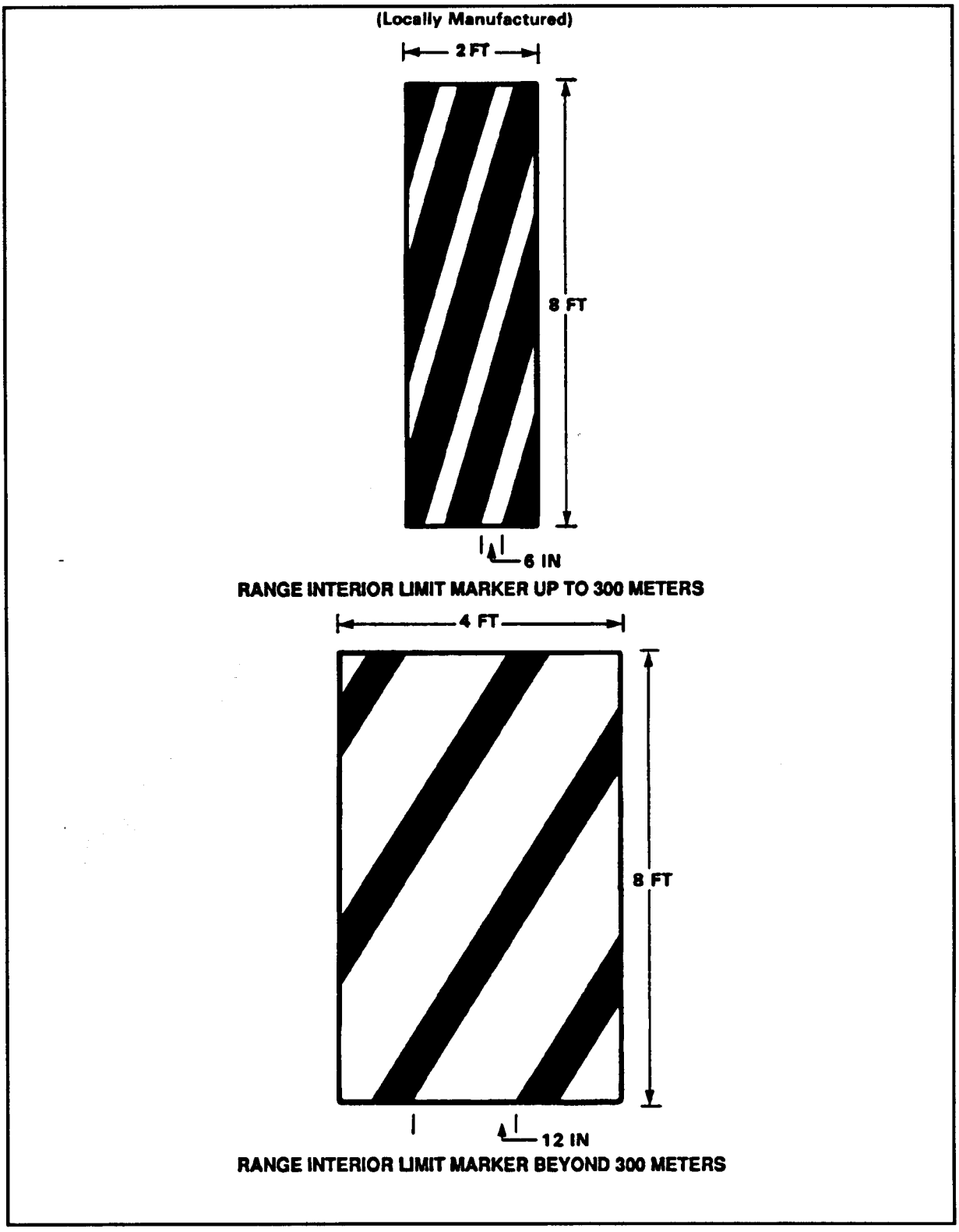
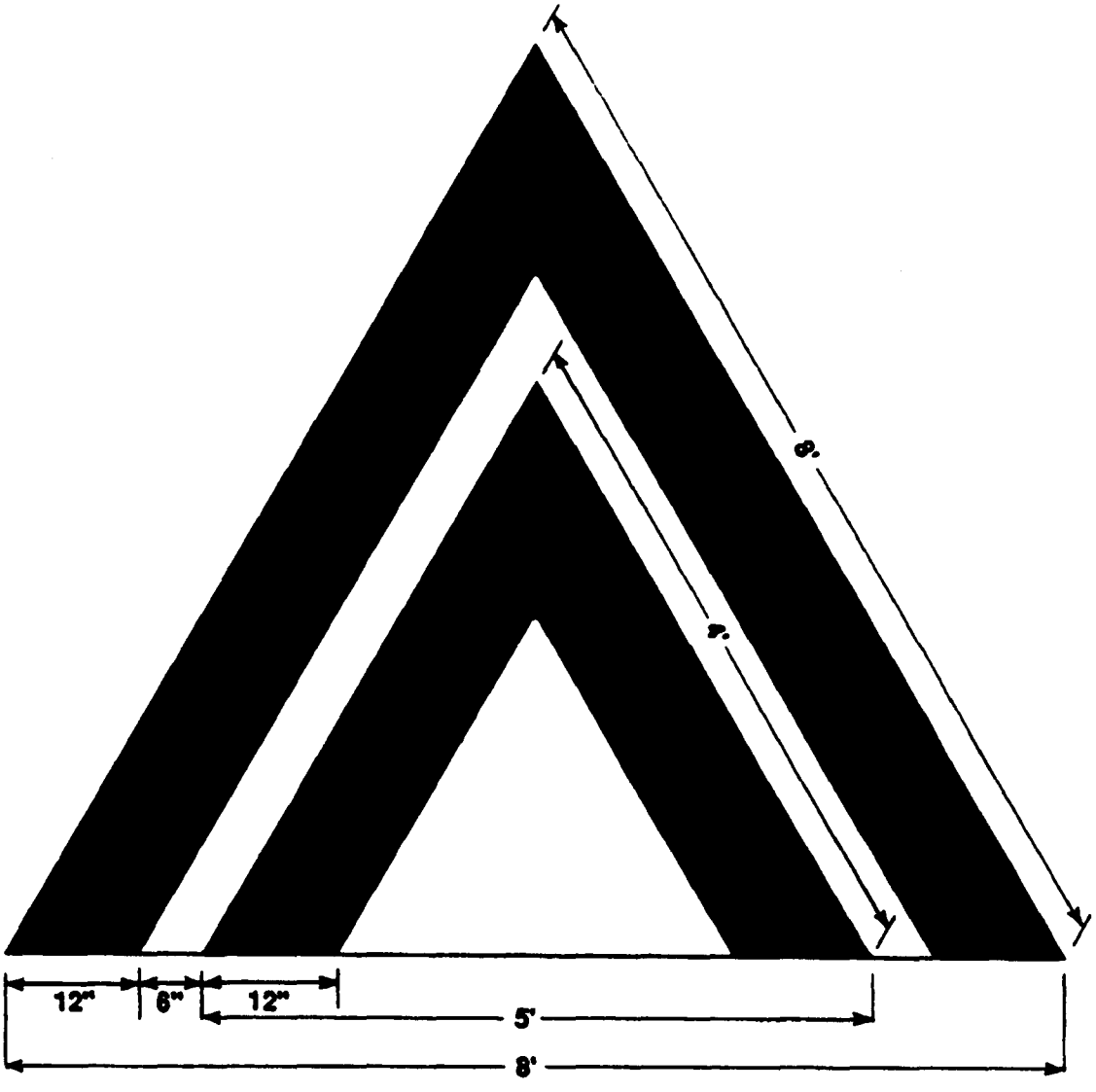


Figure B-79. Range interior limit markers

(LOCALLY MANUFACTURED)

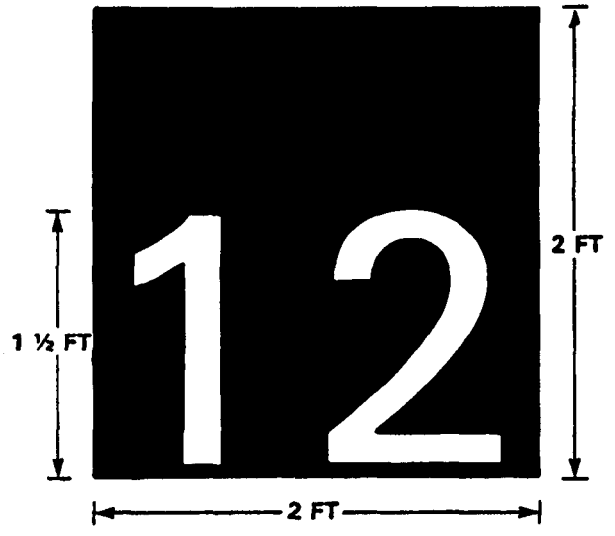


Range Outer Limit Marker

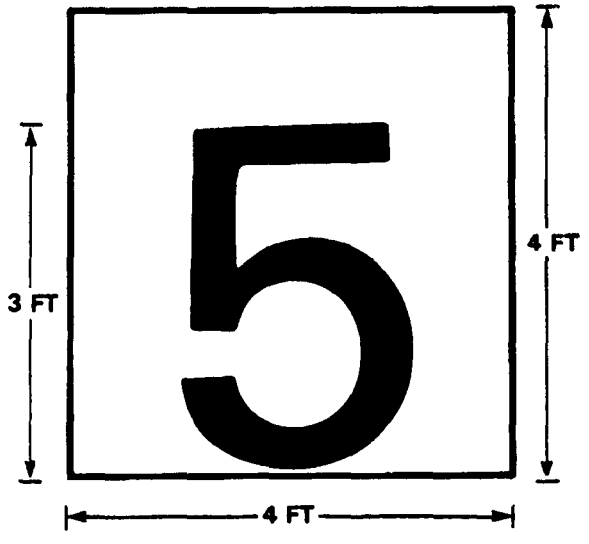
Note: STRIPING IS PAINTED International range/Fluorescent orange. Visual light and thermal signature are added for night firing.

Figure B-80. Range outer limit marker

(Locally Manufactured)



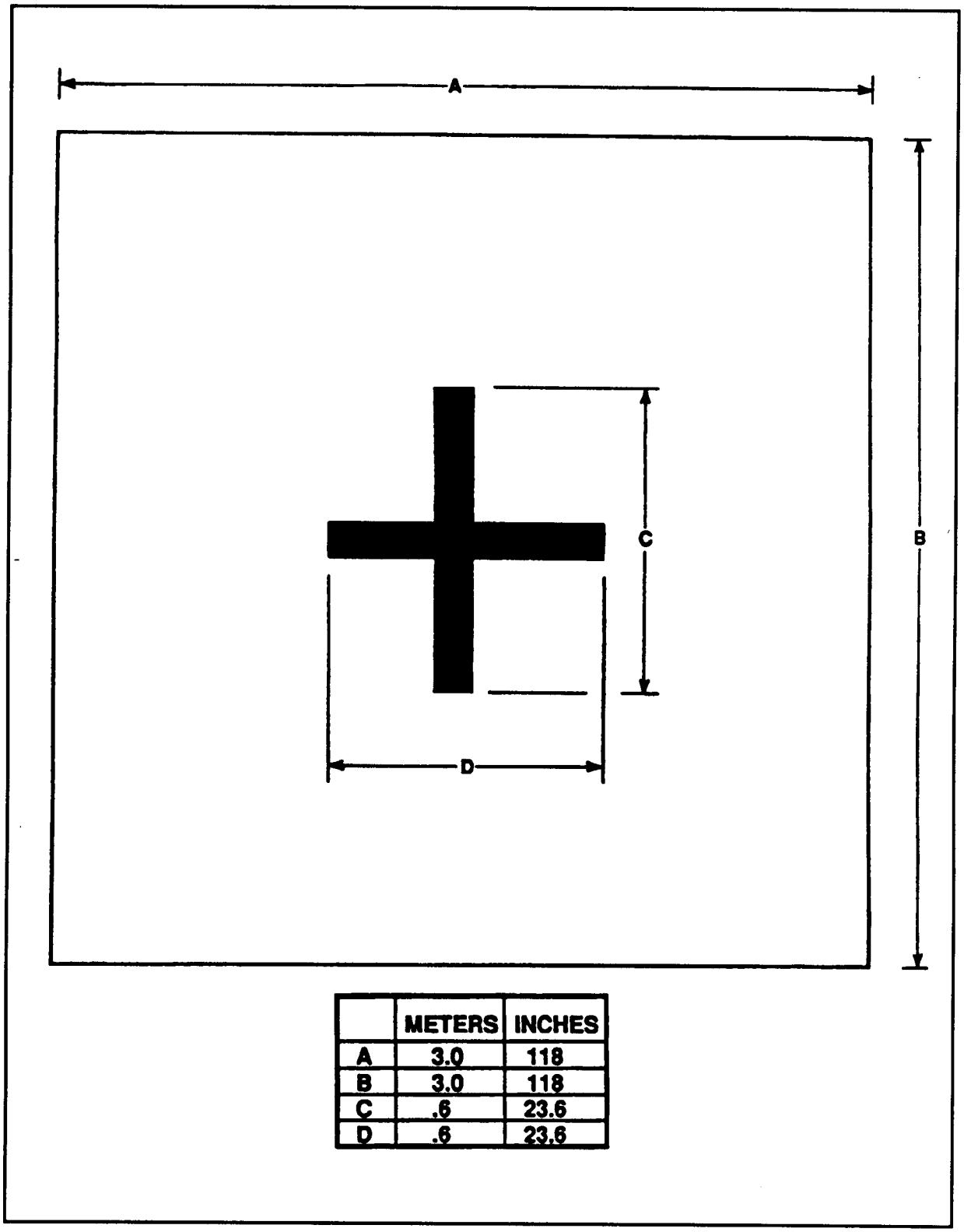
RANGE LANE MARKER UP TO 300 METERS



RANGE LANE MARKER BEYOND 300 METERS

NOTE: Mark odd numbered lanes with black numerals on a white background. Mark even numbered lanes with white numerals on black background.

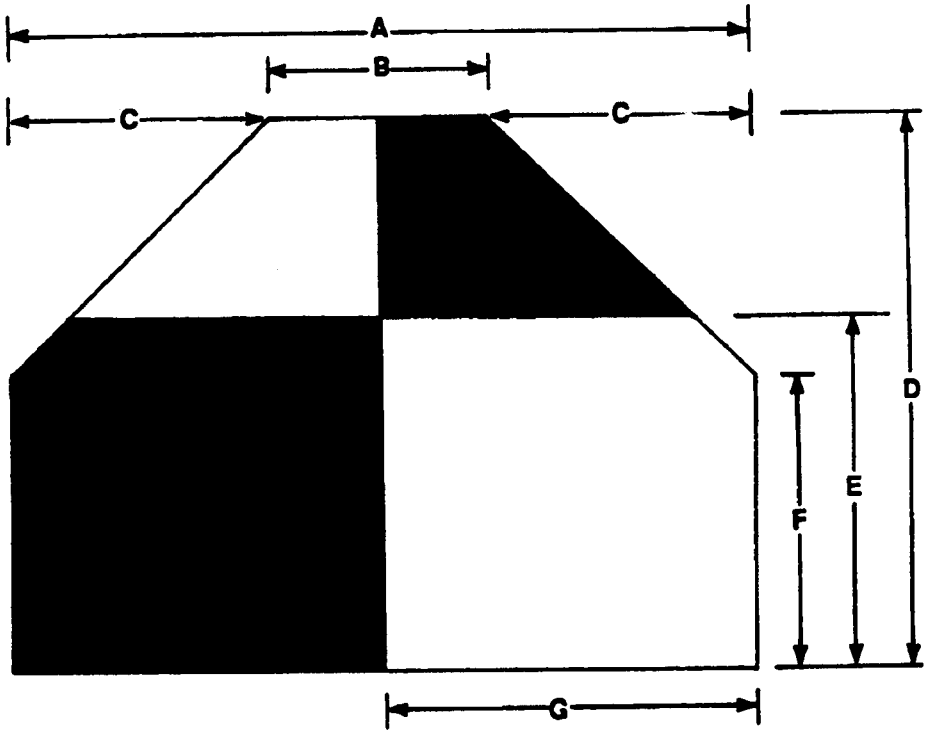
Figure B-81. Range lane markers



	METERS	INCHES
A	3.0	118
B	3.0	118
C	.6	23.6
D	.6	23.6

Figure B-82. Calibration panel

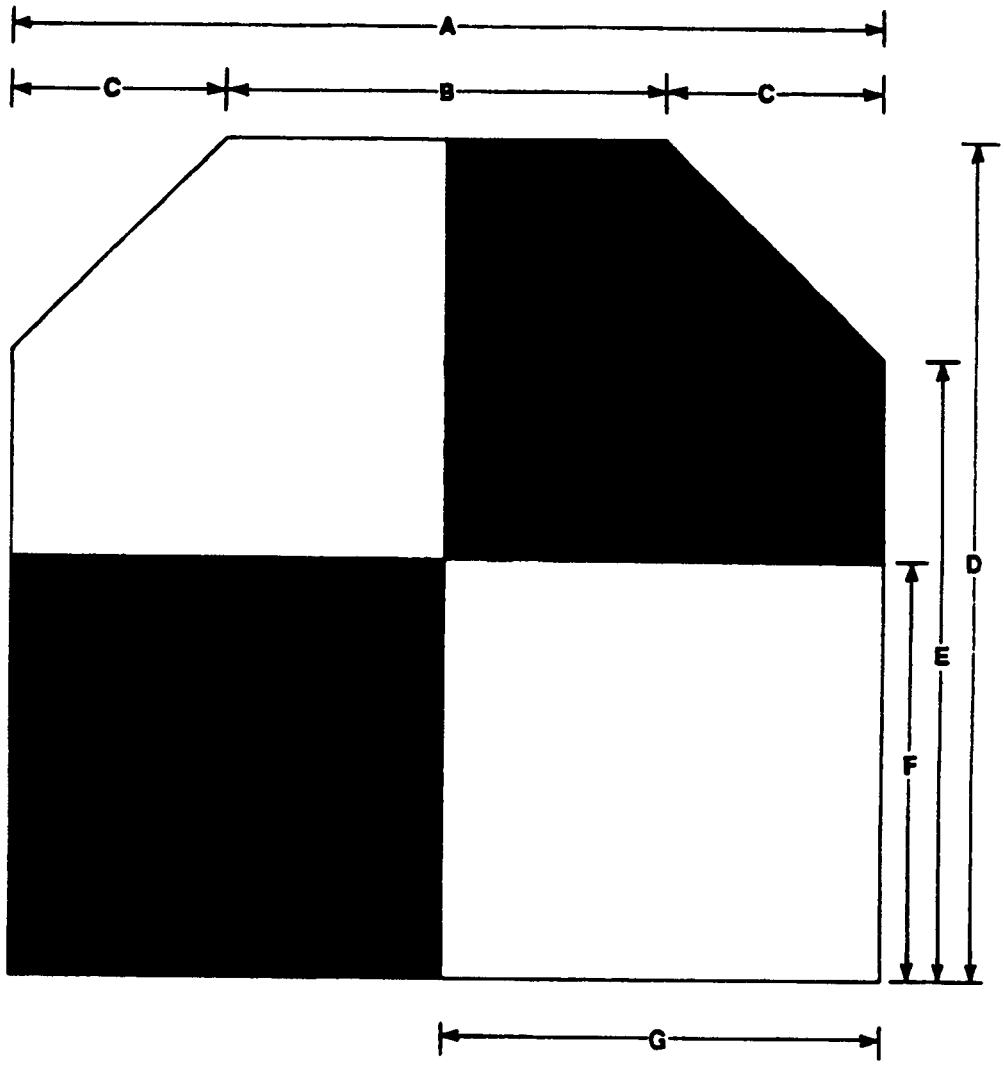
(LOCALLY MANUFACTURED)



	METERS	INCHES
A	2.2	86.5
B	.6	23.5
C	.8	31.5
D	1.4	55
E	.7	27.5
F	.6	23.5
G	1.1	43.3

Figure B-83. Screening test Target No. 1

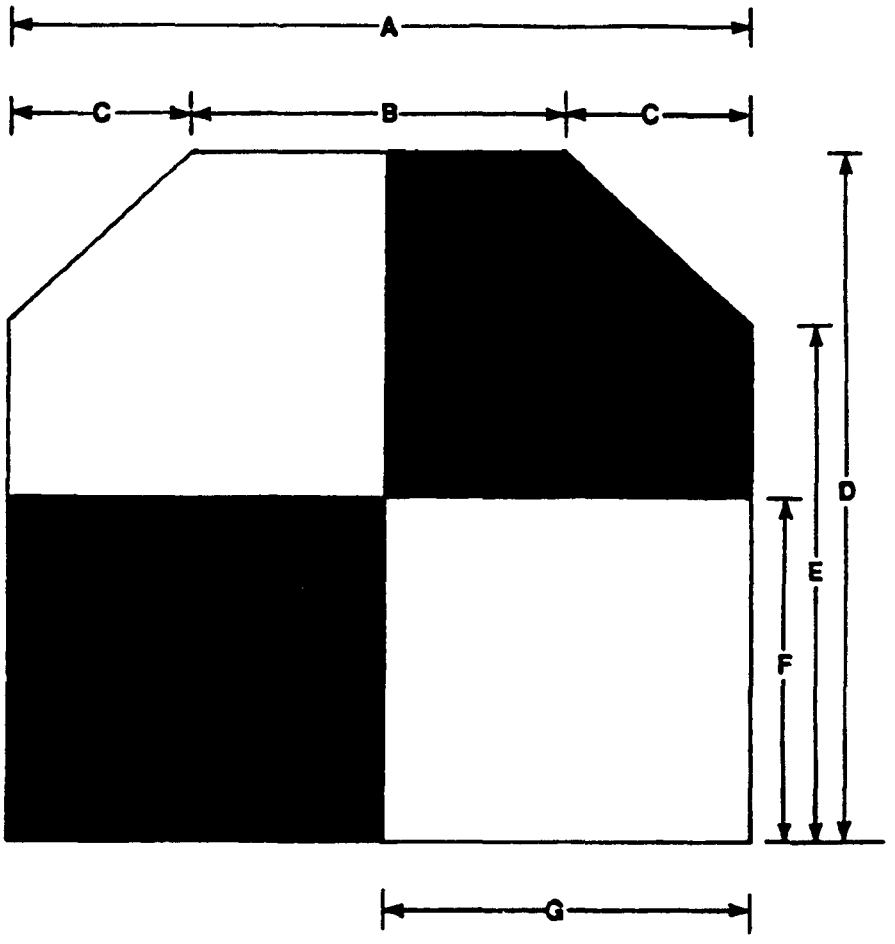
(LOCALLY MANUFACTURED)



	METERS	INCHES
A	3.0	118
B	1.5	59
C	.75	29.5
D	2.25	88.5
E	1.5	59
F	1.1	43.3
G	1.5	59

Figure B-84. Screening test Target No. 2

(LOCALLY MANUFACTURED)



	METERS	INCHES
A	2.2	86.6
B	1.0	39.4
C	.6	23.6
D	1.75	68.8
E	1.15	45.3
F	.8	31.5
G	1.1	43.3

Figure B-85. Screening test Target No. 3

APPENDIX C

LIVE-FIRE CHECKLIST

Officers in charge, range safety officers, and unit trainers should use the following checklist to prepare for and conduct live-fire training. The five-part checklist is notional; it should be supplemented by local range regulations and SOPs.

Part I. PREPLANNING FACTORS

A. Mission analysis

1. Units firing on the range
   Unit(s) _____
   Number of soldiers _____
2. Weapons and course/table to be fired
   Weapons(s) _____
   Course/table _____
3. Range requested
   Range name/number _____
4. Date of scheduled operation
   Date(s) _____
5. Ammunition requisition
   Type(s), quantities required _____
   Date requested _____
6. Attend range-control safety briefing
   Date _____
7. Targets ordered
   Date _____

REMARKS	Y	N	NA

B. Administrative requirements

1. Sufficient ammunition has been requested
2. Range facilities are adequate to conduct desired training
3. Sufficient time has been scheduled to complete training
4. Firing periods coordinated with Range Control
5. Range-scheduling conflicts have been resolved

REMARKS	Y	N	NA

C. Personnel requirements

1. OIC
   attended safety course briefing
   completed unit certification
2. RSO
   attended safety course briefing
   completed unit certification
3. Assistant safety officers
4. Medical support
5. Ammunition detail
6. Assistant instructors (AIs)
7. Range guards
8. Range/target operator
9. Maintenance personnel
10. Target detail

D. Equipment requirements

1. Range packet/clearance form received

REMARKS	Y	N	NA
2. Safety fan diagram/ range overlay on hand			
firing points			
firing lanes			
firing boxes			
target locations			
3. Radios			
4. Range flag and light (night firing)			
5. Vehicle flag sets/lights			
6. Safety paddles			
7. Medical support equipment			
ambulance or designated vehicle			
litter			
backboard			
aid bag, complete			
other equipment prescribed in local guidance			
8. Earplugs			
9. Master score sheet			
10. Scorecards			
11. Armorer's tool kit			
12. Weapons-cleaning equipment			
13. Fire extinguishers			
14. Repair parts/spare weapons			
15. Training publications			
16. Report folder			
17. Life saver procedures			
18. Toilet paper			
Part II. RANGE OCCUPATION			

REMARKS	Y	N	NA
A. Establish communications with Range Control			
B. Prepare designated areas			
1. Ammunition point			
2. Medical station			
3. Concurrent training			
4. Parking			
5. Armorer			
6. Water point			
7. Mess			
C. Range OIC brief			
1. RSO			
2. Safety assistants			
3. AIs			
4. Vehicle commanders			
D. Conduct range inspection to ensure targetry is present and operational			
E. Verify impact area clear of unauthorized personnel			
F. Raise range flag			
G. Check ammunition			
No live-fire ammunition on nonfiring range			
H. Receive firing units			
L Range guards briefed and posted			
J. Conduct safety checks on weapons			
K. Conduct safety briefings			
1. Dud orientation			
2. Noise hazard briefing			
3. Misfire Procedures			
L. Organize personnel into firing orders (keep unit integrity, if possible)			

REMARKS	Y	N	NA
M. Medical support is present or			
1. Medics have communications with treatment facility			
2. Medics have strip map from range/training area to treatment facility			
3. Medics (off-site) have communications with range/training area			
4. Medics (off-site) have strip map to range/training area			
5. Medics, in coordination with Range OIC, select and clear air evacuation site near the range.			
N. For tanks and BFVs, inspect DA Form 2408-4 (Weapon Record Data) for each main gun to be tired			
O. Request clearance from Range Control to commence firing			

Part III. CONDUCT OF FIRING OPERATIONS

REMARKS	Y	N	NA
A. Communication maintained w/Range Control IAW local SOP			
B. Ammunition accountability maintained			
C. Personnel accountability maintained			
D. Guards on duty/alert			
E. Earplugs in use			
F. Weapons cleared before departing firing line on small-arms ranges			
G. Surface danger zone is monitored to ensure it remains clear			
H. Weapon systems are cleared and checked during temporary suspensions of firing			
I. Cease-fire is called when unsafe act is observed or reported or when communication with Range Control is lost			
J. Handle misfires, hangfires, or cookoffs IAW pertinent technical manuals			

Part IV. POSTFIRING OPERATIONS

REMARKS	Y	N	NA
A. All weapons cleared before leaving range or training facility			
B. Conduct brass/ammunition check			
C. Close down range IAW local SOP			
D. Firing status of range or vehicles reported to Range Control			
E. Conduct police of range			
F. Perform maintenance tasks as required by local SOP			
G. Request range clearance from Range Control			
H. Debrief unit personnel			
I. Submit after-action report IAW local SOP			

REMARKS	Y	N	NA
1. Number of rounds fired by caliber			
2. Throughout			
3. Number and approximate location of unexploded ordnance			
4. Weapons malfunctions			
5. Safety hazards			
6. Communications losses			

Part V. LASER OPERATIONS

Laser devices may only be used on those ranges that the installation commander has approved and established for such use. The following checklist is used in planning for and conducting laser operations.

REMARKS	Y	N	NA
A. Verify survey of proposed lasing and, target area			
B. Right and left laser safety limit stakes designate right and left limits of lasing at local training areas			
c. Warning signs and barricades posted to prevent unauthorized entry			
D. Warning signs posted at entrance to the range (Figure C-1)			
E. Verify impact area clear of unauthorized personnel			
F. Sweep range area to remove all specular (mirror-like) material prior to lasing			
G. Target materials are non-secular surfaces — cardboard, wood, or lusterless metal			
H. Recommended target areas are free of specular surfaces (glossy foliage, raindrops, and other material objects are not considered pecular surfaces)			
I. Laser devices are not lased at specular reflective surfaces			
J. Unprotected personnel are not exposed to either the direct beam or the beam reflected from a specular surface			
K. Personnel within the LSDZ are wearing protective eyewear (Table C-1)			
L. Laser devices listed in Figure C-2 are not used in two-sided tactical exercises			
M. Appropriate laser safety filters are placed in daylight optical devices used to observe targets during lasing			
N. Recommended target areas are free of calm, smooth water, and clean ice			
O. Laser safety orientation is provided to all personnel who work with or use lasers			

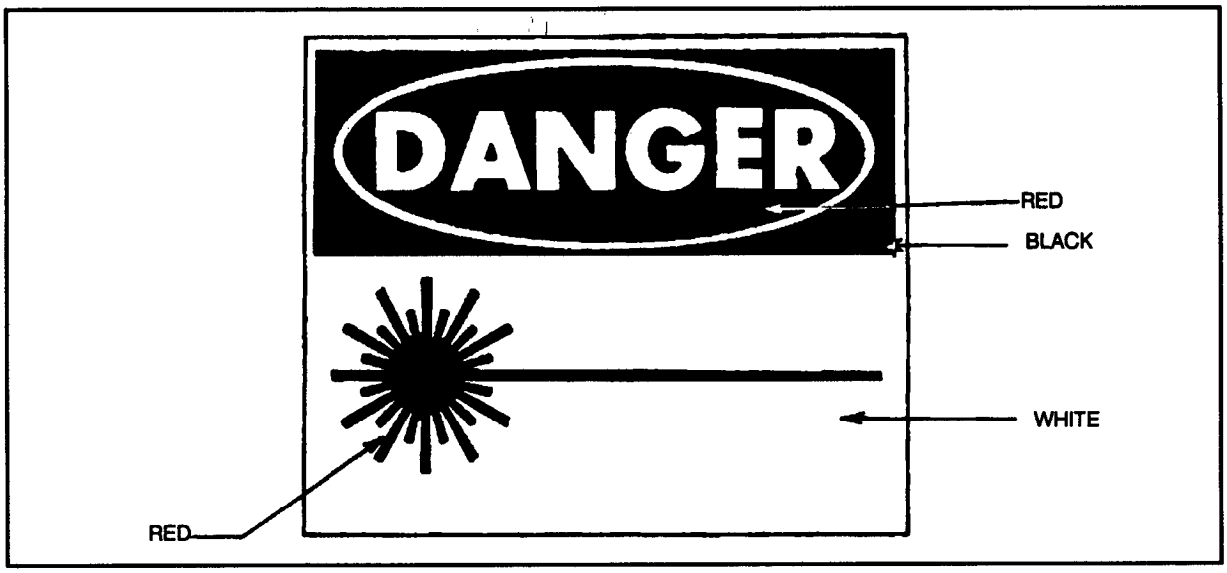


Figure C-1. Laser warning sign

Table C-1. Protective eyewear data*

DEVICE	OPTICAL DENSITY	WAVELENGTH/ TYPE
AN/VVS-1	5.8	694.3nm/Ruby
AN/VVG-1	5.8	694.3nm/Ruby
AN/VVG-2	5.8	694.3nm/Ruby
AN/GVS-5	4.4	1064nm/NdYAG
GLLD	5.5	1064nm/NdYAG
MULE	5.6	1064nm/NdYAG
AN/PAQ-1	5.8	1064nm/NdYAG
LATT	4.8	1064nm/NdYAG
AAH-TAD/PNVS	5.5	1064nm/NdYAG
M1 LRF (M-1)	4.7	1064nm/NdYAG
AN/ASQ-153	5.6	1064nm/NdYAG
AN/AVQ-25	5.8	1064nm/NdYAG
AN/AAS-37	4.6	1064nm/NdYAG
AN/AAS-33A	5.8	1064nm/NdYAG

*If more than one type device is used, protective measures must cover all devices. For devices of the same wavelength, the highest required optical density is used.

AN/GVS-5 (Hand-Held)	AN/VVG-1 (M551-A1)
with 19dB Attenuator (Red Filter)	AN/VVS-1 (M60-A2)
with 29dB Attenuator (Yellow Filter)	LAAT (AH-1S)
AN/PAQ-1 (Hand-Held)	M1 LRF (M-1/M1A1)
AN/PAQ-3 (Tripod) Designator	TADS (AAH)
AN/PAQ-3 Rangefinder	AN/ASQ-153 (A6-E)
AN/TVQ-2 (Tripod) Designator	AN/AVQ-25 (F-111)
AN/TVQ-2 Rangefinder	AN/AAS-37 (OV-100)
AN/VVG-2 (M60-A3)	AN/AAS-33A (A6-E)

Figure C-2. Laser devices prohibited in two-sided tactical exercises

Appendix D

REMOTED TARGET SYSTEM PROGRAMMING

This appendix describes control modes, programming statements, and print options used to develop remoted target system computer programs. This information will help unit trainers develop scenarios from which RETS computer programs can be developed. Understanding the modes, statements, and options will enable scenario developers to provide necessary information to computer programmers.

RANGE CONTROL MODES

The RETS range control station (RCS) transmits command and control signals to targetry equipment and receives hit signals from hit sensors attached to the targets. There are two modes for controlling targetry movement:

- *Automatic mode (AUTO)* runs a preprogrammed, time-driven scenario. The program gives commands to raise or lower targetry mechanism it commands moving target carriers to move forward, to reverse, or to stop. Programmed scenarios are reusable.
- ***Manual mode (MAN)*** allows individual target mechanisms or groups of targets to be raised or lowered on command of the RCS operator. Alibi engagements can be fired when the system is in the MAN mode.

PROGRAMMING STATEMENTS

Programming statements are used to establish the conditions for firing engagements. The following statements may be included in the RETS program:

- The *depth statement* assigns targets or target arrays into groups or zones. In a training scenario, depth can be used to evaluate the firing element's best zones of engagement.

  Example:

Near	0-500 meters
Medium	500-1200 meters
Far	1200-2300 meters

  No more than five depth statements can be used in a program. Each target may be assigned to only one depth.

- The *attrition statement* assigns targets to a kill group. Attrition statements are used in scenarios to simulate enemy withdrawal after sustaining a predetermined percentage of losses.

  Example 1:

  ATTRITION STATEMENT:
  5 targets presented — 3 total hits are required to kill or lower targets

  RESULTS:
  3 of 5 targets receive 1 hit each — all targets are lowered

  Example 2:

  ATTRITION STATEMENT:
  5 targets presented — 8 total hits are required to kill or lower targets

  RESULTS:
  4 of 5 targets receive 2 hits each — all targets are lowered

  The scenario developer determines the number of hits required to kill a particular group of targets. A target cannot be assigned to more than one kill group and need not be assigned to any kill group. In the MAN mode, the RCS operator cannot override an attrition statement that has been programmed into the scenario.

- The *hold statement* suspends target activity. Since it is impossible to predict the time required for a firing element to maneuver or move into position, hold statements are used to suspend the scenario after the last command is executed. The RCS operator must depress the CONT key on the RCS computer keyboard to allow the program to continue. The operator may override the program in the AUTO mode by depressing the HOLD key. The computer will complete execution of the last command before suspending the scenario.
- The *withdraw statement* designates the end of the attack phase of the scenario and the beginning of the withdrawal phase. The program will run only an attack phase unless a withdraw statement is included.

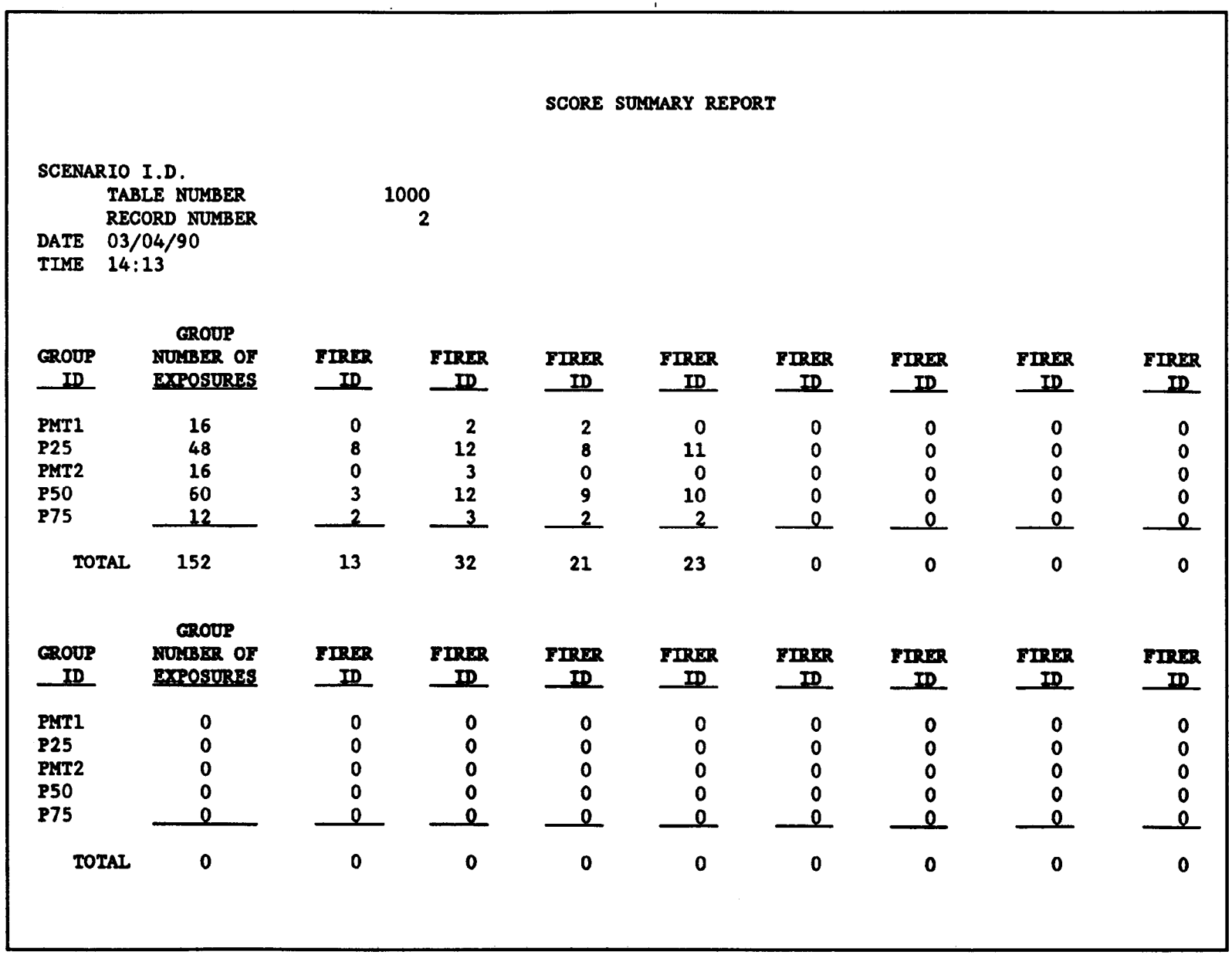
- *Print statements* command the computer and printer to provide report printouts. A *print hold statement* may be included following engagements to suspend the scenario and provide a report. The RCS operator presses the CONT key to continue the scenario after the report is printed.

PRINT OPTIONS

Seven report formats are currently available. The type of scenario and the information desired will determine the report required. The available reports are —

- Score Summary Report.
- Phase Summary Report.
- Infantry Score Summary Report.
- Armor Target Score Summary.
- Diminishing Force Score Summary Report.
- Diminishing Force Scenario Summary Report.
- Armor Diminishing Force Score Summary Report.

Examples of these reports are shown in Figures D-1 through D-7. With the introduction of new and improved equipment, additional report formats may be available.



SCORE SUMMARY REPORT

SCENARIO I.D.
TABLE NUMBER 1000
RECORD NUMBER 2
DATE 03/04/90
TIME 14:13

GROUP ID	GROUP NUMBER OF EXPOSURES	FIRER ID	FIRER ID	FIRER ID	FIRER ID	FIRER ID	FIRER ID	FIRER ID	FIRER ID
PMT1	16	0	2	2	0	0	0	0	0
P25	48	8	12	8	11	0	0	0	0
PMT2	16	0	3	0	0	0	0	0	0
P50	60	3	12	9	10	0	0	0	0
P75	12	2	3	2	2	0	0	0	0
TOTAL	152	13	32	21	23	0	0	0	0

GROUP ID	GROUP NUMBER OF EXPOSURES	FIRER ID	FIRER ID	FIRER ID	FIRER ID	FIRER ID	FIRER ID	FIRER ID	FIRER ID
PMT1	0	0	0	0	0	0	0	0	0
P25	0	0	0	0	0	0	0	0	0
PMT2	0	0	0	0	0	0	0	0	0
P50	0	0	0	0	0	0	0	0	0
P75	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

Figure D-1. Score Summary Report format

PHASE SUMMARY REPORT

SCENARIO I.D.
TABLE NUMBER 1999
RECORD NUMBER 9111
DATE 03/04/90
TIME 14:20

LANE 1 FIRER I.D. _____

ATTACK PHASE SUMMARY

TYPE/RANGE	NUMBER OF EXPOSURES	HITS		
		STATIONARY	MOVING	TOTAL
NEAR	120	42	24	66
MEDIUM	98	34	18	52
FAR	82	28	13	41
TOTAL	300	104	55	159

WITHDRAWAL PHASE SUMMARY

TYPE/RANGE	NUMBER OF EXPOSURES	HITS		
		STATIONARY	MOVING	TOTAL
NEAR	110	38	22	60
MEDIUM	88	29	16	45
FAR	92	31	14	45
TOTAL	290	98	52	150

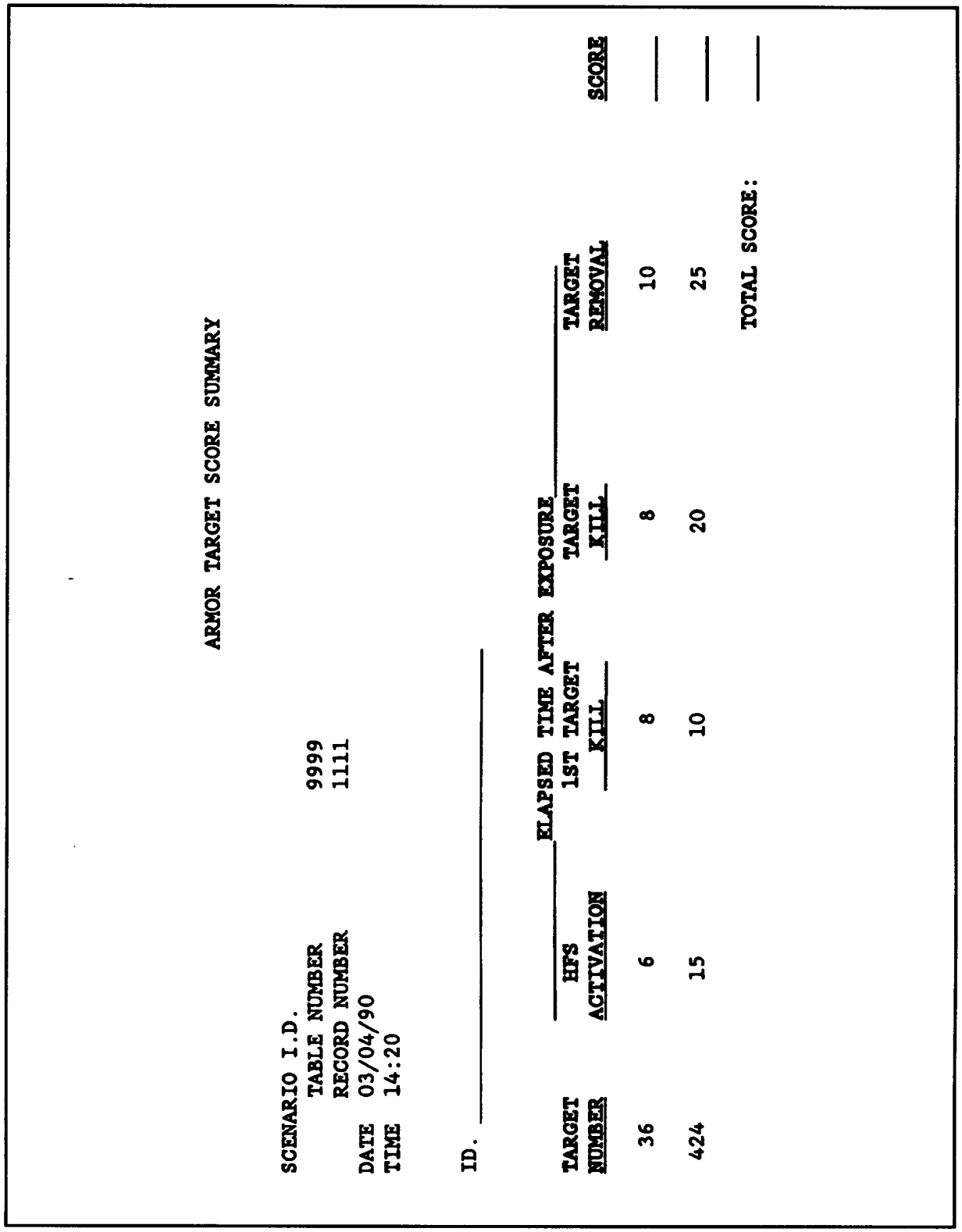
Figure D-2. Phase Summary Report format

INFANTRY SCORE SUMMARY REPORT

SCENARIO I.D.
TABLE NUMBER 1000
RECORD NUMBER 2
DATE 03/04/90
TIME 14:14

TARGET NUMBER	NUMBER OF EXPOSURES	NUMBER OF HITS
1	2	0
2	4	4
3	2	0
4	4	2
5	4	2
6	4	0
7	5	4
8	5	5
9	5	4
10	3	2
20	2	1
21	2	1
22	4	4
23	4	4
24	4	4
25	4	3
26	5	6
27	5	3
TOTAL	68	49

Figure D-3. Infantry Score Summary Report format



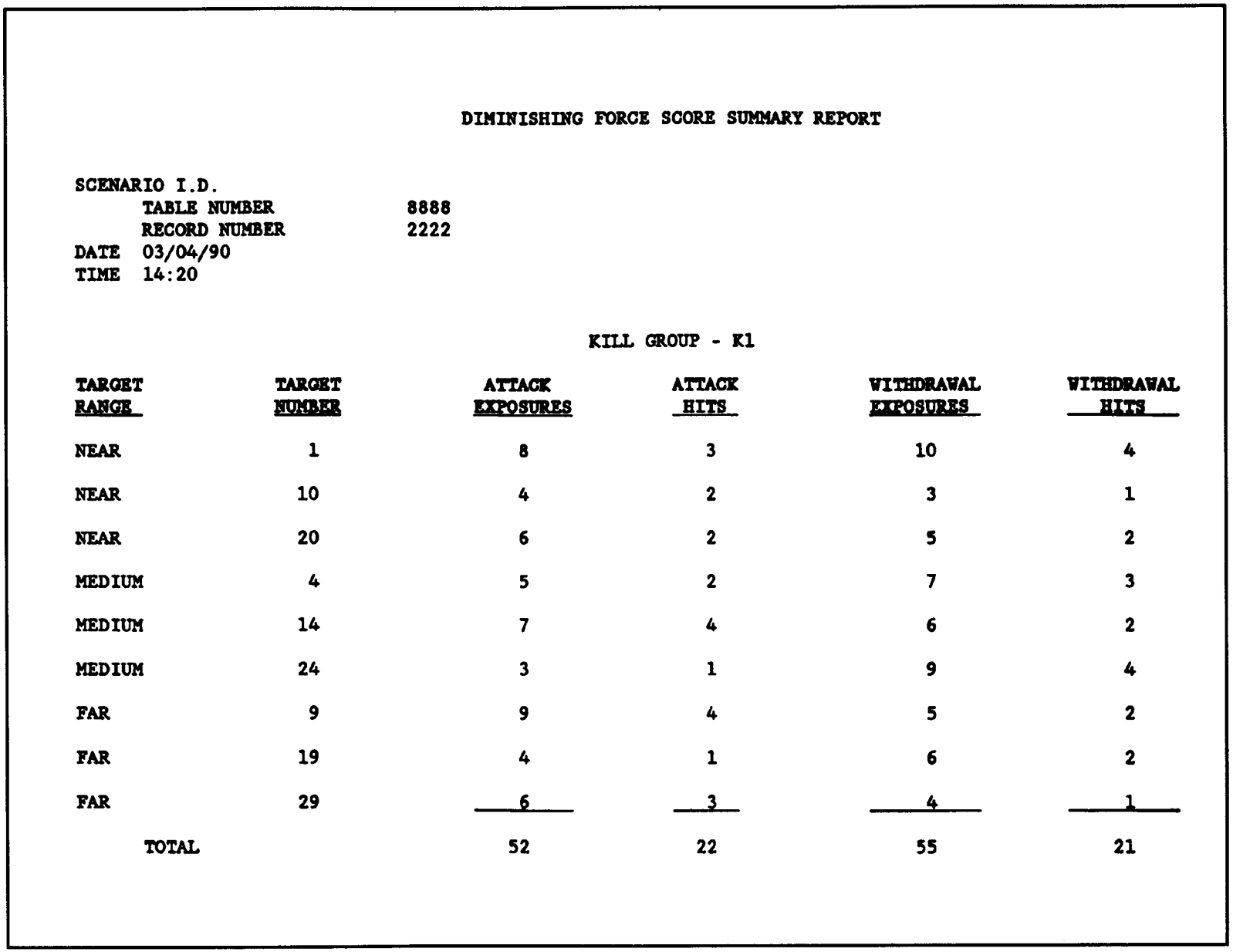
ARMOR TARGET SCORE SUMMARY

SCENARIO I.D. 9999
TABLE NUMBER 1111
RECORD NUMBER
DATE 03/04/90
TIME 14:20

ID. _____

TARGET NUMBER	HFS ACTIVATION	ELAPSED TIME AFTER EXPOSURE 1ST TARGET KILL	TARGET KILL	TARGET REMOVAL	SCORE
36	6	8	8	10	____
424	15	10	20	25	____
				TOTAL SCORE:	____

Figure D-4. Armor Target Score Summary format



DIMINISHING FORCE SCORE SUMMARY REPORT

SCENARIO I.D.
TABLE NUMBER 8888
RECORD NUMBER 2222
DATE 03/04/90
TIME 14:20

KILL GROUP - K1

TARGET RANGE	TARGET NUMBER	ATTACK EXPOSURES	ATTACK HITS	WITHDRAWAL EXPOSURES	WITHDRAWAL HITS
NEAR	1	8	3	10	4
NEAR	10	4	2	3	1
NEAR	20	6	2	5	2
MEDIUM	4	5	2	7	3
MEDIUM	14	7	4	6	2
MEDIUM	24	3	1	9	4
FAR	9	9	4	5	2
FAR	19	4	1	6	2
FAR	29	6	3	4	1
TOTAL		52	22	55	21

Figure D-5. Diminishing Force Score Summary Report format

DIMINISHING FORCE SCORE SUMMARY REPORT

SCENARIO I.D.
TABLE NUMBER 8888
RECORD NUMBER 2222
DATE 03/04/90
TIME 14:20

ATTACK PHASE SUMMARY

DEPTH	ATTACK EXPOSURES	ATTACK HITS
NEAR	18	7
MEDIUM	15	7
FAR	19	8
TOTAL	52	22

WITHDRAWAL PHASE SUMMARY

DEPTH	WITHDRAWAL EXPOSURES	WITHDRAWAL HITS
NEAR	18	7
MEDIUM	22	9
FAR	15	5
TOTAL	55	21

Figure D-6. Diminishing Force Scenario Summary Report format

ARMOR DIMINISHING FORCE SCORE SUMMARY REPORT

SCENARIO I.D.
TABLE NUMBER 1798
RECORD NUMBER 6642
DATE 03/04/90
TIME 14:20

KILL GROUP - K1

		ELAPSED TIME AFTER EXPOSURE			
TARGET NUMBER	HFS ACTIVATION	1ST TARGET KILL	TARGET KILL	TARGET REMOVAL	SCORE
36	6	8	8	10	____
424	15	10	20	25	____
463	2	3	5	10	____
505	4	2	3	10	____
				TOTAL SCORE:	____

TOTAL EXPOSURE TIME FOR KILL GROUP = 55

Figure D-7. Armor Diminishing Force Score Summary Report format

Appendix E

RANGE BAFFLES AND FIGHTING POSITIONS

RANGE BAFFLES

A baffled system consists of a series of overhead barriers, sidewalls, and a bullet stop to contain the trajectory and ricochet of small-arms rounds. Use a baffled system when an installation does not have enough available land to provide impact areas behind or adjacent to a firing range. Baffles are frequently used when converting an existing KD range into an AFF, ARF, MRF, or CPQC, since KD ranges are built with a bullet stop at the end of the range.

Installation range planners should consider the cost of a baffled system versus the availability and cost of purchasing additional land. Baffled systems are designed and site-adapted for each individual range. Before construction the baffling system design must be certified by the command safety officer to ensure that the baffles will capture all rounds. Estimated maintenance requirements and baffle replacement should also be included in the cost comparison. Baffling is expensive. Use it only when it is cost-effective.

Range baffles are designed to capture M16AI/A2 and pistol rounds fired under normal conditions throughout the length of the range. Soldiers can fire the SAW and the M50 MG 10m course on an appropriately designed baffled range by firing within 10 meters of the bullet stop.

A bullet stop and sidewalls are included in converted KD ranges or newly constructed ranges to guard against shooting through the range. Overhead baffles must be built to catch ricochets for targets placed along the entire length of the range floor. The size and location of intermediate baffles are determined by–

- The sheath of fire (1.5m above and below the center of mass of an E-type target).
- A 40° trajectory of an overhead ricochet from the range floor.
- The percentage slope of the range.
- The amount of impact area available, if any.

This information will also be used to determine the size of side walls and side baffles. The height of the sidewalls determines the height of overhead baffles above the range floor.

Figure E-1 illustrates a notional baffled system on a KD range. It may be desirable to incorporate side baffles into the side berms to further avoid ricochets escaping the range. Figure E-2 depicts a notional bullet catch.

FIGHTING POSITIONS

Fighting positions enable troops and vehicles to engage range targets with direct-fire weapons, provide necessary protection for personnel, and still allow for fields of fire and maneuver. Several optional variants of fighting positions are available for construction on ranges. The commander's intent and training requirements will determine the type of positions selected.

Available options are illustrated in Figures E-3 through E-12.

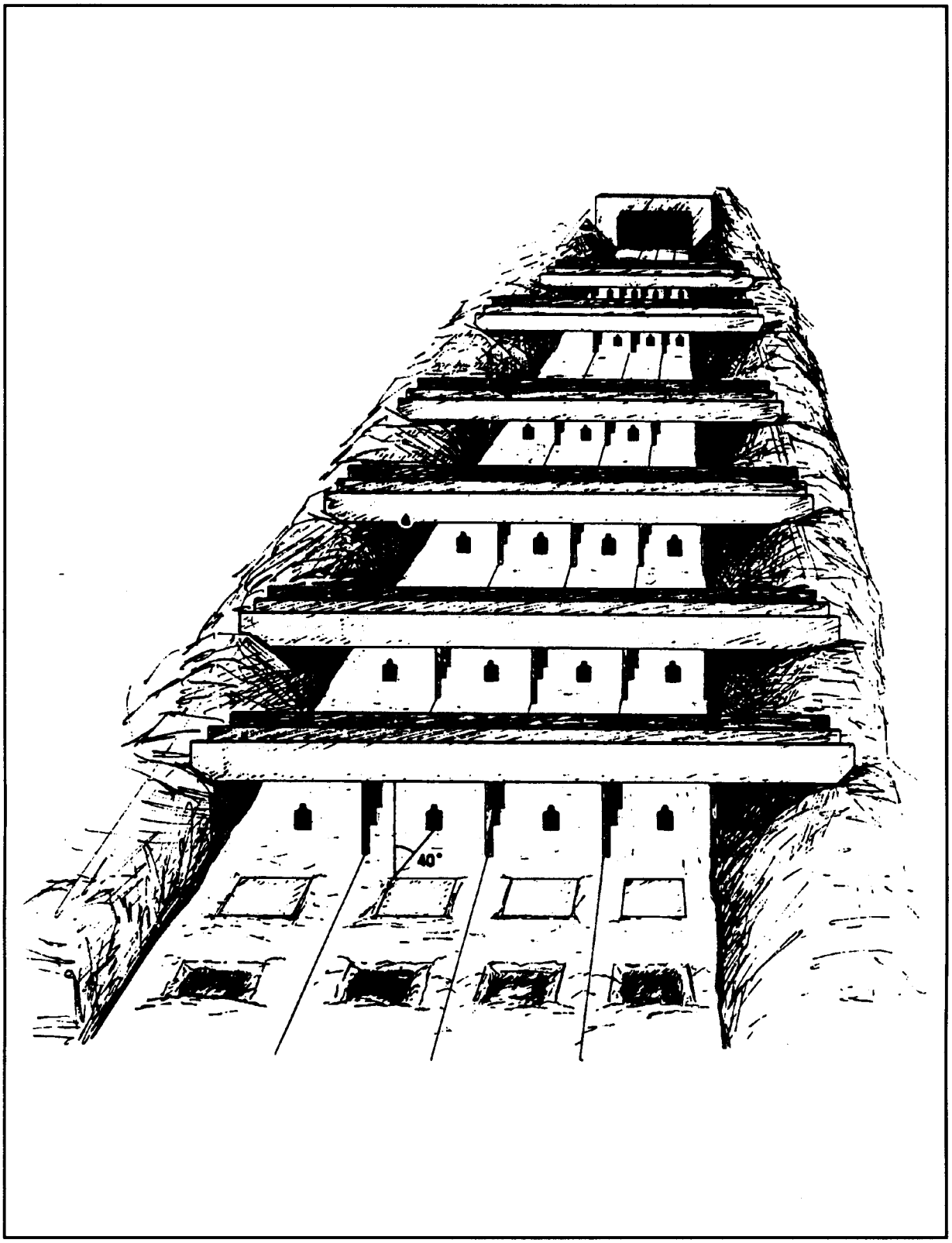


Figure E-1. Notional baffled system

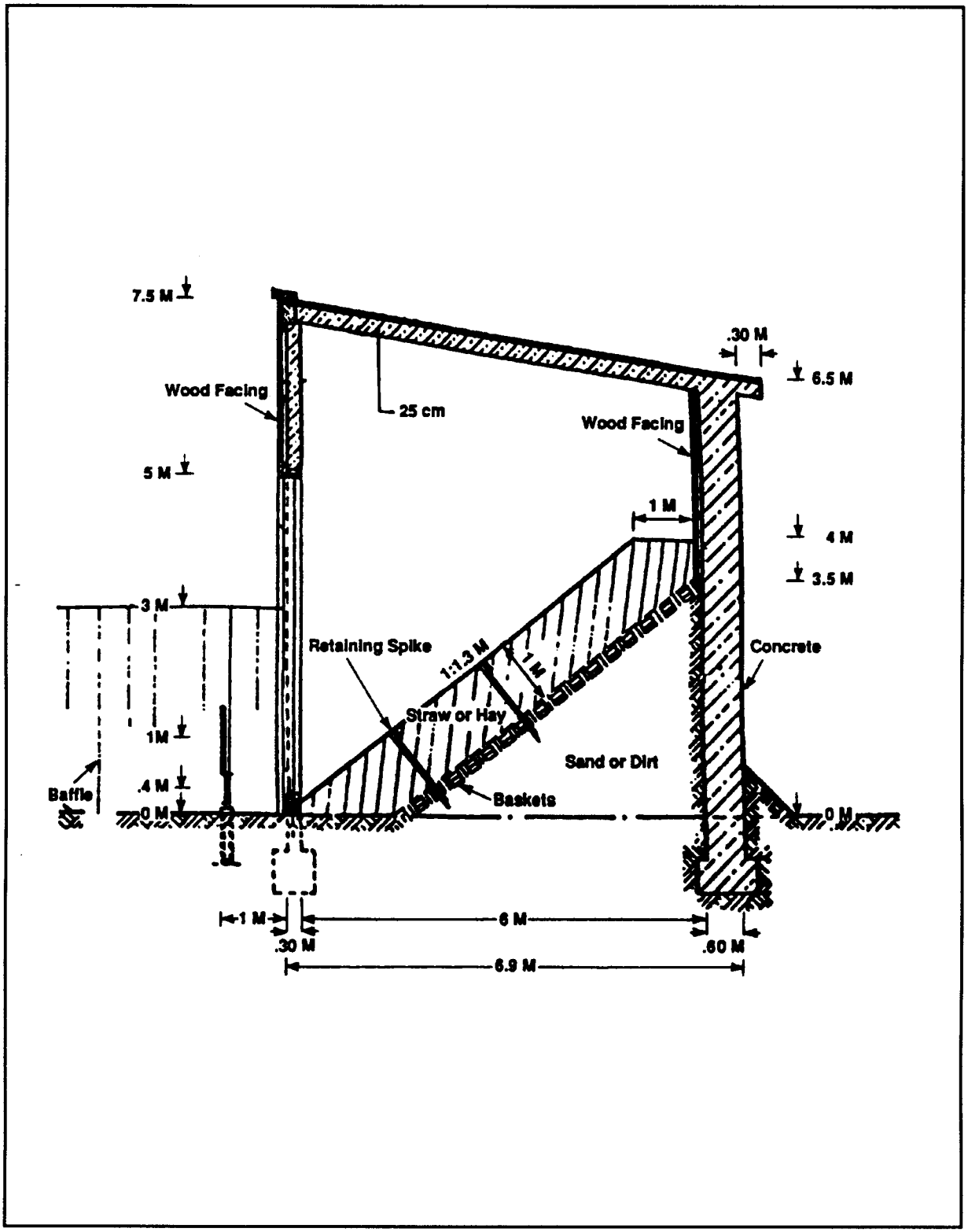


Figure E-2. Standard bullet catch

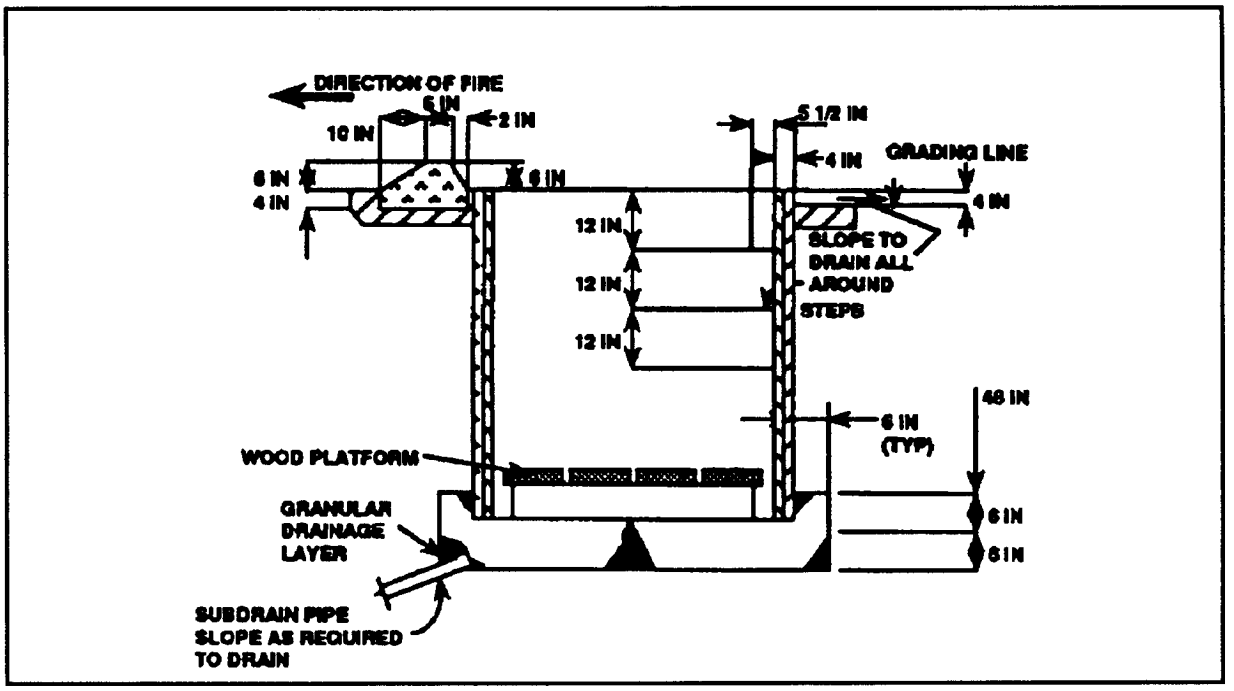


Figure E-3. CEHND standard design—profile

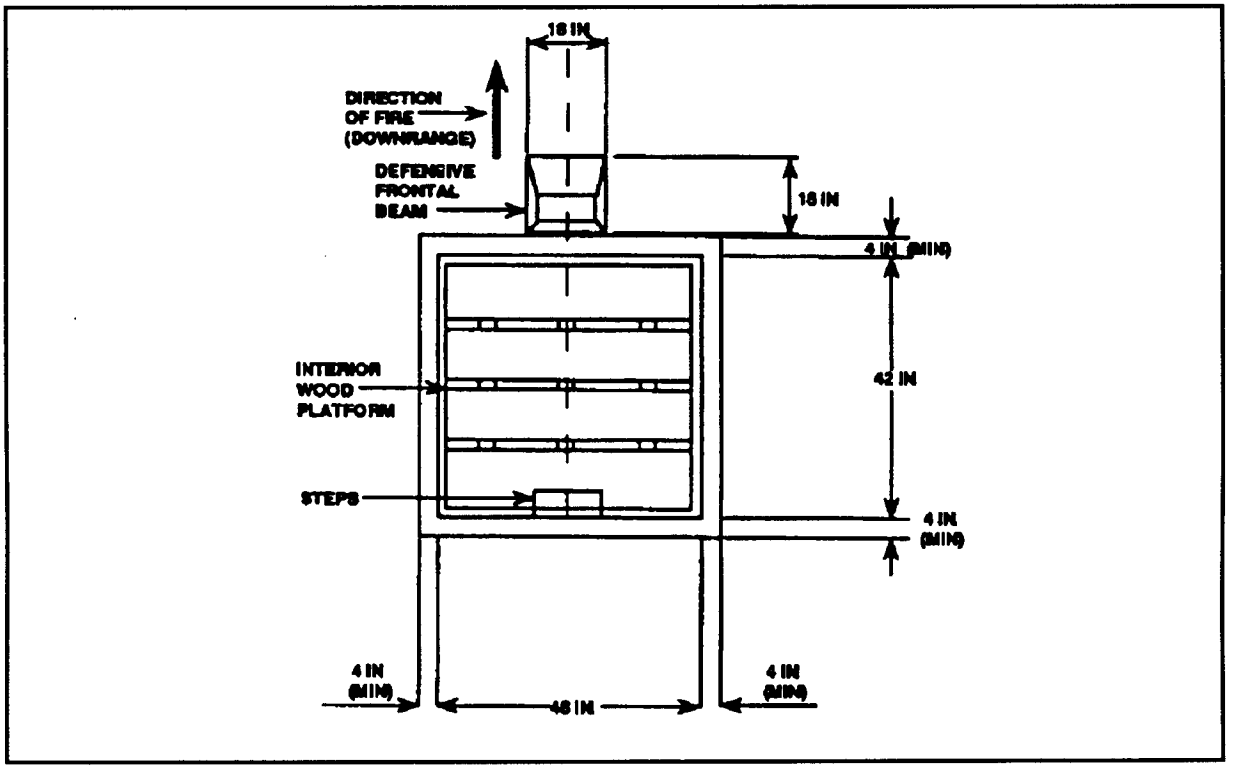


Figure E-4. CEHND standard design—top view

NOTE: A circular precast concrete side section may be used for the foxhole. The pipe should have a minimum diameter of 48 inches.

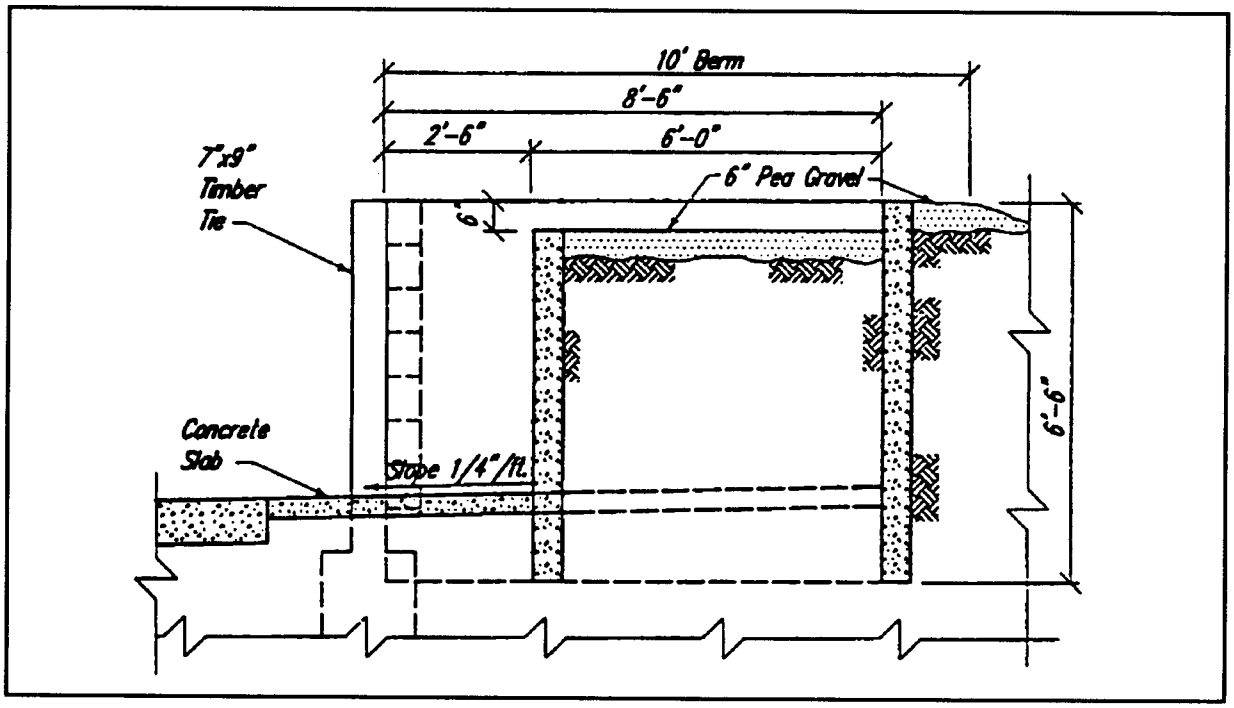


Figure E-5. Walk-in position—profile

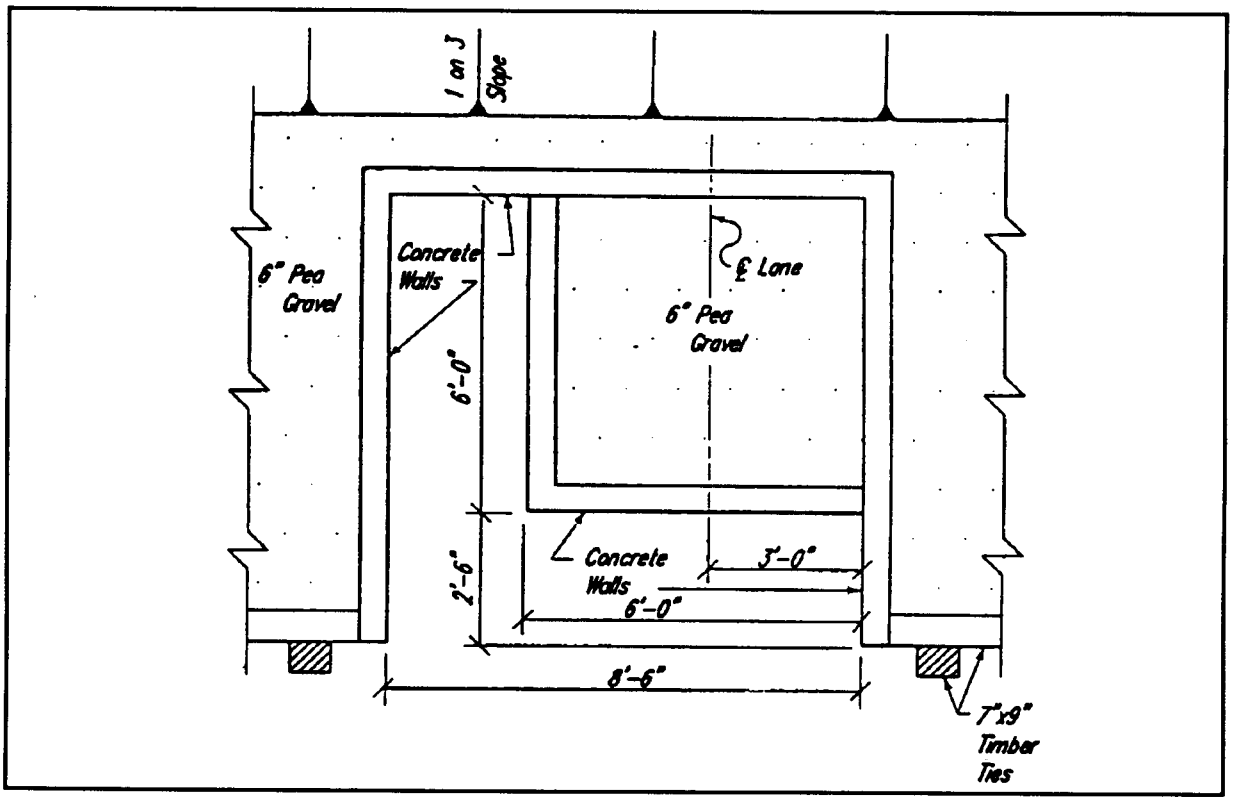


Figure E-6. Walk-in position—top view

Light Infantry and Dismounted Infantry Ranges

Light infantry and dismounted infantry ranges such as the MPRC, MPTR, ISBC, and IPBC may use different types of fighting positions. Three examples follow:

- *Prone position (hasty).* The prone fighting position serves as a good firing position for the soldier while providing protection against direct fire. Soldiers should select positions throughout the course using natural cover and concealment.
- *Two-man deliberate position.* The basic two-man position is a side-by-side entrenchment. The basic position can be modified by extending one or both ends of the entrenchment around the sides of the frontal cover. The modification is generally necessary in close terrain where grazing fire and mutual support extend no farther than one adjacent position. Modification is also necessary to cover dead space in close terrain immediately in front of the position.
- *Machine gun position.* Fighting positions for machine guns are constructed to fire to the front or obliquely. The primary sector of fire is usually oblique so that the gun can fire across the unit's front. The hole is shaped so that the gunner and assistant gunner can fire to either side of the frontal cover. The height of the gun is reduced by digging down so that the tripod platform is lowered as much as possible. The gun traverses the entire sector of fire. The tripod is normally used on the side of the position designated as the primary sector of fire. Bipod legs are used in the second sector. The tripod is left in place when moving the machine gun from the primary to the secondary section.

Tank and Bradley Crew, Section, and Platoon Gunnery Qualification

Deliberate fighting positions are required to protect vehicles from kinetic-energy, hypervelocity projectiles in combat. Positions normally consist of three sections: hull defilade, access ramp, and turret defilade. All fighting positions for tanks and Bradley Fighting Vehicles on ranges are preplanned. For administrative requirements, see applicable field manuals.

Figure E-7. Prone position (hasty)

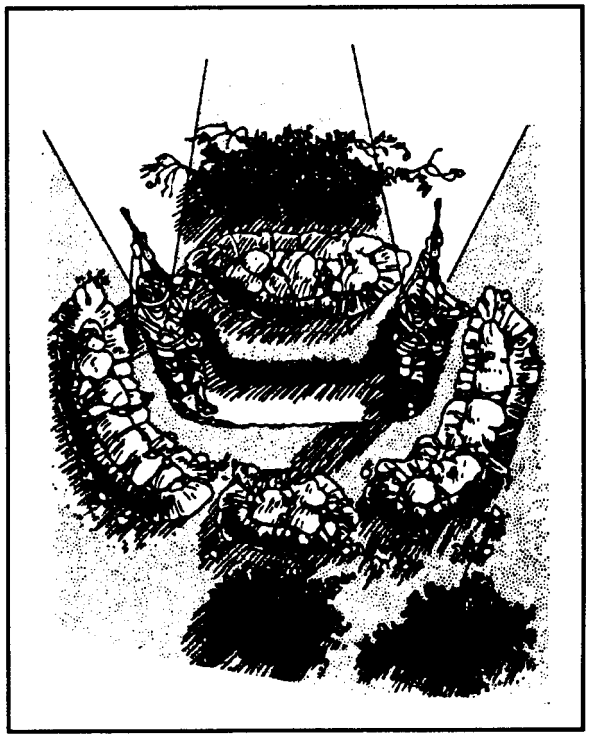


Figure E-8. Two-man deliberate position

Deliberate vehicle fighting positions dimensions and specifications are shown in Table E-1 and Figure E-10 for specific weapon systems. Two additional versions of defiladed positions are shown in Figures E-11 and E-12.

Table E-1. Vehicle fighting positions (deliberate)

VEHICLE TYPE (DELIBERATE)[1]	POSITION DIMENSION, FT[2]			TURRET DEPTH (D)[3]	WEAPON SYSTEM		VOLUME OF EARTH MOVED (cy)			EQUIPMENT HOURS[4] D7 DOZER/M9 ACE		
	LENGTH (A)	WIDTH (B)	HULL DEPTH (C)[3]		DEFLECTION	ELEVATION	HULL	TURRET[5]	TOTAL[6]	HULL	TURRET[5]	TOTAL[6]
M113-Series Carrier[7]	22	14	6	7 1/2	—	—	69	124	193	0.6	10	16
M901 Improved TOW Veh	22	14	7	9	.10°	+30°	80	148	228	0.6	11	17
M2 and M3 Fighting Veh	26	16	7	10	.10° gun .10° TOW	+60° +30°	108	218	326	0.8	17	25
M1 Main Battle Tank	32	18	5 1/2	9	.10°	+20°	118	268	386	0.9	20	25
M60-Series Main Btl Tank	30	18	3 1/2	10	.10°	+20°	120	278	398	0.9	21	30
M48-Series Battle Tank	30	18	3 1/2	10	.10°	+20°	120	278	398	0.9	21	30

[1] Hasty positions for tanks, IFVs, and ITVs not recommended.

[2] Position dimensions provide an approximate 3-foot clearance around vehicle for movement and maintenance. Dimensions do not include access ramps.

[3] All depths are approximate and need adjustment for surrounding terrain and fields of fire.

[4] Production rate of 100 bank cubic yards per .75 hour. Divide construction time by 0.85 for rocky or hard soil, night conditions, or closed-hatch operations (M9). Ripper needed if ground is frozen. Use of natural terrain features reduces construction time.

[5] Turret volume (C) plus approach volume (B). Path length (E) is approximately 1/2 (A).

[6] Hull volume (A) plus approach volume (B) plus turret volume (C).

[7] Includes M132 flamethrower and M103 Vulcan.

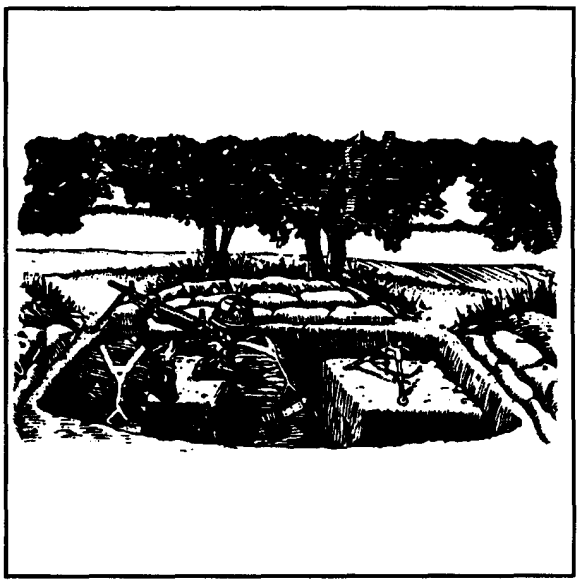


Figure E-9. Machine gun position

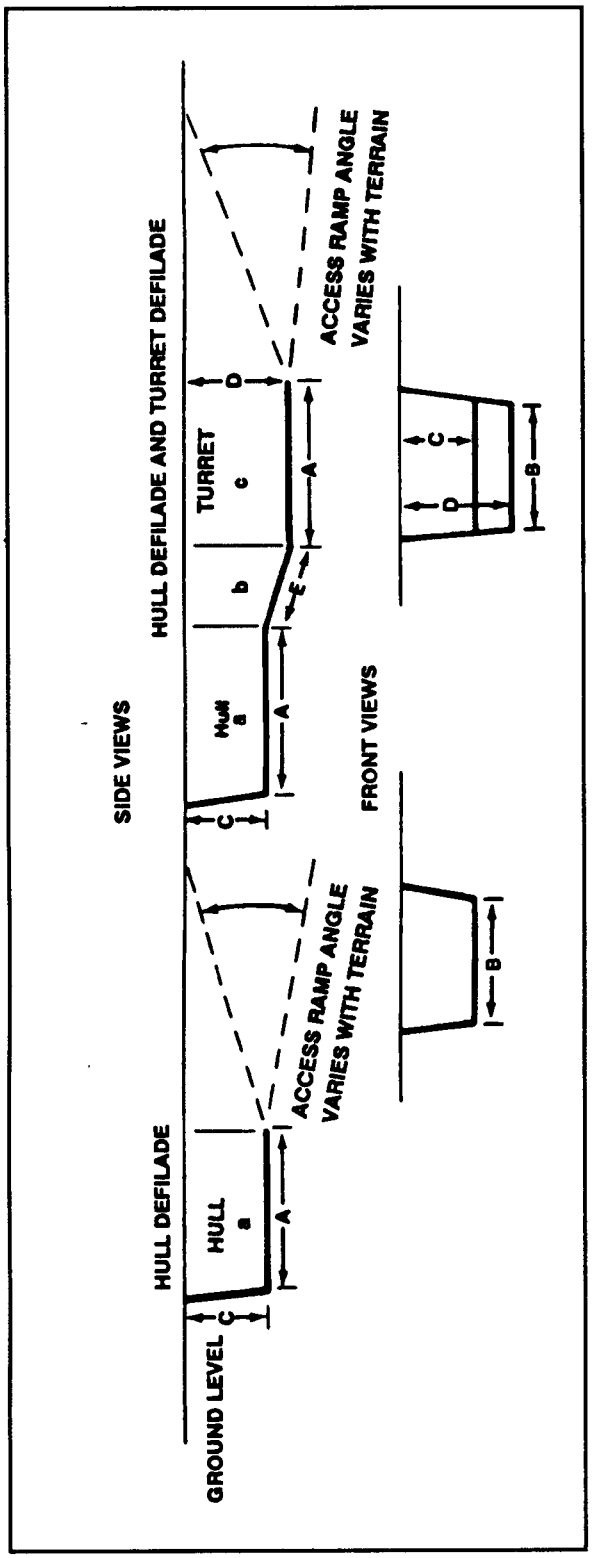


Figure E-10. Vehicle fighting position (deliberate)

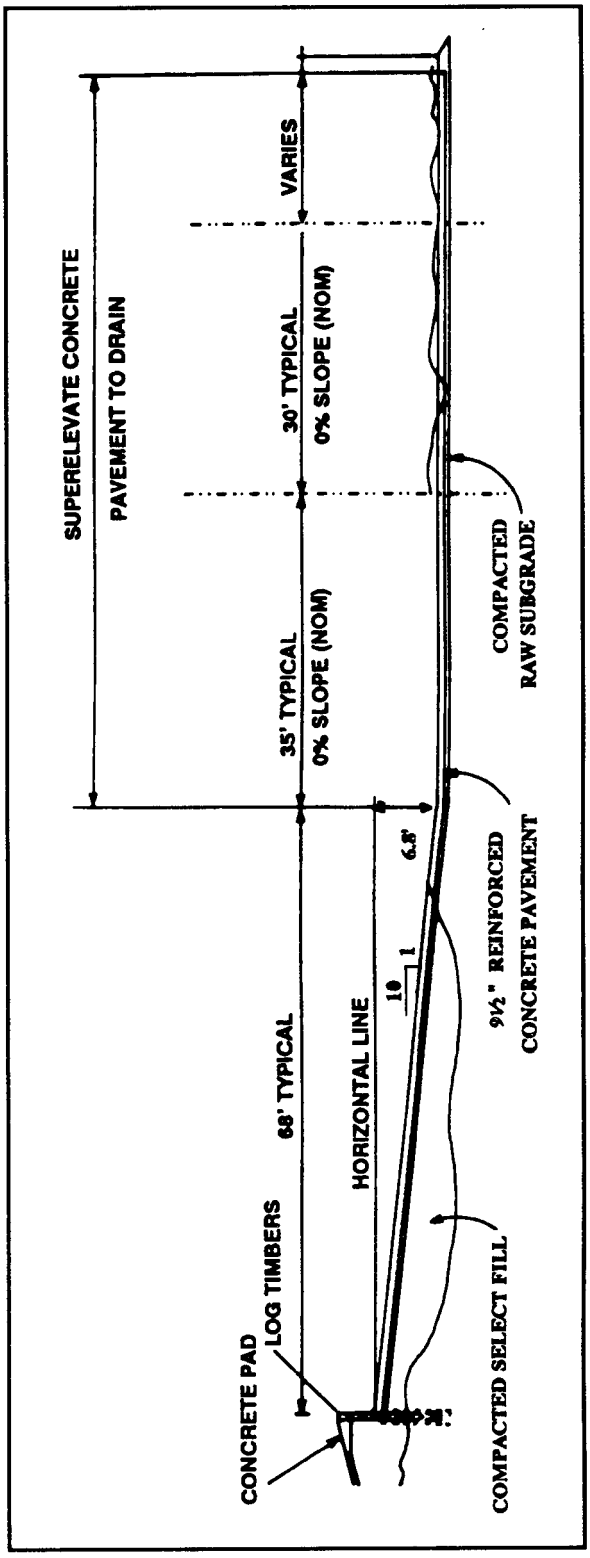


Figure E-11. Defilade position No. 1

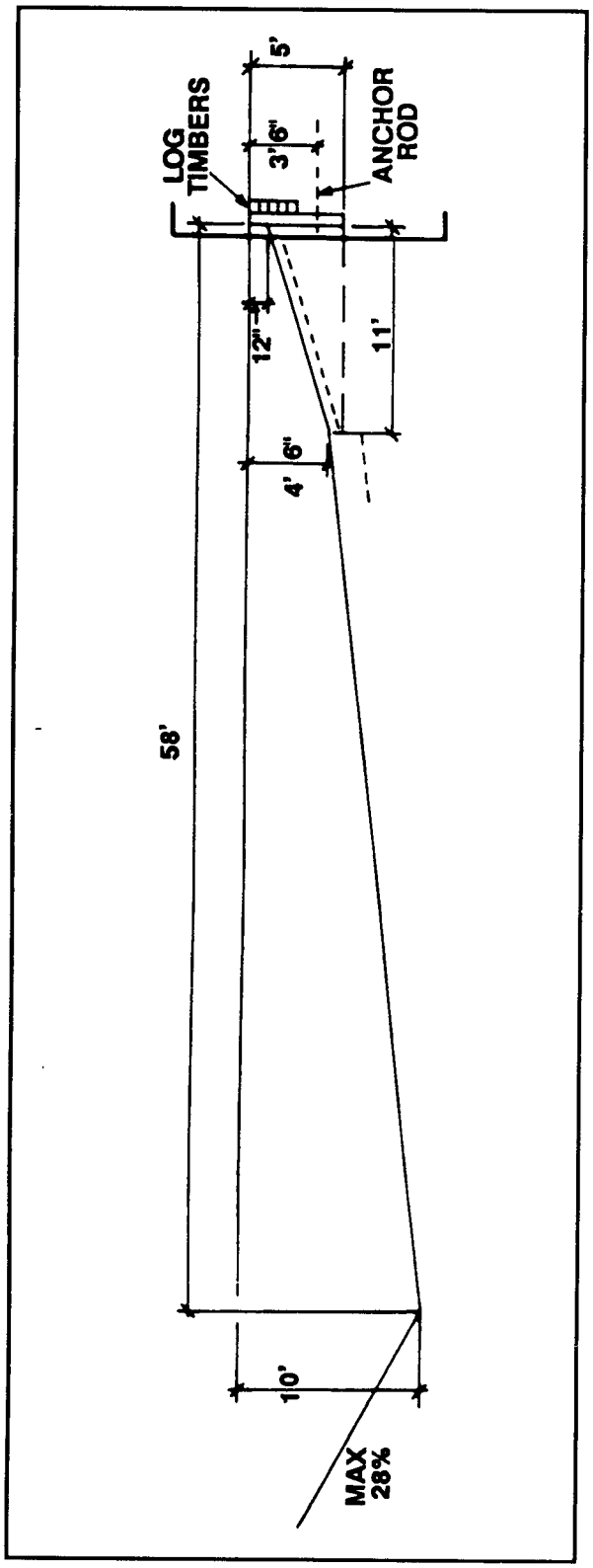


Figure E-12. Defilade position No. 2

GLOSSARY

AA	assembly area
AAR	after-action review
AASLT	air assault
AC	Active Component
ADF	air defense firing
admin	administrative
AE	architectural engineering
AFF	automated field fire
AGR	aerial gunnery range
AI	assistant instructor
AIT	advanced individual training
AMCCOM	US Army Armament, Munitions, and Chemical Command
AMIM	Army Modernization Information Memorandum
ammo	ammunition
AMRP	Army Master Range Plan
AMTC	armor moving-target carrier
AP	armor-piercing
approp	appropriation
approx	approximately
ARF	automated record fire
ARNG	Army National Guard
ARTEP	Army Training and Evaluation Program
ATA	air traffic and airspace
ATSC	Army Training Support Center
attn	attention
ATWESS	antitank weapons effect signature simulator
auth	authorization
AUTO	automatic mode
BATS	ballistic aerial target system
BCE	base-level commercial equipment
BCTP	Battle Command Training Program
BFV	Bradley Fighting Vehicle
BIP	budget increment package
BMD	ballistic missile defense
bn	battalion
br	branch
btl	battle
btry	battery

c	civilian centimeter
Cal	caliber
CALFEX	combined arms live-fire exercise
CB	control box
CCR	construction compliance review
cdr	commander
CEHNDM	Corps of Engineers, Huntsville Division, manual
CEV	combat engineer vehicle
CL	centerline
cm	centimeter
CMTC	Combat Maneuver Training Center
co	company cold
COE	Corps of Engineers
comm	communications
comp	complete
cent	continued
CONUS	continental United States
CPQC	combat pistol qualification course
CPT	captain
CRRC	Construction Requirement Review Committee
Cs	combat support
Css	combat service support
CTC	combat training center
CTF	collective training facility; combined training facility
cy	cubic yard
DA	Department of the Army
DARR	Department of the Army Regional Representative
DCSOPS	Deputy Chief of Staff for Operations and Plans
DE	district engineer
def	defense
DEH	Directorate of Engineering and Housing
dia	diameter
dim	dimension
DPTM	Directorate of Plans, Training, and Mobilization
DRC	Directorate of Reserve Components
ea	each
EOD	explosive ordnance disposal
equip	equipment
FAA	Federal Aviation Administration
FCX	fire control exercise
	flame field expedient

FIFV	future infantry fighting vehicle
fig	figure
FMO	facility management officer
FP	firing position
FRG	Federal Republic of Germany
ft	foot
FTX	field training exercise
FY	fiscal year
G3	Assistant Chief of Staff, G3 (Operations and Plans)
gal	gallon
GEN	general
GIS	geographic information system
GRASS	geographic resources analysis support system
GTA	Grafenwoehr Training Area
GTL	gun-target line
HE	high explosive
HEP	high-explosive plastic
hex	hexagon
HFS	hostile-fire simulator
HG	hand grenade
HQ	headquarters
HTA	Hohenfels Training Area
hvy	heavy
IAW	in accordance with
ID	identification
IET	initial-entry training
IHFS	infantry hostile-fire simulator
IMPB	Installation Master Planning Board
IMT	infantry moving target
IMTC	infantry moving-target carrier
IN	infantry, inch
inst	installation
instr	instructor
IPBC	infantry platoon battle course
ISBC	infantry squad battle course
ITAM	Integrated Training Area Management (Program)
JAAT	joint air attack team
JB	junction box
JRCT	Joint Readiness Training Center

KD	known distance
km	kilometer
kmh	kilometers per hour
LAW	light antitank weapon
LD	line of departure
LFX	live-fire exercise
lg	long
LH	light helicopter
LID	light infantry division
LLLSS	low-light level sight system
LOMAH	location, miss, and hit
LSDZ	laser safety danger zone
Lt	lieutenant
LTA	local training area
LURS	land use requirements study
LZ	landing zone
m	meter
MAC	Military Airlift Command; MOUT assault course
MACOM	major Army command
maint	maintenance
MAJ	major
MAN	manual mode
MCA	Military Construction, Army
MCAR	Military Construction, Army Reserve
MCNG	Military Construction, National Guard
MDEP	management decision package
mech	mechanized
METL	mission-essential task list
mg	machine gun
mi	mile
MILCON	military construction
MILES	multiple integrated laser engagement system
min	minimum
mm	millimeter
MMCA	Minor Military Construction, Army
MOUT	military operations on urbanized terrain
MPB	Master Planning Board
MPFQC	military police firearms qualification course
MPH	miles per hour
MPMG	multipurpose machine gun
MPRC	multipurpose range complex
MPRC-H	multipurpose range complex - heavy

MPRC-L	multipurpose range complex - light
MPS	missile-proof shelter
MPTR	multipurpose training range
MRA	maneuver rights area
MRF	modified record fire
MSD	mortar simulation device
MTA	major training area
MTP	mission training plan
NA	not applicable
NBC	nuclear, biological, chemical
NCO	noncommissioned officer
NEPA	National Environmental Policy Act
NET	new equipment training
NGB	National Guard Bureau
nm	nanometer
No.	number
nom	nominal
NTC	National Training Center
NWPB	New Work Planning Board
OACE	Office of the Assistant Chief of Engineers
O&M	operation and maintenance
ob	observation
obj	objective
OC	observer-controller
OCE	Office of the Chief of Engineers
OCONUS	outside continental United States
OD	outside diameter
off	offense
OIC	officer in charge
OMA	Operation and Maintenance, Army
OMAR	Operation and Maintenance, Army Reserve
OMARNG	Operation and Maintenance, Army National Guard
OMB	Office of Management and Budget
OPA	Other Procurement, Army
OPFOR	opposing force
OPTEMPO	operational tempo
OSD	Office of the Secretary of Defense
PAO	Public Affairs Office
PAX	programming administration, and execution (system)
PCIP	Productivity Capital Investment Program
PDB	project development brochure

PECIP	Productivity-Enhancing Capital Investment Program
PEO	program executive officer
PIF	productivity investment funding
plt	platoon
PM	project manager
POC	point of contact
POM	program objective memorandum
PPBES	planning, programming, budgeting, and execution system
pre-const conf	preconstruction conference
PZ	pickup zone
QA	quality assurance
QRIP	Quick Return on Investment Program
qty	quantity
RC	Reserve Component
RCMAT	radio-controlled miniature aerial target
RCS	range control station
RDP	range development plan
REFORGER	return of force to Germany
RETS	remoted target system
RFMSS	Range Facility Management Support System
RSO	range safety officer
RTLP	Army Range and Training Level Program
SAAD	small arms air defense
SAT	stationary armored target
SAW	squad automatic weapon
SDZ	surface danger zone
SFA	support facility annex
SGR	scaled gunnery range
SIT	stationary infantry target
SJA	Staff Judge Advocate
SMR	scaled mortar range
SOP	standing operating procedure
SP	static position
sq	square
STRAC	Standards in Weapons Training Commission
STX	situational training exercise
TAC	Tactical Air Command
TADSS	training aids, devices, simulators, and simulations
T&EO	training and evaluation outline
TASC	training and audiovisual support center

TBD	to be determined
TC	throughput capacity
TCPC	Tank Crew Proficiency Course
TES	tactical engagement system
TD	target detection
tgt	target
THM	target-holding mechanism
THP	take-home package
TII	target interface inspection
TOE	table(s) of organization and equipment
TOW	tube-launched, optically tracked, wire-guided
TP	target practice
TP-T	target practice – tracer
TR	throughput requirement
TRADOC	US Army Training and Doctrine Command
TRC	training readiness condition
typ	typical
UCOFT	unit conduct of fire trainer
USAASO	US Army Aeronautical Services Office
USACE	US Army Corps of Engineers
USACERL	US Army Construction Engineering Research Laboratory
USAEDH	US Army Engineer Division, Huntsville
USAR	US Army Reserve
USAREUR	US Army, Europe
USATSC	US Army Training Support Center
USGS	United States Geological Survey
USMC	US Marine Corps
UXO	unexploded ordnance
v	volt
VAC	volts alternating current
VDC	volts direct current
veh	vehicle
VIP	very important person
w	with
WET	weekend training
WETS	weekend training site
yd	yard

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TC 25-8
25 FEBRUARY 1992

By Order of the Secretary of the Army:

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00679

DISTRIBUTION:

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