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Small Arms RANGES

DEPARTMENT OF THE AIR FORCE

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Training

SMALL ARMS RANGES

This manual provides detailed guidance for personnel who are planning, constructing, and operating small arms ranges. It outlines their duties and responsibilities, and recommends policies for the use of small arms ranges to help achieve and maintain small arms skill and proficiency. The manual also serves as a reference text for resident course training, individual on-the-job and unit training, and refresher or proficiency training.

CONTENTS

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This training manual is published by Air Training Command in accordance with AFR 5-5.

The trap and skeet range layouts, attachment 13, are used through the courtesy of the Winchester-Western Division, Olin Mathieson Chemical Corporation.

The targets bearing the NRA seal in attachment 3, the universal outdoor small-bore rifle target frame, figure 19 and attachment 12, and the construction details for the outdoor pistol range in attachment 9 are used through the courtesy of the National Rifle Association of America.

Send recommendations for improving this manual to Hq ATC (ATTTS-W), Randolph AFB, Texas 78148.

CHAPTER 1

Range Planning

This chapter contains policy, responsibilities, and information for those who plan or program for rehabilitation or construction of a range for firing hand guns, rifles, and carbines at stationary or timed targets, using standardized courses of fire.

SECTION A — RESPONSIBILITIES

1. Major Commands. Success of small arms marksmanship training prescribed in Chapter 8 of AFM 50-15, *General Military Training*, depends on the adequacy of ranges to support training requirements. Major commands monitor this training and review existing range facilities. If ranges are inadequate or nonexistent, major commands direct rehabilitation or new construction, as appropriate. A training representative well versed in small arms qualification and range construction helps determine and review the training requirements and support capability of ranges. The staff training activity includes approved range projects in its budget estimates for approval of funds. Major commands advise their installations of programmed mission or personnel changes affecting range requirements.

2. Installations. To insure compliance with small arms training programs, installation commanders establish review procedures to weigh local existing and programmed facilities and personnel against current and projected training requirements. To rehabilitate or construct ranges, commanders obtain the recommendations of their operations, training, materiel, communications, civil engineer, ground safety, security and law enforcement, and combat defense staff personnel. At least one representative from the range operating section who is an NCO graduate of course ALR75330 gives his recommendations concerning the most economical type, size, and style of range construction. Participants are not limited to those listed above; they may come from any other offices with a corollary interest. Commanders are to include approved plans in their budget estimates.

a. Civil Engineering. This office has the greatest responsibility in providing small arms range facilities. The base civil engineer is responsible for real estate management, acquisition and disposal, design, construction, improvement, maintenance, preventive maintenance, rehabilitation, modification, extension, or addition to small arms ranges and allied buildings or structures. Portions of this manual outline certain functions of the civil engineering office. Civil engineering uses this information to help determine such things as safety, economy, maintenance, and methods and types of construction. No attempt is made in this manual to decide on one type of construction, building, or design for the planning engineer to use. The material presented here is for planning purposes only. Each range, facility, or training activity must satisfy local requirements.

b. Communications. To permit the safe firing of weapons upon ranges, it is the responsibility of the communications section to install those communication facilities required by existing directives. There must be communication at all times between target pits and firing line, and between firing line and parent installation. Public address systems are necessary to insure the safe transmission of audible commands to firers. Point-to-point communications are usually by telephone but not always; they could be by radio if this is more economical.

c. Supply. The supply officer is responsible

for logistic support of small arms training missions. Appropriate and realistic stock levels of materials and equipment are necessary to the success of the training mission.

d. Munitions. The munitions officer is responsible for providing the ammunition required for small arms marksmanship training.

e. Small Arms Range Personnel. Qualified small arms range personnel furnish technical advice and additional information necessary in planning for construction, rehabilitation, personnel, safety, training requirements, and specifications.

f. Materiel. The materiel officer costs salvage items used in range construction. He freezes these items for range use and costs them at fair market value, not as new items. His representative in redistribution and marketing informs civil engineering of suitable salvage materials available from other sources. In the construction of range facilities, installations must consider the use of salvage materials when practicable.

g. Safety. When the safety officer determines that a small arms range has an unsafe condition, he recommends, to the commander, that the range be temporarily closed. Furthermore, he supervises whatever tests are necessary to determine whether corrective measures are satisfactory. After the range is again safe, he recommends that the range be reopened.

h. Assistance from USAF Marksmanship School. Upon request from any USAF organization, the USAF Marksmanship School (MMS-G-QS), Lackland Air Force Base, Texas 78236, furnishes technical assistance in small arms range construction projects. Requests are forwarded through Headquarters ATC (ATTMS-M). To cover the cost of TDY for two technicians for about 2 days, the requesting base forwards the necessary fund citation to the Lackland address above.

SECTION B — DETERMINATION OF TYPE AND SIZE

3. Mission. That part of the Air Force mission applicable to the marksmanship training program determines the range facilities necessary to perform the training mission. Mission is the main factor in establishng criteria for type and size of range.

a. USAF. The Air Force mission implied above is the development of a high degree of marksmanship proficiency for personnel armed in the performance of their duty. This includes, among others, air police and combat defense forces; personnel who perform sabotage control to protect aircraft, missile sites, and installations proper; personnel who control civil disorder or riot resulting from nuclear attack; and aircrew members who must improve their survival capability.

b. Installation. The using installation must plan enough firing points of proper type to permit the amount of firing, within the training days available annually, that regulations and directives require. The installation must also consider geography, annual weather forecasts, annual mean temperature, and other climatic conditions. It may be necessary to perform additional firing points if other mission requirements prevent personnel from participating in scheduled firing (for example, flying personnel on alert status a certain number of projected days).

4. Personnel Training. The small arms marksmanship training program endeavors to improve an individual's marksmanship ability with minimum costs, with the least number of man-hours that might affect the primary mission, and with minimum effect of weather on attainment of training goals. The various types of personnel requirements listed below in a, b, and c, help to determine range size and type.

a. Special Categories. Personnel armed in the performance of their duties must attain a higher degree of proficiency (sharpshooter) than those mentioned in paragraph 4b. These special category personnel, defined in Chapter 8 of AFM 50-15, require different types of ranges. An evaluation is made of past scores of special category personnel to determine the approximate number of refirers (those failing to qualify the first time) who require training beyond the original planning figures. As yearly training progresses, the number of refirers should decrease, but on an initial program refirers may run as high as 45 percent with the pistol and as high as 25 percent with the carbine.

b. General Military Training. Air Force personnel, including civilians armed in execution of their duties, must demonstrate proficiency in the use of their issue small arms. Chapter 8 of AFM 50-15 gives the frequency of training, courses of fire, and level of qualification.

c. Competitive. Participation in competitive

shooting is classified as training, building a desire, and establishing an incentive for Air Force personnel to improve their marksmanship abilities and techniques. Air Force ranges should be able to support shooting competitions. Various types of competition improve the abilities of personnel to better carry out the assigned Air Force mission. Types of competition include intramural, intergroup, interbase (to include the postal variety of match), local civilian, state (NRA), regional (NRA), and national.

SECTION C — SELECTION OF SITE

5. Geography.

a. Climate. Attention must be given to the climate of an area. Temperature extremes, moisture, and winds play an important part in the selection of a small arms range site. Extreme heat, high winds and sandstorms prevail in arid or desert country. If possible, locate a range to take advantage of a prevailing breeze but yet have a hill for a windbreak in case of high winds. Overhead baffles are subject to heavy stress forces from wind resistance because of the large surface area. Northern climates often have extreme cold, snow, and high winds. Ranges, however, usually operate all year except during periods of intense cold. Plot access roads to minimize the need for removal of snow. In other areas, rainy seasons, monsoons, or even typhoons or hurricanes affect planning. In such areas, a range must have good natural drainage. To combat high winds in a hurricane or typhoon area, build baffled ranges to take advantage of any natural windbreaks. Climate is not the only factor to consider when selecting a small arms range site.

b. Other Factors. Selection of suitable terrain for a small arms range can affect its total cost more than any other item. To make range surfaces as level as possible, all irregularities must be graded. The cost of leveling an area is high, especially in rocky or mountainous sections; therefore, flat land is the best choice for a range site. A natural slope for drainage is desirable, but water should not flow into a low area or sump where it becomes stagnant. Mosquitoes and other insects breed in and inhabit stagnant water and are not only distracting but also a safety hazard.

Make sure there is good access to a range. Use existing roads and rehabilitate them as necessary. Generally, there is only a moderate requirement for new road construction. To reduce construction and maintenance costs, site access roads to avoid steep grades, soft marshy soil, and areas subject to deep, drifting snow.

Where there is insufficient real estate for an impact area, a backstop and baffles are necessary. A natural backstop, such as a mountain, cliff, or steep hill is suitable and reduces range costs. Ricochets do occur from such areas, however, and roadways, livestock, etc., must not be subject to this type of danger. When target emplacement necessitates cutting into a hill or mountain, use the removed dirt to fill low areas. The recommended backstop height for ranges up to 100 yards is 20 feet above the range floor level. For each additional 100 yards in range distance, increase the backstop height 10 feet. Ranges using impact areas do not require backstops. For baffled ranges, backstop heights depend on the quantity and depth of the baffle system. The use of natural backstops to reduce the cost of baffle construction is important in range planning.

Other things to consider in range planning include low flying aircraft; dual purpose facilities; availability of surrounding lands through purchase, donation, or long lease terms; noise nuisance to residents or classrooms; and programmed construction within the range site area.

c. Soil. Always examine the soil of a proposed range for rocks. Since a rock as small as a marble can cause a bullet to richochet, range soil must be as free of rocks as possible. Good soil permits the growth of grass, and a good stand of grass on top of a layer of rock-free soil reduces the chance of bullet ricochets. Also, rock-free surfaces make grass cutting safer and easier.

Sometimes it is not feasible to remove all rocks from range surfaces. Surfacing the range with a 6-inch layer of debris-free soil is one way of correcting the rocky condition.

6. Safety Factors.

a. Impact Areas. To assure that surrounding inhabitants and buildings are safe, civil engineers must survey all proposed range sites. Impact areas are desirable because they can contain the maximum trajectory of all bullets, making it unnecessary to construct costly backstops and baffles. Usually, installations do not have enough real estate to use impact areas. It may be necessary to reduce

safety hazards by using natural or constructed backstops and by fully baffling the range with overhead and ground baffles.

b. Backstops. A backstop does not require a guaranteed impact area but will normally need the addition of baffles. Trainees and even trained weapons handlers may accidently discharge weapons, sending a bullet over the top of a backstop. A fully automatic weapon increases this danger. An uninhabited impact area, such as a grazing land, forest land, or wasteland, reduces the chance of injury or damage from a bullet over a backstop. If either the base or a housing unit is located behind the backstop, the range requires a system of baffles to make it safe.

c. Baffles. A well-baffled range in the center of a city is not dangerous to outside personnel or property. This type of range has a minimum right and left danger area extending 5° both to the right and to the left of the line of fire, with the vertex measured from the firing point of the rearmost firing line. If enough land is available, use a danger area including the limit angle, limit of fire, and ricochet areas as shown in Attachments 7, 8, and 9. Natural or constructed backstops, baffles, and earthen berms can reduce or eliminate all danger areas. Either move out or place underground those structures and facilities located inside danger areas. It is not always feasible, however, to move or bury structures, such as water pumps and unmanned aircraft homing devices; a baffle or berm adjacent to such structures provides the necessary protection.

7. Existing Facilities.

a. Ranges. Air Force installations should evaluate any ranges not in use to determine whether they can be rehabilitated or used. Rather than construct a new range at another location, it is much easier and less costly to rehabilitate an old range. This usually requires only a small amount of grading or earthmoving. Ricochet tests before and after rehabilitation determine whether further modification is necessary.

Unused ranges deteriorate rapidly, and the wood and metal of such ranges may become unserviceable after several years. Rehabilitate or replace unserviceable structures, such as target frames, turning mechanisms, target numbers, communications, and buildings. Examine the backstops, berms, raised firing lines, and target pits so that a comparison can be made with the cost of new range construction. If the traget frames are in poor condition, it may be more economical to install a new target system rather than repair the old one. The addition of housing units, new runway extensions, and other changes in land use may make it necessary to relocate ranges. For this reason, locate new range sites in the most remote section of the installation. Before planning rehabilitation, review any projects programmed near ranges for possible safety violations.

b. Utilities. Small arms ranges require utilities including water, electricity, telephone, gas, and sanitary facilities. These utilities are necessary for range operation, maintenance, safety, and personnel comfort. If utilities installed over long distances increase construction costs to a prohibitive level, evaluate the terrain near or adjacent to existing facilities for possible range sites. When alternate range sites are available, the one nearest to existing facilities may be cheapest to construct.

c. Maintenance. Civil engineering provides the necessary maintenance, repair modification, and construction of training facilities for target ranges. This includes target-frame shelters, markers, observation towers, racks, benches, portable equipment, sighting bars, aiming devices, chalkboards, platforms, mockups, and markers used as instructional aids. These items are usually fabricated in the field by the using activities. The supply of small arms targets is requisitioned through normal supply channels.

Civil engineering must also repair overhead and ground baffles, reface backstops and berms, replace eroded earth, cut grass, etc.

Schedule range systems to close for short periods of time to allow for preventive maintenance. This must be done on a regular basis, or ranges deteriorate to such an extent that large sums of money are necessary to rehabilitate them at a later date. Civil engineering includes all of the above maintenance in its yearly budget requirements.

8. Availability of Real Estate.

a. U.S. Owned. Government-owned real estate possessed by the Air Force is the ideal property on which to locate a small arms range. Where feasible, locate ranges on such property. Consult the base civil engineer for information about Government-owned real estate in the vicinity.

b. Acquiring Real Estate. When Government-

owned real estate is not available, consider the acquisition of privately owned real estate, pursuant to the provisions of AFR 87-1, *Acquisition of Real Property*. If possible, do not acquire farming, mining, and game refuge land; however, if it becomes necessary to acquire such lands, consider allowing co-use of the land for game conservation, hunting, and fishing within the bounds of safety. Consult AFM 50-18, *Weapons Ranges*, for additional details on the acquisition of range sites. After selecting a range site and preparing appropriate perimeter and boundary descriptions and layout maps of the proposed range sites, submit a formal request for real estate acquisition in accordance with AFR 87-1. Where feasible, consolidate all small arms ranges into one complex to take advantage of common areas and utilities. The procedure for acquiring an interest in real estate depends on the existing ownership or control of the area. For example, if another command controls the area, it may be necessary to arrange for joint use or for transfer of control. In some cases, another Government agency may control the land, or private interests may own it. Too, part of the site may be over navigable water. The base civil engineer makes the formal requests for the acquisition of real estate as discussed in this section. Therefore, submit requirements, together with complete and detailed justification, to the civil engineering office.

SECTION D — DEFINITIVE DRAWINGS

9. USAF Definitive Drawings.

a. High-Power Rifle Range. Department of the Air Force Definitive Drawing AD 84-01-08R1, *Range, High-Power Rifle, Outdoor,* provides general information and specifications for construction, such as top view, side view, and danger area plot plan. This drawing, shown as Attachment 7 to this manual, gives basic guidance for use in design and does not contain the many details, dimensions, and specifications, required in a set of contract drawings.

The danger area plot plan of this definitive drawing is of the impact area type. Use of a backstop or baffled range and backstop reduces the danger area considerably. Construct firing lines of 100 yards on this range to support caliber .30 carbine and M-16, 5.56mm marksmanship training.

b. Small-bore, M-16 Rifle, and Carbine Range. Department of the Air Force Definitive Drawing AD 84-01-07R1, *Range, Small-bore Rifle/Carbine, Outdoor,* provides general information and specifications for construction, as shown in Attachment 8. Conduct carbine and M-16 rifle training on this range if a high-power rifle range is not available.

c. Thousand-inch Rifle Range. Installations must obtain approval from Hq USAF (AFPTR-TC) before constructing 1,000-inch rifle ranges.

d. Outdoor Pistol Range. Department of the Air Force Definitive Drawing AD 84-06-06R1, *Range, Pistol, Outdoor*, supplies general information and specifications for planning and construction, as shown in Attachment 9. When constructing this range with both baffles and backstop, disregard the danger area plot. However, if only a backstop is constructed, attention is given to the area that normally lies in the danger area. Paragraphs 17 and 23 contain detailed information on backstops and baffles.

e. Indoor Pistol Range. Department of the Air Force Definitive Drawing AD 84-06-05, *Range, Small Arms, Indoor,* gives general information and specifications for an indoor range that can accommodate both pistol and small-bore gallery practice. This definitive drawing is shown in Attachment 10.

f. Fallout Shelter, Indoor Small Arms Range. In range design, consider the incorporation of fallout protection provisions consistent with *current minimum criteria* and Air Force policy.

g. Multipurpose Range. Installations are encouraged to construct multipurpose ranges. This type range expedites training and saves money in both new construction and rehabilitation costs. Attachment 11 shows a good example of a multipurpose range.

h. Superimposed Range. This type range is expensive to construct and increases training hours. *Do not* construct a superimposed range without the approval of Hq USAF (AFPTRTC), Washington D.C. 20330.

10. Modification and Alteration. As indicated in this section and other applicable portions of this manual, installations may deviate from plans and drawings presented herein.

a. Specification Changes. Specification changes may include design, structure, material, etc., but may not impair the safety of the facility or of the

personnel using it. The base civil engineer, with the assistance of the base safety officer and range personnel, determines adequate safety of range facilities and advises the installation commander on such matters. When specification changes become necessary, civil engineering may ask for technical assistance from the USAF Marksmanship School (MMS-G-QS), Lackland Air Force Base, Texas 78236. Forward such requests for assistance through Headquarters ATC (ATTMS-M).

b. Additional Details. Chapter 2, Section B, and the attachments to this manual contain additional information of greater scope and detail. This information will assist in planning constructional, material, and design changes or specifications. For safety and economy, study the feasibility of alternate plans until no doubt exists as to the better plan. After exploring all courses of action, present the information to the installation commander. He then uses this information to determine what plan best fits the requirements of the installation.

SECTION E — PROGRAMMING

11. Cost Estimates. In arriving at initial cost estimates, do not omit small items of construction. Until corrected, such omissions can prove expensive by compromising safety and by preventing use of the range. Carefully study the portions of this manual that give advice, guidance, or direction to insure that items of construction or rehabilitation will fit within budget allowances. The base civil engineer furnishes the technical assistance and personnel necessary to cost estimate any construction or rehabilitation project of small arms ranges. This assistance consists of, but is not limited to, site selection, design, surveys, drafting, blueprinting, elevations, etc. All of these items are necessary in making cost analyses lists of construction materials, earth-moving, man-hours, etc. Where feasible and permissible under existing directives, economize by using both troop labor and excess or salvage materials.

a. New Construction. When cost estimating new construction, the base civil engineer coordinates his activities with range and training sections to assure inclusion of new data affecting construction, such as change in programmed mission or personnel requirements. When making cost analyses, treat target actuating devices and communication items as installed property.

b. Rehabilitation. It is usually cheaper to rehabilitate existing facilities rather than begin new construction. To determine long-range economy, make a comparative study of rehabilitation and new construction.

c. Self-help Projects. When funds are not available for range construction projects, the base civil engineer must consider constructing a range on a "self-help" basis. For a "self-help" project, make a close study of the following possibilities:

- Steel for baffles is often available, upon inquiry, at the nearest U.S. Naval yards. In the past, this steel has been acquired by a transfer of accountability.
- Used telephone poles make good baffle supports and are available from various sources. They cost less, offer a more durable support for baffles during heavy winds, and last longer than normal 4- by 4- or 6- by 6-inch supports.
- The use of heavy-duty equipment operators, carpenters, and painters undergoing on-the-job training reduces the money requirements for the project. OJT hours are not counted for job costing hours.
- Ask the materiel officer about materials that might be available through the redistribution and marketing office.
- Inquire at the nearest U.S. Army Reserve Unit; it may be that this unit can complete the necessary earth moving, carpentry, etc., as a summer project.
- Upon inquiry, the chief of security and law enforcement may be able to furnish skilled, semi-skilled, and unskilled laborers from prisoner details.
- Members of the base Rod and Gun Club, as well as range personnel, may be willing to contribute off-duty time toward building a range. Solicit for these services through the applicable agencies.
- When buildings are programmed for replacement, it may be possible to use them at proposed range sites, making it unnecessary to build new range offices, target storage facilities, toilets, etc. In addition, if range support buildings are too costly, consider using Butler buildings or similar types of construction.
- Air Force and other service bases programmed for closing, and bases that are closed but

still under government control, often have turning mechanisms, steel, wood, etc., suitable for range construction projects.

d. Other Cost Factors. Overcosting, low priorities, and other factors make it difficult to get approval for range construction. Therefore, give first consideration to "self-help" projects for new construction or rehabilitation. By considering all of the above factors listed under "self-help" projects, it is possible to quickly construct a range with an asset value of approximately fifty thousand dollars with an outlay of about fifteen thousand dollars.

12. Submission of Requirements.

a. Base. The base civil engineer develops and maintains current and accurate data on real property facilities requirements and existing assets. He includes in his reports the facility condition, actual use, and proposed use. The accuracy of these reports is a dual responsibility for the using agency and the civil engineer. Accurate reports are essential because all agencies use these reports when reviewing projects in the Military Construction Program (MCP) and the Maintenance, Repair, and Alteration (O&M), and Minor Construction Programs. The deputy commanders for operations, as well as subordinate supervisors, must familiarize themselves with these reports to make sure they present adequate requirements and the true status of existing facilities.

(1) FORMS. Range construction programs require the use of applicable forms and documents. One such supporting document would give a visit report as provided by paragraph 2 of this manual. The base civil engineer gives guidance on the accomplishment of all forms. Be particularly careful when showing costing data on the format of DD Form 1391, *Military Construction Line Item Data (LRA).* Clearly show the asset value as opposed to the actual cash outlay. (See the example in paragraph 11.)

(2) PROGRAMS. Either the Military Construction Program or the Maintenance, Repair, and Alteration, and Minor Construction Programs provide for all new or rehabilitated small arms training facilities. Air Force policy under current public law governs the appropriate program for submission of a project. The base civil engineer furnishes current programming information upon request.

(3) JUSTIFICATION. Justifications to support construction or alterations under the above programs must be thorough and accurate. Use the following information to assist in this justification.

- AFM 86-4, *Standard Facility Requirements,* is not a source of authorization for construction or alteration. It is merely a guide to use in determining the amount of space authorized and the criteria used for this authorization.
- Justification data must include, but is not limited to, the mission of the unit requesting construction, detailed reasons why the existing facility does not satisfy requirements, and the scope of desired construction.
- For justification, use the criteria and information set forth in this manual and AFM 86-4. However, in the justification show the source of information and computation factors. For instance, 1 firing point provides adequate training for approximately 33 qualification courses of fire a month. Use of a range for premarksmanship training, ball and dummy exercises, and similar training lowers the number of qualification courses fired per firing point per month. If this is the case, program additional firing points. Also, ranges that support competitions require additional firing points. Make the justification detailed enough to permit careful analysis by all reviewing agencies.
- To support and substantiate requirements, include pictures of present facilities or drawings of proposed sites, or both. There should be a thorough statement of difficulties to be encountered if the project is not approved.
- When DD Form 1391 shows, for example, a fifty thousand dollar investment, the review panel may be rather skeptical. To avoid this, point out in item 25 of DD Form 1391 the factors, such as those given in paragraph 11 of this manual, that increase the asset value. Point out also that the cash money shown as a "needed" item makes the completion of the project possible. "Self-help" projects are more likely to be favorable reviewed by Hq USAF.
- The office of prime responsibility for range construction should send representatives before a facilities utilization board to explain the need for ranges and to expedite the project.

NOTE

Outdoor small arms range facilities, including firing points, are listed under category item 179-47 of AFM 86-4. Small arms range buildings, including storage, control house, and indoor range facili-

ties, are listed under category item 171-47 of AFM 86-4.

b. Higher Headquarters. When evaluating programming requests of small arms range construction or rehabilitation, higher headquarters furnishes prompt guidance and assistance to the initiating agency in correcting any mistakes caused by failure to fulfill administrative requirements.

c. Supporting Documents. When submitting DD Form 1391, attach the following supporting documents: the "job breakout" showing government labor and materials necessary; the "report of visit," if any, by technicians of the USAF Marksmanship School; agencies the system is to support as required by pertinent publications, including all reserve and local shooting activities; and all other items of value in obtaining project approval.

CHAPTER 2

Range Construction

SECTION A — RESPONSIBILITIES

13. Civil Engineer. Air Force Regulation 85-6, *Real Property Maintenance, Repair and Construction*, governs the agency to use for constructing ranges: whether to use local base civil engineering or to use MCP (Engineers, Navy-Bureau of Yards and Docks). If funding requirements indicate MCP channels, the Air Force Regional Civil Engineer (AFRCE) coordinates the construction program.

14. Small Arms Range Personnel. Civil engineering solicits the help of a graduate of course ALR75330 to act as a consultant in selecting, designing, and renovating small arms range sites. For a contract range, the contractor solicits the above help through the official representative of the contracting officer. During construction, range personnel must give technical advice to acquaint the builders with various specifications, target adjustments, and proper range procedures and use. This technical guidance prevents mistakes and assures the construction of better ranges.

SECTION B — CONSTRUCTION

15. Types of Ranges.

a. Multipurpose. A multipurpose range system allows the simultaneous firing of all hand and shoulder weapons, using fixed courses of fire at various targets located at different distances.

b. Superimposed. A superimposed range system limits firing to either a hand or shoulder weapon. This type of range is not recommended for construction unless unusual conditions exist. Such a range seriously hampers training and costs a great deal. Do not superimpose a range without approval from Hq USAF (AFPTRTC) Washington, D.C. 20330.

c. Impact. An impact range system has enough real estate available so that the firing of small arms ammunition does not cause harm to personnel or property.

d. Baffled. A baffled range system consists of overhead and ground baffles, sheltered firing points, a bullet catch, a backstop, and side berms. When bases do not have enough real estate to construct impact ranges, they must construct baffled ranges.

16. Berms.

a. Purpose. Small arms ranges frequently require a bulletproof obstruction to separate adjacent bays or ranges. A berm serves this purpose. Also, ranges use berms to limit ricochet angle or to protect facilities in an area that a bullet is likely to strike directly or by ricochet. Before constructing a berm, first determine the penetration of the most powerful cartridge authorized for the range. Then, construct a berm of adequate height, length, and capacity to protect the area or facility, including such installations as a navigational aid, overground pipelines, etc. Berms play an important part in completely baffled ranges. They constitute the left and right walls or baffles on the range.

When berms separate bays of a range or separate one range from another, as shown in Figure 1, make sure the berms are high enough to obstruct the line of sight of personnel from any point in adjacent bays or ranges to any point on the firing line. Berms raised to this height safely permit personnel of adjacent bays or ranges to proceed forward, score, and change targets at will without having to effect a cease fire on all bays or ranges.

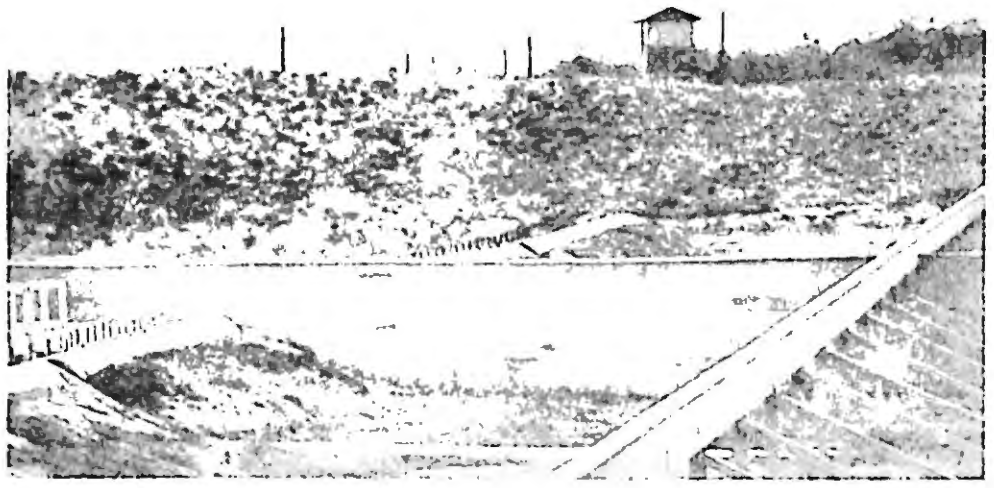


Figure 1. Wooden Berm of Baffle Specifications

A pistol or small-bore range may have scheduling problems where shift work or heavy workloads exist. This results in small classes and often leaves over half of the firing positions empty. Using a berm of baffle specifications, divide the range so that two different courses of fire can be run concurrently. Each class can proceed to the target line to score and change targets in complete safety. The berm does not affect total range use by one firing order if it does not extend behind the firing line.

b. Types. Berms generally consist of earth. It is usually available and once in place does not deteriorate, needing only a minimum of maintenance. The "fill" substance may consist of broken concrete or asphalt, trees, brush, etc. The "facing" of each berm, however, must have a minimum of 3 feet of top soil.

When constructing pistol or small-bore ranges, it is permissible to construct side berms of wood, using the same specifications as for overhead baffles. Compared with earthen berms, wooden side berms are less desirable. They offer only a minimum of safety, and the weather subjects them to damage and deterioration.

An earthen berm is a mound or wall of dirt which has been raised by heavy earthmoving construction equipment, such as bulldozers. A berm has two steep sides and must be thick enough at the top to stop the most powerful ammunition authorized on the range. In all cases, berms must be as high as the highest portion of overhead baffles. The quantity of dirt necessary for an earthen berm is not always readily or economically available. In this event, it may be wiser to use retainer walls, barriers, or cribs. This should reduce the cost and the size of the construction area. For example, the use of an upright retainer wall for the lower portions of one or both sides of a berm greatly reduces its base width. Civil engineers determine the thickness and engineering specifications of retainer walls. Retainer walls of wooden materials absorb bullets with a reasonable amount of safety. When using concrete or perforated steel planks for retainer walls, study the effects of accidental or poorly aimed shots hitting these walls. Individuals capable of recognizing separation of "bullet tail" are to test fire into these walls at night, using tracer ammunition to determine ricochet potential. Baffling or wood surfacing on concrete or steel-surfaced retainer walls or berms is seldom necessary because they are rarely struck by bullets. When raising berms to great heights, study the feasibility of using retainer walls with barriers or cribs on top of the berms, as shown in Figure 2. The base civil engineer determines at what height the cost of raising the earthen berms with dirt exceeds the cost of constructing a barrier or crib. Fill barriers or cribs with dirt, or on a range limited to pistol or small-bore rifle fire, it is permissible to construct the barrier to baffle specifications. Barriers, cribs, or baffle extensions of earthen berms must arrest and contain bullets from the most powerful ammunition authorized for a particular range.

During the construction of earthen side berms, slope them at the same angle as the backstop. To further reduce ricochets, seed or turf the berms at this time.

17. Backstops.

a. Purpose. The purpose of a small arms range backstop is to decelerate a bullet or change its direction so that it cannot inflict bodily injury or damage. A backstop is normally engineered to arrest and contain a bullet; however, freak ricochets do occur by a bullet striking small rocks or other bullets exposed on the surface of the backstop.

A ricochet glancing from a backstop departs at an angle greater than the slope of the backstop. Ricochets departing at an angle of 35° or greater attain such a high arc of ballistic curve that they expend their remaining energy on the rise and free fall back to earth. Ordnance tests on small arms bullets free falling back to earth show that such bullets have approximately one-half the energy necessary to inflict a wound. In instances where the backstop surfaces are not steep enough, numerous ricochets occur. Free-falling ricochets can be a nuisance and to those who are unfamiliar with

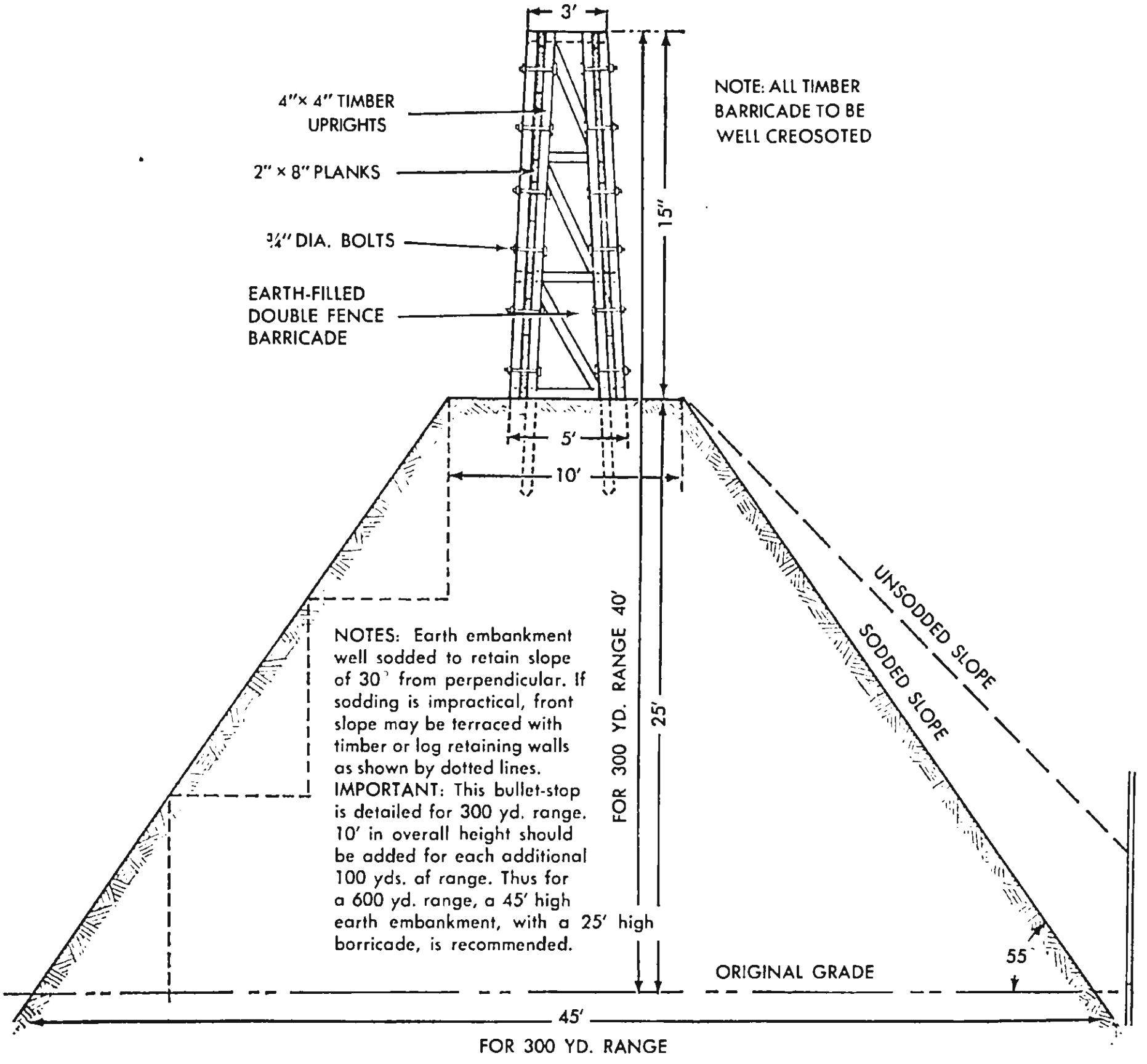


Figure 2. Earthen Berm with Crib

small arms and ammunition, ricochets are often misinterpreted as being as lethal as a bullet that has not decelerated.

Backstops can be built of any "fill" substance, such as broken concrete or asphalt, trees, brush, etc. On that portion of the backstop facing the shooter, there must be a minimum of 3 feet of top soil. Rather than construct a backstop entirely of soil, use "fill" substances to reduce the cost of such construction. The number of overhead baffles in a range system determines the height of any backstop. For a 100-yard range, the backstop can be as little as 13 feet in height. Depending on local soil composition, a backstop might have a slope of 55° or greater from the perpendicular. If soil composition permits, slope the backstop 45° or more. A 45° backstop absorbs all but a small number of the bullets striking it. Where free-falling bullets behind the backstop are not a nuisance, as in an uninhabited area, the angle of the backstop can be as little as 35°. Nevertheless, anything less than 45° increases the rate of ricochets off the surface of the backstop. Since it is difficult to predict ricochets, use only dirt that is free of rock and other reflective debris. After a backstop is constructed, bullets may escape over the backstop endangering life or damaging property. When this happens, put a "bullet catch" or a "vertical cut" on the backstop, as shown in Attachment 11. However, before installing a "vertical cut" or a "bullet catch," carefully consider future maintenance problems.

b. Types. There are two types of backstops—outdoors and indoors.

(1) The larger outdoor backstops accommodate more firing points and arrest higher powered projectiles than do the smaller indoor backstops. When constructing an outdoor range, consider choosing a site that contains either an impact area, or danger zone, or a natural backstop, such as a mountain, cliff, bluff, or steep hill. If none of these natural backstops is available, a constructed backstop is the only alternative. Before programming a constructed backstop and because constructed backstops are costly, survey all installation areas and nearby Government-owned or controlled real estate for a range site that will contain either a danger zone, as shown in the definitive drawings in Attachments 7, 8 and 9, or a natural backstop. Outdoor constructed backstops are generally, but not always, limited to steeply rising dirt embankments that absorb bullets passing through the target.

For baffled ranges using backstops instead of impact areas, extend backstops to a recommended height of 20 feet above the original grade for a 100-yard range. Add another 10 feet in height for each additional 100 yards of range. For example, a 200-yard range requires a 30-foot-high backstop and a 300-yard range a 40-foot-high backstop. Install target frames so that when they are in the firing or fully raised position, the center of the bull's-eye is not more than 7 feet above the original grade of the backstop, as shown in Attachments 8 and 9.

The backstop height on a baffled range can be lowered in proportion to the number of baffles used. Construct backstops and baffles so that bullets fired from the lowest shooting position on the range cannot escape between baffles, between the last baffles and backstop, or between the ends of the overhead baffles and side berms. If there are no natural backstops and it is necessary to haul dirt over long distances, it may cost less to reduce the required height of the backstop and add several more rows of baffling. The base civil engineer can determine the most economical backstop-baffle combination for baffled ranges.

With dirt backstops, soil erosion and ricochets can present a problem. To correct such a problem, install a vertical retainer wall of wood or railroad ties at the base of the backstop. When constructing outdoor backstops, use not only the cheapest bullet-absorbing material available, but also that which is cheapest to maintain.

(2) Indoor ranges generally use a backstop of metal that deflects the bullet downward into a sand trap. Range definitive drawings contain the specifications for metal backstops. The armor plate, or structural steel equivalent, specification of 300-320 abrasive resistance is the minimum requirement to achieve the desired safety and durability. Substitution of mild steel plate, similar to boiler plate, results in bullets damaging the surface. A dented deflector surface causes bullets to ricochet at odd angles, and some of the ricochets may even fly back at the firer. Always install a metal plate of the proper specifications. Consult local steel distributors for the availability, cost, etc., of armor plate or structural steel equivalent. The deflector plate in a backstop consists of a series of smaller plates welded together. A ground butt weld insures a smooth surface on the range side of the backstop; however, this is not necessary for the back side of the weld.

Suspend the backstop deflector plate approximately 40° for the most effective angle of deflection. A 45° angle is permissible; however, the 40° angle deflects bullets with greater ease and there is less metal fatigue and denting in the surface of the plate.

Use dry sand to absorb the bullets deflected downward from the deflector plate. Make the sand trap the same size as the deflector plate, and locate it directly under the plate. To help prevent ricochets, use sand of fine granulation that is free of rocks. Make certain the sand is dust free so that targets are easily visible during heavy firing. Construct protective shields at the forward base of the sand traps to prevent bullets from "splashing" back at shooters. Without a protective shield, bullets usually strike deflector plates, enter the sand, and continue in a rearward motion back toward the shooters. Protective shields must be thick enough to stop any bullets.

Gunpowder smoke and dust from the sand affect the target visibility of the shooters. Use an exhaust blower or blowers in the backstop area to draw the acrid smoke and dust out of the range.

The definitive drawings in Attachments 7, 8, and 9 give metal deflector plate specifications for backstops. All indoor ranges use .38 and .45 calibers of pistol ammunition, not exceeding the ballistics of issue .38 special and .45 automatic

service ammunition. This specification includes .22 rimfire pistol and rifle cartridges, not to exceed long rifle ballistics.

NOTE

This excludes the use of .22 WMR magnum and all .22 centerfire cartridges, unless the backstop has been specifically designed to withstand such calibers and ammunition.

Do not use metal- or armor-piercing cartridges. Firing of .357 and .44 magnums is prohibited unless handloads of reduced velocity (not to exceed .38 and/or .45 ballistics mentioned above) are used, or unless the specific range design is capable of withstanding such calibers and ammunition.

18. Target Pits.

a. Rifle. Rifle target pits are required to protect target operating personnel during firing and to provide an accurate method of scoring long-range targets.

The target pit area contains sliding targets, telephone communications with the firing line, the target storage and repair building, drinking water and latrine facilities, and shelter for the target operators. Target pit areas do not usually require electrical service. However, it may be necessary to repair or service targets early in the morning or late in the evening, or shooters may fire at night. In either case, target pits and storage areas require electrical lighting. To prevent damage from firing, locate target storage and repair, latrine, and drinking facilities in a safe place. These facilities are usually in a dugout under the earthen parapet that protects the pits, or to the right or left side of the target positions.

Some target pits that service ten to fifteen targets have outdoor target sheds. To facilitate entry during firing cycles, locate these moderate-size sheds at each end of the target line. If it is necessary to place target storage and latrine facilities directly behind the targets, do not permit entry or use during firing. Use issue combination sliding targets in highpower rifle target pits. This standard target carrier is used in the blueprint data of the target pit cross section shown in Attachment 7.

The target operator requires a level of 2 feet 3 inches above the base of the target. Otherwise, the operator cannot reach the target when it is in the raised position, nor can he reach the upper half of the lowered target to score and paste. Adhere closely to the specifications; the target in the raised position must be fully visible above the parapet protecting the target pit. Pit operators require about 4 feet of operating space between the parapet protecting the target pit and the actual target. Measure this from the center of the target support posts.

Place targets so that centers are 12 feet apart. This permits about 3 feet between target carriers for personnel to pass and for the passage of target frames. It also makes maintenance and repair easier. Do not place target frames closer than 2 feet to one another when trying to conserve space and funds. Install an overhanging shelf of not less than 2-inch-thick wood material, 2 feet 3 inches wide, 6 feet 6 inches above the target operators' walk. Affix it to the target pit retainer wall. This ledge protects the target operators from debris caused by low-striking bullets.

Make target number signs triangular, as shown in Figure 3. Each sign must have a base of at least 6 feet, with the top of the sign pointing at the bull's-eye of the proper target. These sign numbers must be easy to read at the longest ranges for which they are used. Construct signs with 8-foot bases for ranges of 700 to 1,000 yards. Make the numbers as large and bold as the sign permits, with numbers running consecutively. As Figure 3 shows, define targets further by alternating number and background colors for each sign. For colors, use either black and white or black and USAF international orange. Paint even numbers black on a white background and odd numbers white on a black background. Raise each target fully, and place each sign so that it will not cover any part of the target when viewed from the prone position at the firing line.

Target pits may be placed below the surface of the range terrain, depending on the local terrain and civil engineer design. Consider proper drainage for the target pits and erosion control of surrounding surfaces.

If possible, use concrete for the retainer wall of the parapet and the target foundations. However, it is permissible to build the retainer wall of a framework of telephone poles, railroad rails, or any other suitable supporting material. It may be surfaced with pierced steel planking, or other temporary runway material, railroad ties, flat stock galvanized corrugated sheet metal, etc. When using fencing materials in retaining wall faces,

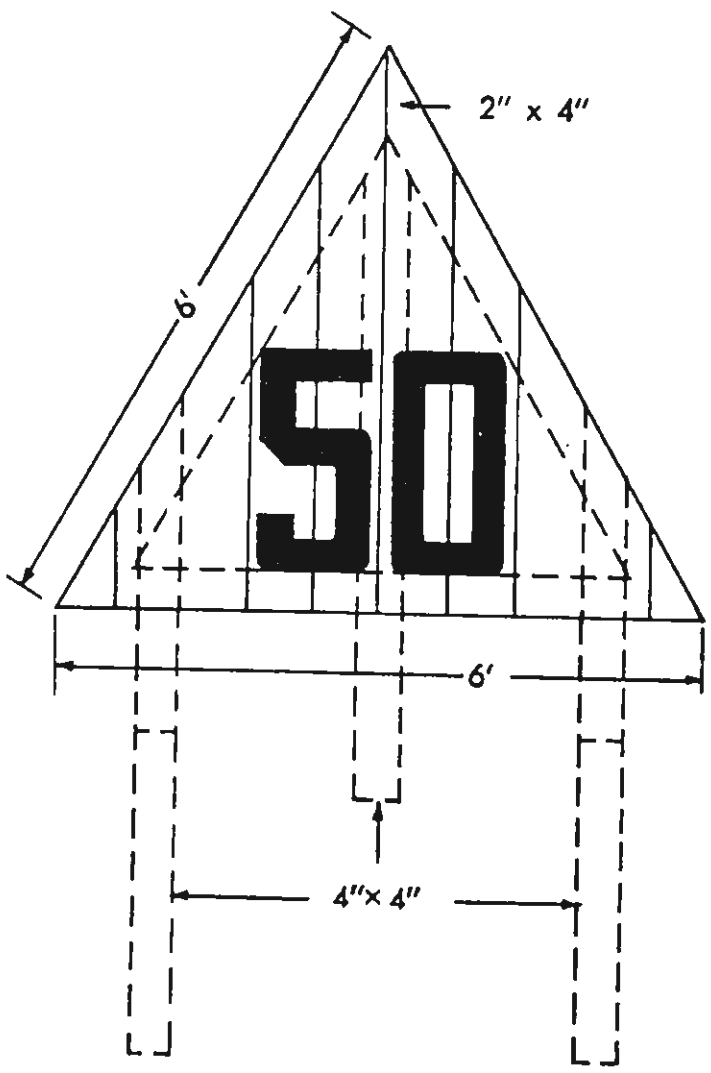
check erosion with a rock, scrap asphalt, or concrete fill capped by not less than 3 feet of dirt, free of rock and debris.

The operators' walk must be surfaced and the target carriers well anchored. The target frame is about 6 x 6 feet, and the combination sliding target base width is about 9 feet. It takes well-anchored target carriers to keep normal winds of 1 to 15 miles per hour from uprooting the target.

b. Pistol. Usually, pistol ranges do not have target pits; nevertheless, they do offer several advantages to those pistol ranges that have them. During annual recurring military training with handguns, classes of students fire the same course of fire simultaneously. After the course of fire, all students proceed to the targets to score and change them. This system works well with scheduled classes firing a common course of fire. Sometimes personnel have different courses of fire, such as during noon hours, after normal duty hours, night hours, or arrive at the range while firing is in progress. Thus, it is inconvenient for them to wait for a cease fire or a break in the course. With a pistol range target pit, targets are lowered, scored, repaired, and raised to the firing position safely while shooting is in progress. This feature expedites training on those bases that have personnel, such as aircrew members on alert, air policemen, competitors, and persons receiving individual small arms training. Pistol target pits are also ideal for police or commercial pistol ranges.

Target pits for pistol ranges use the same general principles found in high power-rifle target pits. Target frames may be placed in sockets, guide rails, or tracks; and they may be held in place by catches, pins, or a pulley and weight system. Regardless of the target frame system, the pit must give complete protection from shots on the firing line. The backstop or deflector must be several feet behind the target pit so that bullets do not ricochet or deflect into the pit. If the backstop is a metal deflector plate, the upper lip must begin several feet behind the rear edge of the target pit.

Outdoor ranges can use a tunnel, an earthen berm, or a wall of proper baffle specification to protect personnel moving to and from the target pits during firing. Indoor ranges can use a hall at one side of the firing line. Using the proper specifications, make the firing line wall of either baffle material or masonry so that it will withstand the impact of authorized bullets.



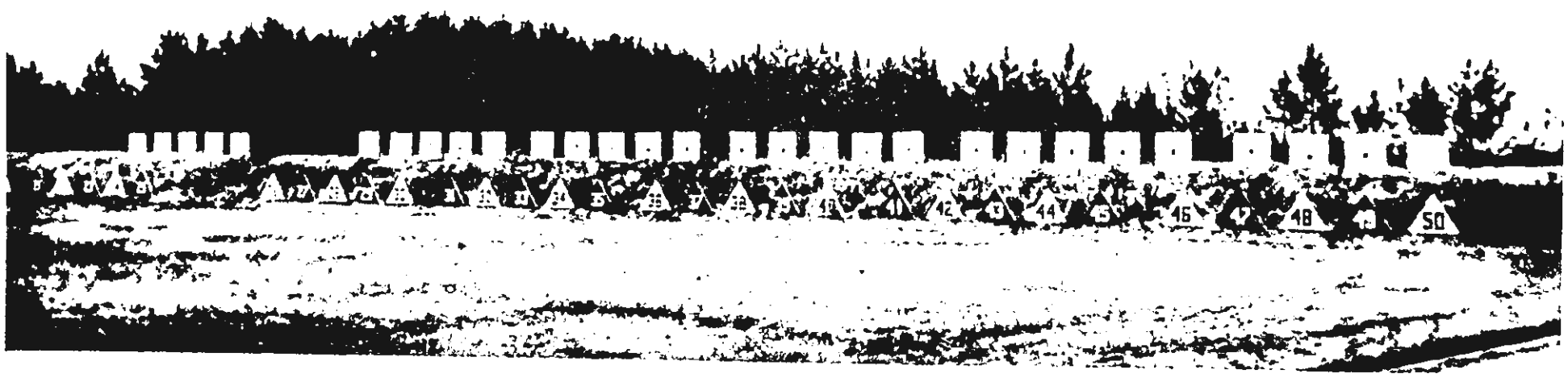


Figure 3. Target Number Sign, High-power Rifle Range

19. Firing Points.

a. Grading.

(1) PISTOL. The firing line must be absolutely parallel to the target line. Slope the firing line downward toward the rear about 3° for proper drainage. Measuring from the rear of the surfaced firing line under the shelter to the base of the pistol table or stands, make the firing line about 10 feet wide. The measurement between target surfaces and firing line is the range distance. A well-defined firing line provides a target range line with which to positively determine correct firing positions. At any time the firing line is removed, destroyed, or displaced (for example, in case of movable stakes), the firing line must be remeasured and remarked before any firing takes place.

During training or competitive firing, the firer must take his position at the assigned firing point. To assure safety, no portion of the firer's body may rest upon or touch the ground in front of the firing line. If possible, paint the defined firing line upon the firing point surface. This expedites the movement of equipment before and after maintenance and reduces the time it takes to resume range operations. If it is necessary to resurface the firing line, resurvey and remark it. Table legs, firing stakes, and other pieces of equipment usually have pipe legs. To expedite the movement of this type equipment, it is wise to bury pipe of a yet larger diameter in the ground. By letting the pipe extrude from the ground slightly, equipment legs can be slipped into the larger pipe to hold the equipment firmly in place. When moving the equipment, it is then a simple matter to slip the legs out of the pipe.

To prevent excessive grading, consider locating ranges on reasonably level ground. When constructing ranges that use a natural or constructed backstop, it may be necessary to use large quantities of dirt to build and level firing lines, side berms, backstops, etc. Locating the range in a hillside may produce more dirt for firing line grades, it may provide a better backstop, and it may provide portions of the side berms.

(2) RIFLE. Grading of 100-yard firing lines for small-bore rifle and carbine ranges is similar to grading for pistol firing. Make firing lines and target lines on the same level. Measure the firing lines so that they are about 10 feet wide and slope them to the rear several degrees for good drainage. The measurement from the target surface to the forward boundary of the firing point is the range distance. Firing line designators may be metal or wood, stakes or painted lines. Use any means of ready identification. Then if there is a need to move the firing line markers, the designators make it unnecessary to resurvey the site.

High-power rifle ranges use multiple firing lines. Plan and grade these so that each successive firing line does not obstruct or partially obscure the view of the target. With the top of the target pit parapet as an index point, grade the firing line to effect not more than a 2°, plus or minus, angle from horizontal level with the parapet. When selecting range sites, take advantage of any natural slope to the terrain. This can often minimize the need for moving large amounts of dirt to establish firing lines. Highpower rifle range firing lines must be at least 14 feet wide, not including the slope area to the base. If possible, it is better to have a 20- or 30-foot-wide line. By sloping the rear gradually, successive firing orders can assemble on the ready and assembly lines and have easy access to the firing line. For good drainage, slope the surface of the firing lines at about 5° toward the rear.

b. Shelters. Most ranges should have protective shelters covering the firing line. Shelters protect shooters so that the hot sun, rain, etc., do not interfere with training. Unbaffled ranges do not require shelters except in those areas of severe heat and rainfall. Baffled ranges do require shelters. Use overhead-baffle material for that portion of the shelter extending down range from directly over the shooter's head. Using the overhead-baffle material, construct an overhang on the front of the shelter, facing the targets. Make the overhang as long as the overhead baffles, and usually, no lower than the lowest overhead baffle. Overhangs are economical because they are affixed to the shelter, require no other support, and usually eliminate the need for one or two overhead baffles. In all instances, do not allow bullets to escape between overhangs and overhead baffles.

c. Surfacing.

(1) PISTOL. Pistol firing lines require a topping of concrete or similar hard surfacing. Hard surfaces make it easier to pick up empty cartridges, and shooters can use ranges immediately after rains and spring thaws. Place walkways to the target line, on either side of the range floor or on both sides, at the base of the side berms. It is permissible to construct a walkway along the

target line directly in front of the targets. Walkways are not to exceed 18 inches in width and must have a top soil covered with either grass, coke cinders, or packed sand.

(2) RIFLE. Small-bore, carbine, and rifle range firing lines require a topping of concrete or similar hard surfacing material. Walkways are of the same design and substance as those in the preceding paragraph.

Surface high-power rifle firing lines with fine gravel. Small gravel pebbles give the shooters more comfort than crushed rocks. Obtain granulated gravel, such as that highway departments use to surface roads. *Do not* use sand because it erodes rapidly and gets into the eyes of the shooter. Also, sand causes unnecessary wear and malfunctions in weapons. The sharp edges of crushed rock causes discomfort to shooters, especially to annual recurring trainees who shoot in fatigues and do not normally have shooting jackets or shooting mats. Dirt and clay provide a smooth surface and are satisfactory in arid regions; however, they are not useful in wet weather, especially during constant training. The slopes up to the firing line should be sodded or planted with a good type of grass which resists soil erosion. Take every precaution to reduce and control dust. Use any of various chemicals available on rocks, gravel, sand, and dirt to successfully control dust. Dust not only causes excessive wear but also creates a health and safety hazard.

d. Marking.

(1) PISTOL. Mark the firing points on all pistol ranges with numbers that are easy to read by anyone in the vicinity of the firing points. Number each firing point to correspond with the respective target frame directly down range from it. As well as being numbered, pistol firing points should have the boundaries well defined. When using individual pistol stands, the area from stand 1 to stand 2 is the shooter's position. His pistol box sits on stand 1 to his left, and the pistol stand should be numbered and the shooter's position well marked by painting the boundary of the position and position number on the firing line at ground level. Do not construct permanent tables or benches on a range firing both Air Force qualification and competitive courses. Such construction interferes with firing.

(2) RIFLE. The firing points on all rifle ranges must be well defined and arranged in numerical order. This is usually done with notched wooden blocks or stakes. Set or drive them into the forward portion of the firing surface on the firing line, as shown in Figure 4. Paint them white with black numerals. Since the blocks or stakes form the boundary of the firing line, survey and measure accurately the distance from target faces to firing blocks or stakes. Notch a "V" in the top of the blocks or stakes to provide a nonslip rest for rifles. This keeps the rifles out of the dirt when not in use. Mark each firing line by individual position blocks or stakes, numbered with the respective target. Place a small sign at each end of the firing line to show the range distances.

The shooter's position or area is to the right of the position stake. The shooter assigned to target 1 uses the area between position markers 1 and 2. Left-handed shooters position themselves to the left of the position marker, with the permission of the range officer. The telephone line junctions behind the firing line require a sign denoting the targets serviced by each telephone, as shown in Figure 5.

High-power rifle ranges also require two well-defined areas directly behind the firing line. These are the ready line and the assembly line. The ready line is about 30 feet behind the rear edge of the firing line and is marked by small signs about 50 feet apart. The ready line is the alinement area where shooters on the next relay await the completion of the present relay. The assembly line is about 30 feet behind the ready line and is marked by small signs about 50 feet apart. The assembly line provides a place for the shooter to check his equipment and make all the necessary adjustments before proceeding to the ready line.

20. Roads and Parking Areas. The volume and character of road traffic determine the type of construction and width of the required roadway. Passenger vehicles and light or medium trucks generally use those range roads located in the more remote sections of an installation. These roads must permit access to ranges in all kinds of weather and usually require surfacing. The surfacing may consist of light asphalt, crushed rock, or gravel, as local conditions and funds permit.

Class C roads are generally the proper specification for small arms ranges. Class C includes roads and streets designed and planned as routes for traffic consisting principally of passenger cars and light trucks, 2½ tons or less, with an occasional

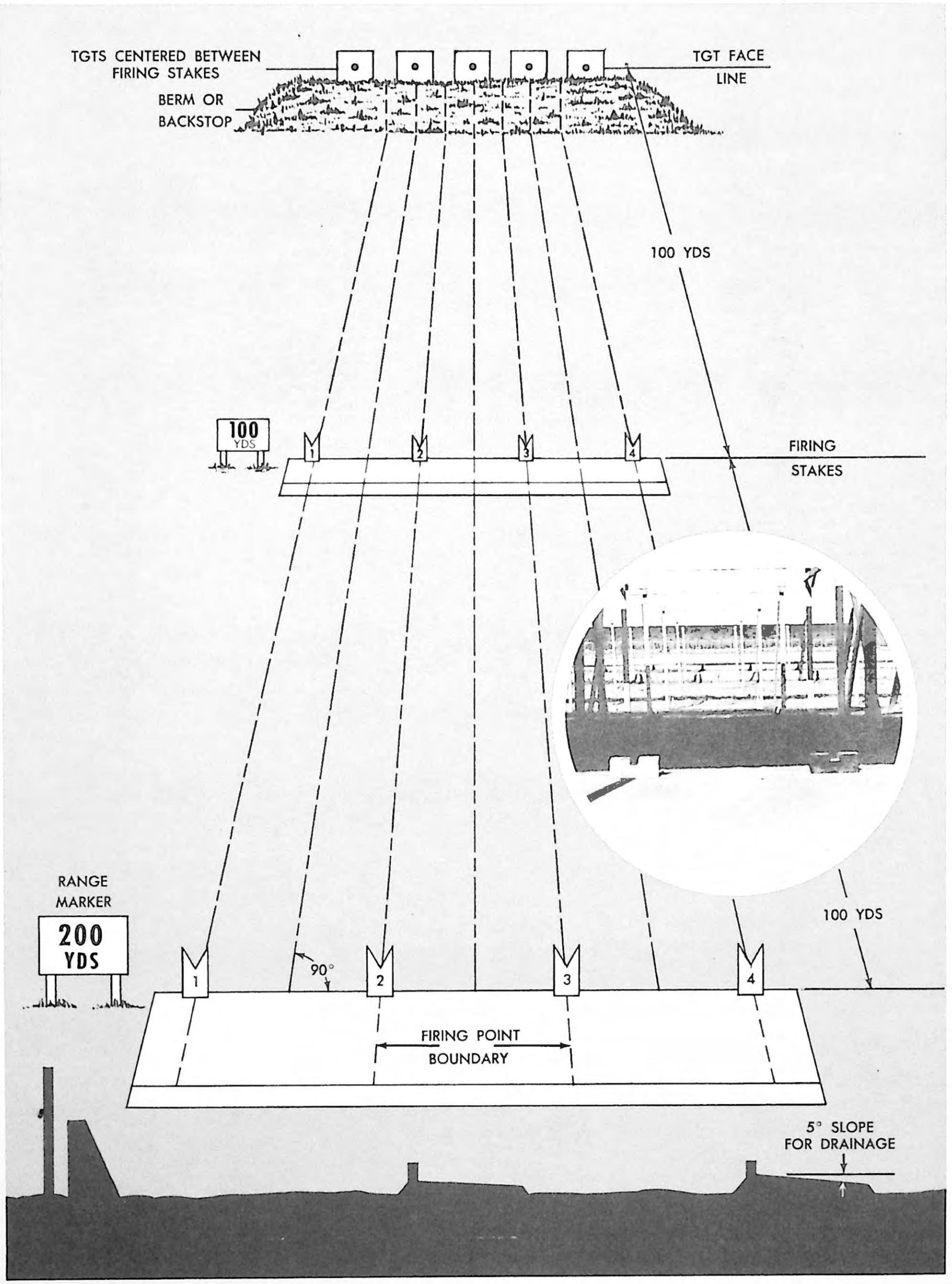


Figure 4. Pistol and Rifle Firing Point Boundaries

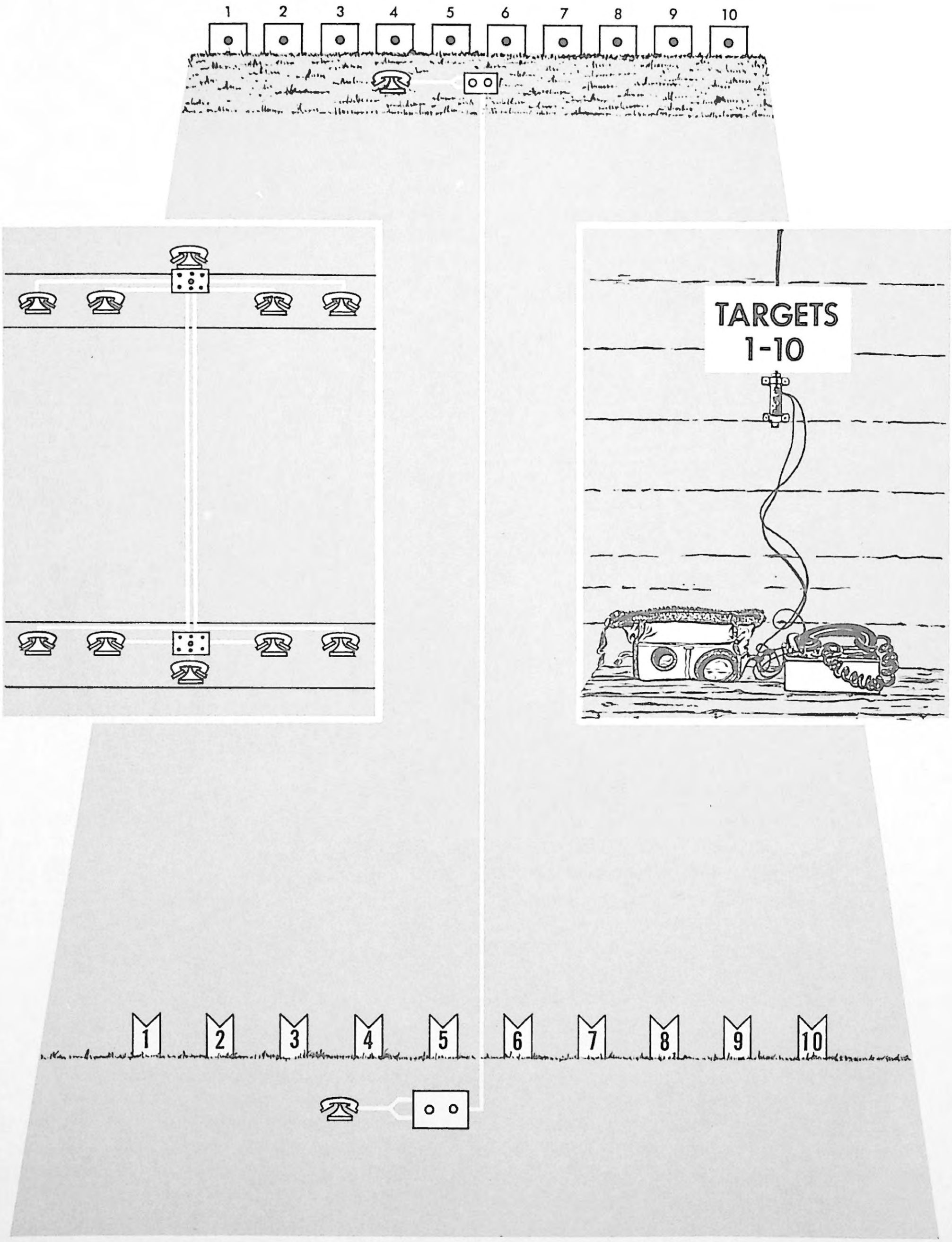


Figure 5. Typical Field Telephone Hookup and Target Service Signs

vehicle having a wheel load not exceeding 9,000 pounds. The proportion of heavier trucks must not exceed 5% of the average daily traffic. If traffic loads to small arms ranges are heavy or if numerous medium and heavy trucks are using range roads, make an evaluation to determine the need for a class A or B road.

Surface small arms range access roads to target lines or target pits with crushed rock or gravel. Class C roads are adequate for target area access, because personnel normally use vehicles or trucks of 2½ tons or lighter to service and maintain targets.

Locate roads leading to small arms ranges so as not to subject traffic to the danger of bullets or ricochets. The ideal range approach is towards the rear of the firing line. The range access road must never approach the range less than 35° from the line of fire, measuring the vertex from the rearmost firing line, with two exceptions: (1) when a baffle or earthen berm completely protects the road from firing. (2) on high-power rifle ranges where the vehicle approach is not less than 35° to the line of fire, measured from the firing line being used.

If roads other than the range access road enter the range impact area, visually check the danger area before daily firing begins to see that it is clear of vehicles. Also, check to see that the road barriers and signs are in place, blocking the road. Lock the gate or barrier for maximum safety. It is permissible to have a simple gate or barrier; however, it should prevent vehicular entrance. It may be a 4-inch pipe, hung by a hinge approximately 4 feet above ground level that can be locked in the closed position.

Construct parking areas that are large enough to accommodate vehicles driven by personnel taking small arms training and entering competitions. Small arms ranges seldom have bus lines running to them. Private vehicles are the chief means of transportation to and from ranges. If training loads are normal, one parking space per firing point, plus allowance for range personnel, is sufficient. Heavy training loads and competitions occasionally require two spaces per firing point. If possible, surface the entire parking lot for all-weather operation. However, if surfacing material is difficult to obtain, or the cost is extremely high, surface one parking space per firing point, plus spaces for range personnel. Surface parking areas with asphalt, crushed rock, or gravel. If blowing sand and dirt are a problem, use asphalt. For the shortest distance and best access to the range office and shooting activities, assign reserved parking areas to the small arms range officer, NCOIC, permanently assigned personnel, official visitors, and competition officials. Parking areas must be at least 50 feet from the firing line. If possible, locate parking areas 75 to 100 feet from the firing line.

Always locate parking areas adjacent to the small arms range that they serve and, if possible, to the rear of the firing line. On indoor or fully baffled ranges using side berms, the parking areas may be on either side or on both sides of the range. On all other ranges, vehicle parking is behind the firing line. When considering parking lots, make sure they have adequate natural drainage or that they can be modified to provide good drainage. Small arms range parking lots in remote areas of installations do not usually require curbing.

21. Barriers and Fences. Barriers and fences provide security and safety by preventing people and vehicles from entering the range. Use barriers to blockade roads, walkways or paths, and use fences to keep people and animals out of the danger area.

Indoor ranges seldom require barriers. Fully-baffled and side-bermed ranges generally limit the use of barriers to the range access road. Outdoor ranges that use a backstop with no baffles or that have an impact area in place of a backstop may require a number of barriers to make the range safe. The number of barriers required depends on the numbers of roads, walkways, and paths that lead into the danger zone. It is best to fence in the entire danger zone, but the terrain or cost may prevent this. An alternate method of preventing unauthorized entry into the range proper or the danger zone is to blockade all normal approaches with barriers and signs, as shown in Figure 6. The barriers are used to prevent vehicles from entering but may also be used to prevent people from entering the impact area danger zone by a footpath. Block paths with a timber, heavy pole, gate, or a chain placed about 4 feet above the ground. Attach a sign to the barrier to warn people of the danger within. Make a permanent barrier unless limited access is permitted for hunting or week-end firing. In such a case, place a hinge on the barrier for easy removal and replacement. Lock the barrier when it is in the closed position, and make

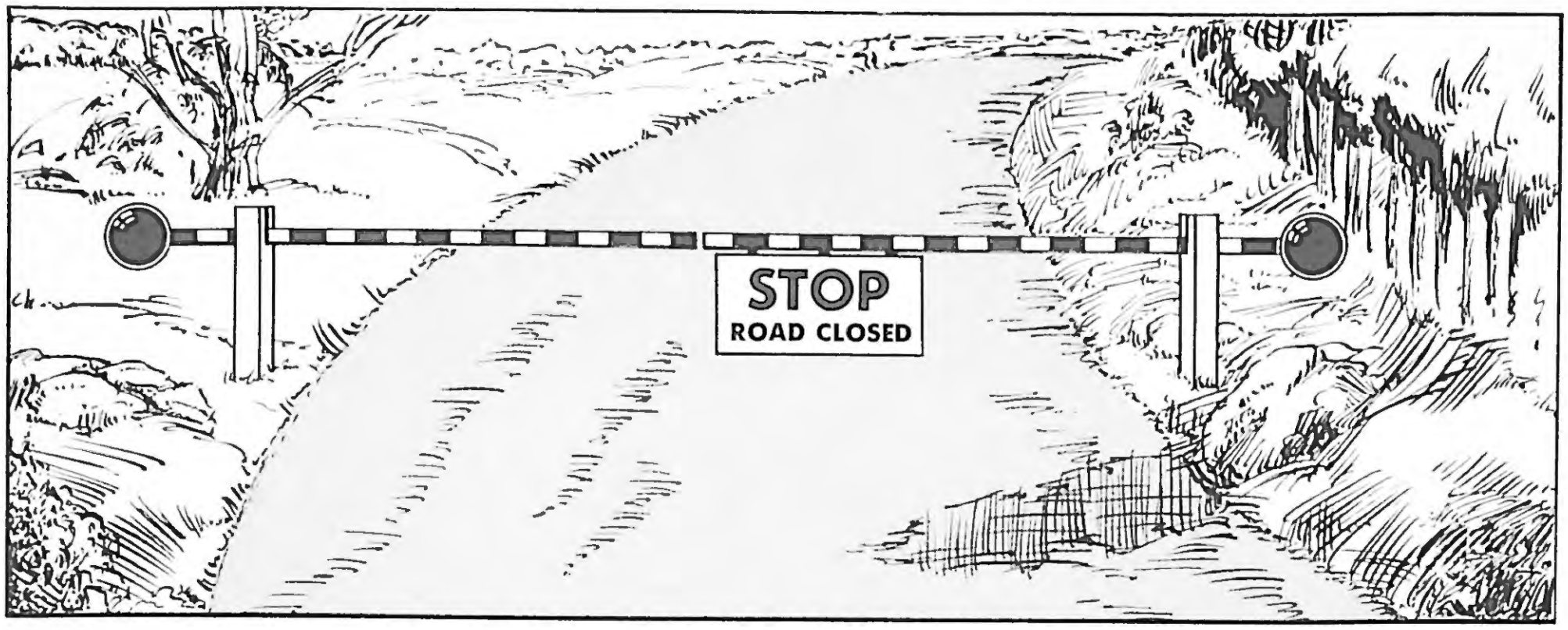


Figure 6. Gate Vehicle Barrier with Sign

sure the keys are in the possession of range personnel to assure that no one unfamiliar with firing schedules enters the impact area and danger zones without permission. The small arms range office keeps one key for each lock.

Any person, group, or activity requiring access to the impact area or danger zone must coordinate this requirement with the small arms range section. If permission is granted, then dates and hours of access will be indicated. Do not permit small arms range access at any time if conflicts with, or is not in the best interest of, small arms training or competition.

As stated in paragraph 20, before each day's firing, make a visual inspection to assure that barricades are closed and locked, and that range signs are in place.

Small arms ranges often require fences to prevent personnel, animals, and vehicles from entering the danger zones or the range from an unsafe approach. For safety, a close-mesh fence around outdoor small arms ranges is most desirable.

22. Windbreaks. Gusty or high velocity winds often hamper small arms training and competitive shooting at many Air Force installations. Use windbreaks to reduce this wind to an acceptable level. A windbreak seldom stops the wind altogether. It does reduce the wind enough to protect the shooter from high wind, flying dirt, sand, or other debris. On high-power rifle ranges, other than international types, the most desirable windbreak consists of several rows of trees. Plant them on both sides of the range not less than 50 feet from the line of fire, extending them from the target pits to the rearmost firing line. Outdoor pistol, small-bore, and carbine ranges, because of their smaller size, may use natural or constructed windbreaks. Natural windbreaks are desirable for they can improve the beauty of the landscape and require little or no recurring maintenance. They do, however, have one disadvantage. After planting, it takes several years for trees to attain the proper size to break the wind. Sometimes, however, ranges are sited in areas that have trees suited for windbreaks. It may be advisable to construct temporary windbreaks until small trees reach the proper size. Plant fast growing trees and shrubs that have plenty of foliage and attain good height. Choose a variety of tree that grows well in the area. The earthen side berms of fully baffled ranges serve as windbreaks. However, winds from the rear affect shooters nearly as much as winds from the side.

Windbreaks need not be solid to deflect or decelerate the wind. A venetian blind type of windbreak deflects the wind upward at a 45° angle. The firing line needs this cool circulating air during the hot summer months. On ranges that have sheltered firing points, the windbreak may consist of a wall of 1-inch boards attached to the shelter frame. To provide proper air circulation, make sure that 12 inches of the base has hinged or removable sections. During hot weather, open or remove these sections as necessary and during cold weather, replace them to reduce cold drafts and

to prevent blowing snow from accumulating on the firing line. Paint all wooden windbreaks to improve their appearance and to preserve the material.

23. Baffles.

a. Safety Range. A fully-baffled pistol, small-bore, M-16, or carbine range on a small plot of ground, about one-half the size of a football field, is a rather new and developing concept. This is the result of America's rapidly growing suburbs. Many military bases, once in the country, are now within city limits, and housing areas, manufacturing facilities, and business complexes surround them. It is permissible to build small safety ranges anywhere on an installation that has enough area to support a backstop, the distance between firing point and target, and the firing point. A typical small arms range installation is approximately 320 x 120 feet (this has a 100-yard 15-point capability). Installation expansion, new small arms range concepts, and nonmilitary expansion adjacent to the base can easily result in unauthorized approach to the range. For safety and security, it may be necessary to fence outdoor ranges of 100 yards or less with close-mesh fencing. If ranges are near housing projects or areas where children play or gather frequently, erect a hurricane fence around three sides of the range, excluding the firing line. No one will then approach the range from a direction that would subject him to danger.

b. Indoor. Baffles are plates or walls that regulate or check the stray bullet's flight. Indoor ranges require baffle protection for water and electrical conduits, lights, target-turning or target-carrying mechanisms, the roof, and in some instances, the walls. Place or suspend baffles so that an accidental shot or ricochet, not striking the backstop, cannot damage utilities or personnel. When converting an existing building into an indoor range, many items require baffle protection. Due to backstop limitations, it is wise to limit indoor ranges to pistols of .22 caliber rimfire, .38 special, and .45 automatic, and to rifles of .22 caliber rimfire. For the use of backstops in indoor ranges, see paragraph 17 of this manual. Air Force definitive drawings in Attachments 7 through 10 give the baffle specifications for the above calibers. Place those baffles protecting lights, electrical and water conduits, and target-turning or

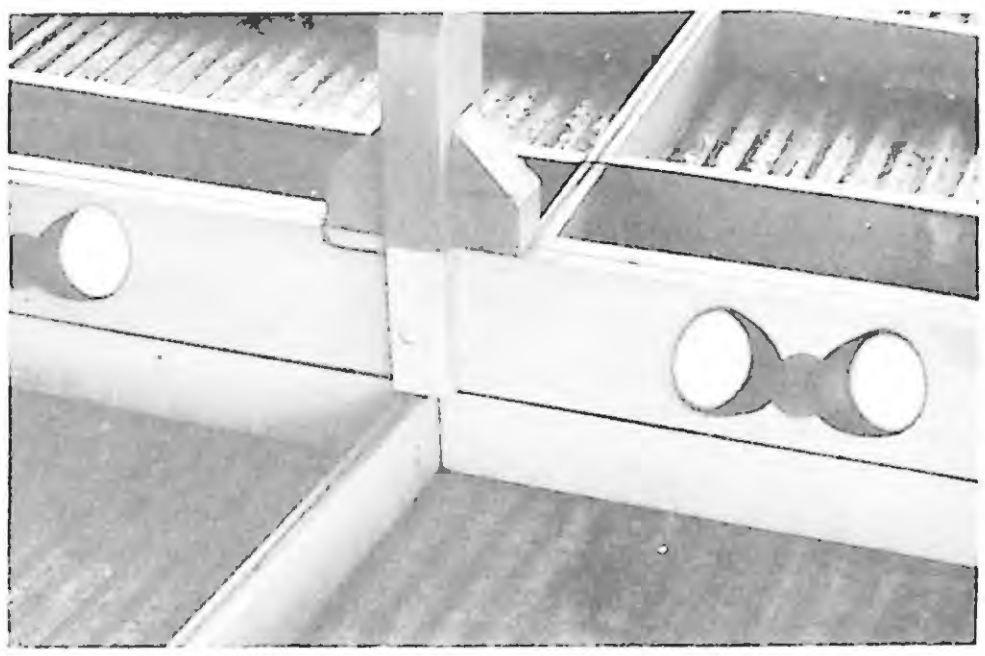


Figure 7. Baffle Protecting Overhead Light Fixtures

target-carrying mechanisms immediately in front of the object needing protection, as shown in Figure 7. Make the baffles large enough so that the protected object cannot be hit by a bullet fired from any position at any point on the firing line. For this purpose, wooden baffles are usually the cheapest and easiest to suspend. It is permissible to use steel baffles or deflector plates to protect utilities, but face them with 1-inch yellow pine, fir, or other suitable soft wood to reduce ricochets.

Walls of concrete, concrete block, or similar masonry do not require baffles as weapon restrictions do not allow the use of high power ammunition. However, face these walls with a minimum of 1-inch yellow pine, fir, or other suitable soft wood to prevent "splash back" of bullet particles. When converting wooden buildings into indoor ranges, baffle the walls to prevent an accidental firearm discharge from penetrating the thin wall and escaping. A good way to baffle the walls of a wooden building is to line the inside with masonry, such as concrete foundation tile. Be sure to face all exposed hard surfaces as described above.

Basements of buildings are often converted into indoor ranges. A basement roof of poured concrete does not require baffling for attached lights and for electrical or water conduits. When roofs of indoor ranges are made of thin materials that are subject to damage or that permit bullets to escape, suspend baffles to protect them.

c. Outdoor. Outdoor small arms range baffles serve the same purpose as indoor baffles; they regulate or check the stray bullet's flight. There are two reasons for the increase in baffled outdoor ranges. First, there is a great increase in the number of shooting enthusiasts since World War

II; and second, inhabited areas have greatly expanded to surround many small arms ranges. It is almost impossible to find an adequate impact area and danger zone for a small arms range on a military installation near a large or moderately large city. Many small arms ranges must add a constructed backstop to make them safe. Properly installed baffles eliminate accidental shots over or to the side of the backstop, or ricochets off the ground over the backstop. An adequately baffled outdoor range may be constructed and operated with absolute safety in the center of a military installation or in a city. With a properly baffled range, the only way a bullet can escape is rearwards from the firing line. A .30 caliber rifle bullet fired straight up has only one-half the energy required to inflict a disabling wound while free falling back to earth.

Baffles greatly increase the cost of a range. Do not construct them where impact area danger zones exist or where a natural or constructed backstop gives adequate safety.

Ranges usually require the use of overhead and ground baffles when a backstop is also in use. Most ranges requiring backstops and overhead baffles must also have side berms and a bullet catch. These additional safeguards are required if personnel or property come within unprotected side ricochet angles. When constructing overhead and ground baffles, civil engineering should imbed baffles into side berms to prevent ricochets from escaping the range system and to give added support to overhead baffles.

As Attachments 8 and 9 indicate, baffles may be of material other than laminated wood and metal. Earthen berms that form the right- and left-hand walls of a range or that separate adjacent ranges are acceptable for baffle requirements. Although they are similar to backstops, they fulfill the baffle requirement of checking bullets. Keep the berms as steep as possible to increase bullet absorption.

There are several ways to reduce or eliminate ricochets coming from the range floors. Paragraph 24 describes some of these, however, when ground ricochets become a safety problem, the installation of ground baffles is the only possible solution. There are several types of acceptable ground baffles. Remember, constructed baffles must completely contain the caliber or calibers of weapons fired on the range. When there is any doubt about a certain type baffle stopping a bullet, build a small prototype of the desired baffle and test it for intended effects. Upon achieving satisfactory results, build the baffle into the range system. Build ground baffles as illustrated in Attachments 8 and 9. There are several reasons why the baffles shown in the attachments are capped and beveled. First, the upper portion of ground baffles receive the most severe punishment. Replacing the upper capped portion of the baffle is easy, inexpensive, and rapid. Second, the bevel cut causes bullets to tip toward the ground rather than upward. To determine the critical placement of the first ground baffle from the firing line, measuring down range, measure from a 6 foot elevation above the firing position, downward at a 27 degree angle. At the point of contact with the ground, install the first ground baffle. Install additional ground baffles by "line of sight," the method used for installing overhead baffles.

On baffled ranges, the baffles start directly overhead under the shelter roof, and they extend forward to overlap the first upright baffle. Overlap all baffles, as shown in Figure 8, so that a bullet cannot escape the range even from the lowest firing position.

As shown in Figure 9, baffles may be used to divide a range so that two different courses of fire may be conducted simultaneously. Using the range floor as the base, extend a partition from the firing line to the backstop. Make sure it is high enough so that a person cannot view anyone on the other portion of the range from any position or location on the firing line. Use specific baffle specifications when constructing the partition.

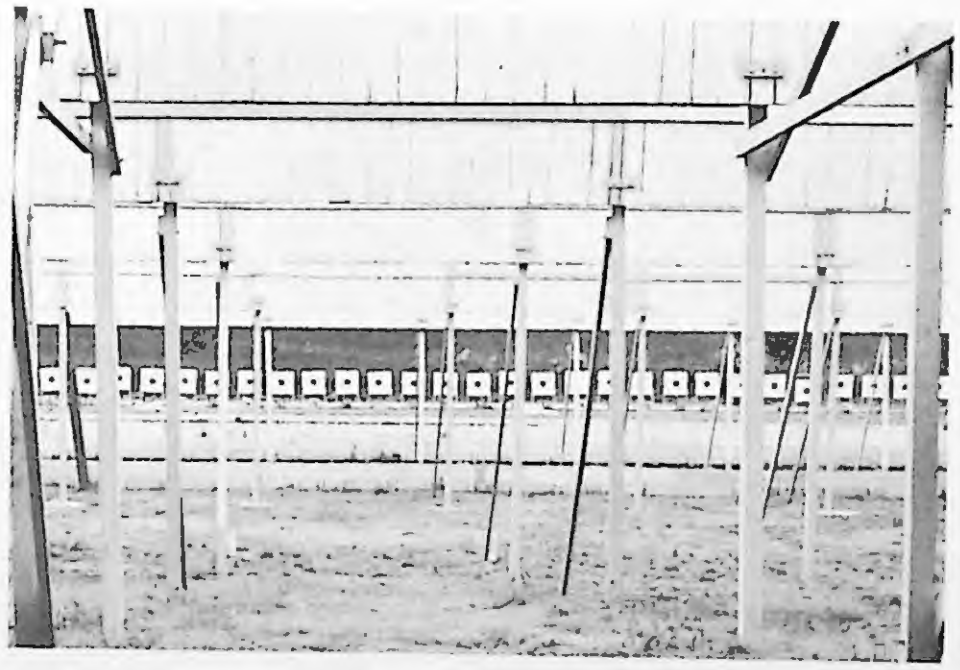


Figure 8. Outdoor Range Overhead and Ground Baffles

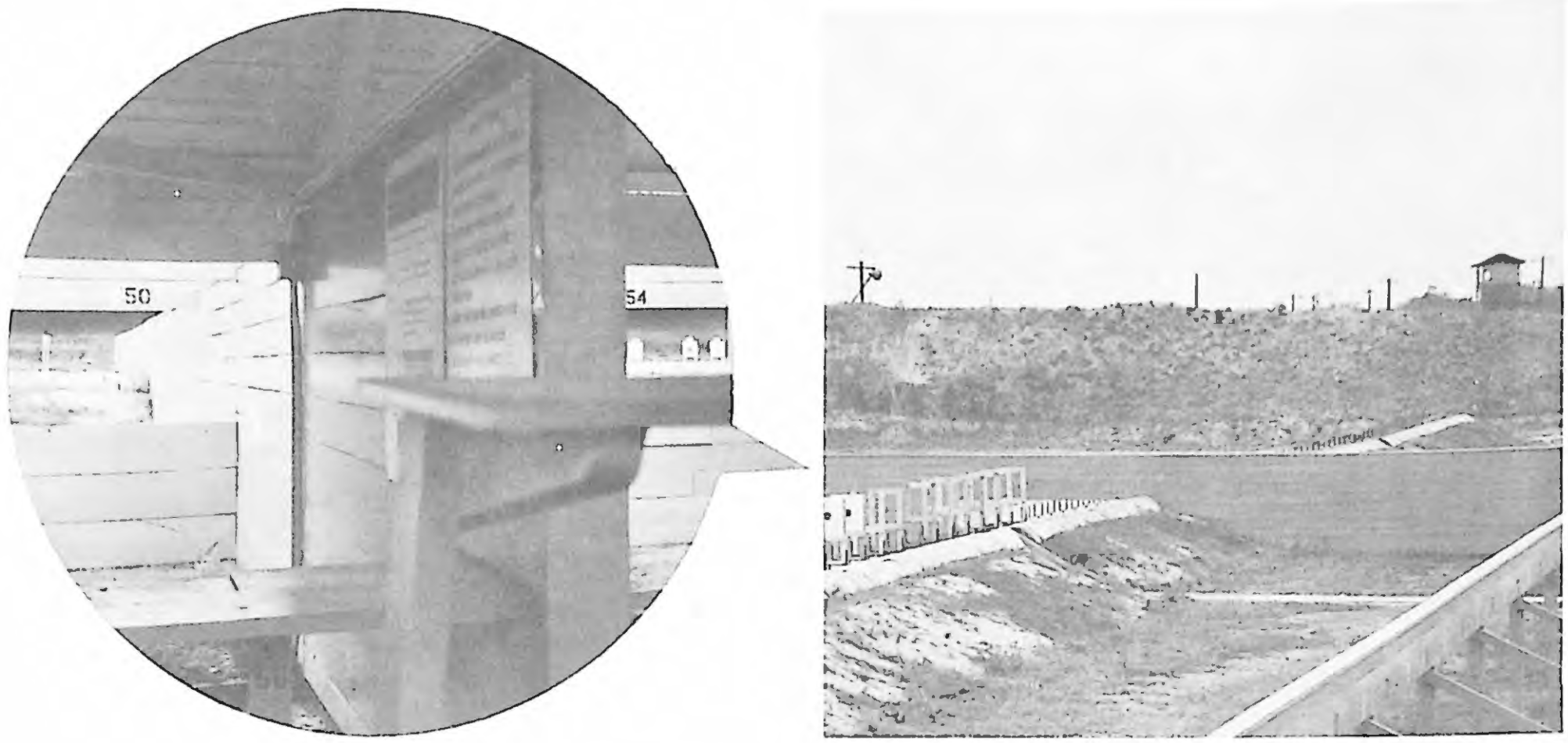


Figure 9. Baffle Dividing a Small Arms Range

Targets can then be changed and scored safely without disturbing the other firing order. Usually, the baffle divider is only a few inches thick and is cheaper to construct than a bulky earthen berm. Extend the partition to the firing line only and not to the rear of it. This enables the range officer in command to view the entire firing line.

Build braces for the large surfaces of outdoor upright baffles to withstand the highest wind velocity in the area. Since baffles are heavy, support them with timbers or poles of adequate strength, firmly set deep in the ground. Timber cross braces and cable guys add to the rigidity of a baffle system but they must not interfere with the shooter's vision of the complete target. Ground baffles must not obscure the shooter's vision of the complete target when he is in the prone position, and the same applies to overhead baffles when the shooter is in the standing position.

Wood and metal may be used to laminate baffles. Use 1 inch of soft wood, such as yellow pine, fir, or redwood on that portion of the baffle facing the firing line. Back this with metal and then back the metal with two layers of 2-inch wood. These two layers of wood may consist of any dense wood, such as oak. The critical area of a baffle is the 1-inch piece of wood that faces the shooter. The soft wood absorbs the bullets and prevents ricochets. The definitive drawings in Attachments 8, 9, and 10 give baffle material specifications.

24. Range Surfaces. The surface of range floors should be free of rocks and gravel or any other material that causes ricochets. Most projectiles that leave range sites are the result of ground ricochets. On proposed range sites, determine ground ricochets by firing tracer ammunition at ground surfaces after dark. If ricochets occur, ground baffles are required. A good stand of grass reduces ground ricochets; therefore, it is important to sod range floors. Make sure there are adequate facilities for watering grass in those geographical locations that do not have enough moisture to promote a good stand of grass. Also, provide for proper drainage to allow for the use of ranges during bad weather. If range floors do not have a good stand of grass and if ranges require a backstop and overhead baffles, then ground baffles must be constructed.

Keep all dirt surfaces between the firing line and target free of rocks or other debris. If pebbles and rocks are a safety problem, cover the surface with about 6 inches of debris-free dirt to reduce ricochets. *Do this on pistol, small-bore, M-16, and carbine ranges only.* It is not feasible to surface high-power rifle ranges because of their size. Improve ranges further by planting grass on berms, backstops, and range floors. A good stand of grass minimizes or stops erosion, reduces ricochets, and greatly improves the overall appearance of ranges. A grass that plants easily, grows well locally, and

forms a heavy, tough mat is desirable. A series of steep terraces several feet high, parallel to the firing line, produce right angle surfaces for low shots to enter rather than ricochet. Terracing does, however, present an erosion problem.

25. Drainage. Small arms ranges must have good drainage. Insects that are aggravating and distracting to the shooter will breed in stagnant water. Any distraction increases the chances of an accident. If drainage is poor, baffle bases, target and sign emplacements, and roads may deteriorate or shift position, resulting in time-consuming, costly repairs. The range itself may become a quagmire. Make sure that ditches and other drainage facilities are large enough to assure normal runoff. Also, consider any erosion potential.

On high-power rifle ranges that require raised firing lines, grade a borrow ditch between firing lines. This provides drainage, and the excess dirt makes good fill for the firing lines. It is possible to improve a drainage problem by placing target pits below grade level.

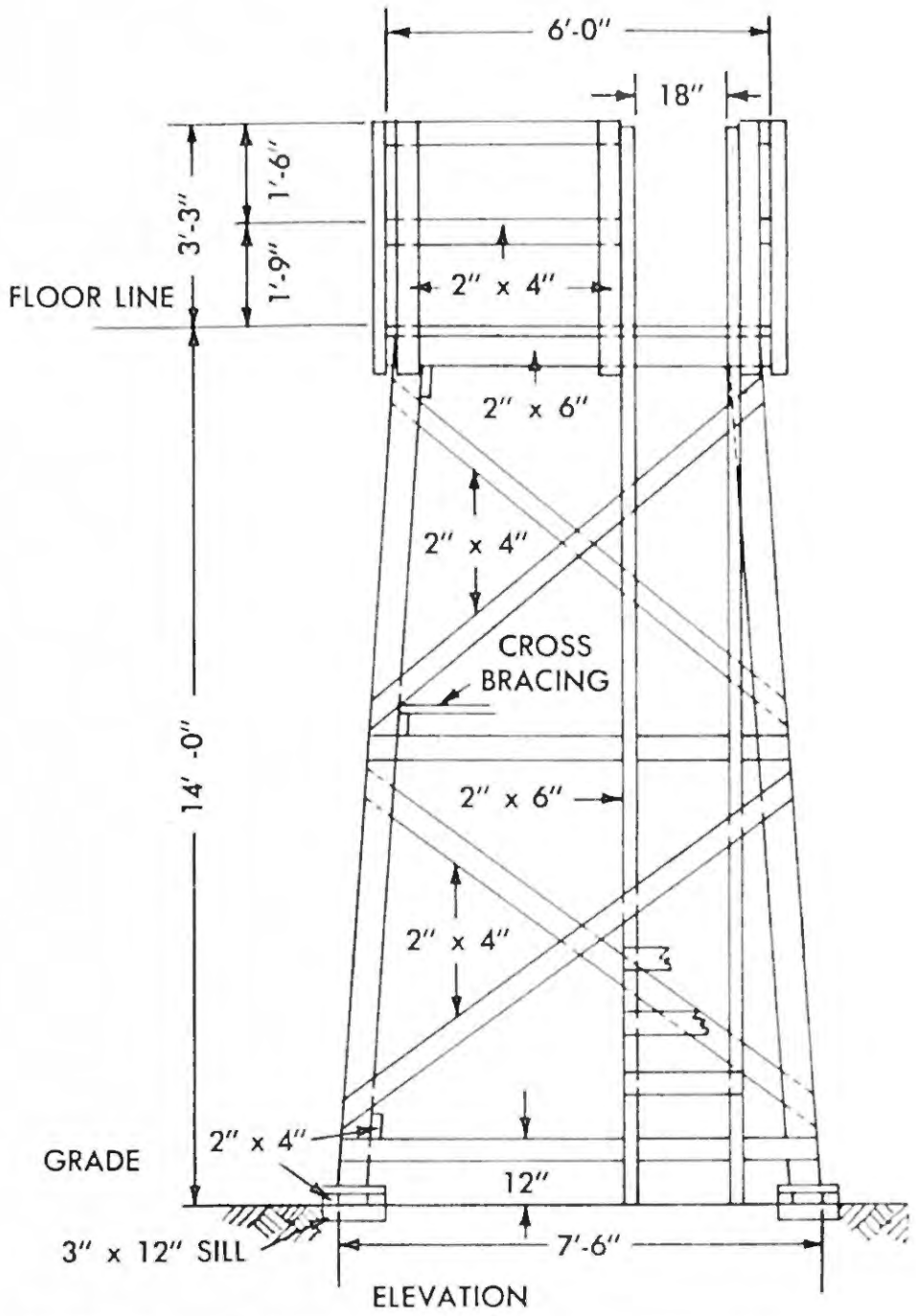
One hundred- or 50-yard outdoor ranges are rather easy to grade for proper drainage during construction. Low spots may appear in a new range surface after several months of settling or after a rain or two. Use dirt to fill any low spots where water collects and stands. Program ditches and conduits to take advantage of any natural drainage. Connect them with other drainage facilities by the shortest feasible route.

26. Observation and Control Towers. The range officer or operator must have a clear view of the complete firing line and the shooters during range operation. To enable him to do this, he is stationed on a raised platform overlooking the personnel, such as coaches, block officers, and scorers, who would otherwise obstruct his view. On sheltered ranges the raised platform is called an operator's stand or chair and is similar to the one shown in Figure 10. The operator's stand or chair, usually found under sheltered firing points on ranges up to 100 yards, has the seat about 4 feet above the level of the firing line. The table surface is required for public address system controls and microphone, and for pertinent printed matter on course of fire, standing operating procedures, and range conduct. Attachment 9 gives the specifications for the operator's stand. Locate the stand behind the firing line and just inside the overhead shelter. Normally, one stand per range is enough,

Figure 10. Range Operator's Chair

but sometimes a range is separated by a divider so that two different firing orders are run at the same time. In this case, put the usual stand in the middle of the entire firing line and one stand in the middle of each half of the firing line for a total of three stands.

High-power rifle ranges or any range that does not have sheltered firing points may use an observation or control tower as illustrated in Figure 11. The floor line of the tower may be as low as 5 feet off the ground for ranges with up to 20 firing points. For ranges with more than 20 firing points, construct the floor lines from 10 to 14 feet above ground level. The tower is normally located behind and at the middle firing position. On high-power rifle ranges, firing is moved from one firing line to another. In this case, lower the tower on its side or completely remove it so that it will not obstruct the path of bullets from any of the rearward firing lines. Place the tower on its side when it is at a lower level than the raised firing line. The rearward firing lines then have a clear view of the targets. To construct a tower that is easy to raise or lower, place heavy hinges on two of the legs; make eyelets for the two opposite legs and the base;



NOTE: The control tower as designed is predicated on a total load of 1000 pounds. If this tower is not to be used for observation, the size of the platform can be reduced and the entire design lightened.

Figure 11. Observation or Control Tower

secure two heavy pins that fit the eyelets. Insert the pins to erect the tower, and withdraw the pins to lay the tower down. This system requires one tower for each firing line served.

For an alternate method, put the control tower on a trailer of adequate wheelbase and width. A range vehicle can pull the trailer from one firing line to another, and the tower is ready to use in just a few minutes. Unhitch the trailer and chock all four wheels before letting anyone in the tower. The wheel chocks may be of steel tubing welded to wedges, or they may be wooden wedges. Permanently attach the chocks to the trailer with a light chain or cable to prevent loss.

27. Flagstaffs.

a. Placement. Use red flags and streamers to indicate that the range is in use and to signal danger. Position the range flag behind the rearmost firing line in a prominent place. A good position is near the access road where the flag is readily visible to all persons on or approaching the small arms range. If the range system consists of multiple bays or ranges, each bay or range must have its own flagstaff and flag, as shown in Figure 12.

High-power rifle ranges require danger flags at each end of the target pits. They must be clearly visible from all firing points at all firing lines. Keep these flags fully raised when anyone is in the target pits. The first person entering the target pits must raise the flags, and the last person to leave the target pits must lower and store the flags. A red pit flag is shown in Figure 13.

Place the flagstaffs about 25 feet from the first and last target frames so that an 18-foot streamer, when fully unfurled in the wind, does not obscure vision of the targets. Make sure the flagstaffs are at least 20 feet above the ground so that the streamer does not touch the ground. Target pit flags not only show that personnel are occupying the pits but also indicate wind direction and velocity for the shooter.

Usually, the range flag, individual bay flags, and target pit flags are enough for safety requirements. However, display additional danger flags when necessary.

b. Size. The object of range flags is to alert all personnel to existing danger. Therefore, make sure the flagstaff raises each flag high enough so that all persons in or approaching the range area can

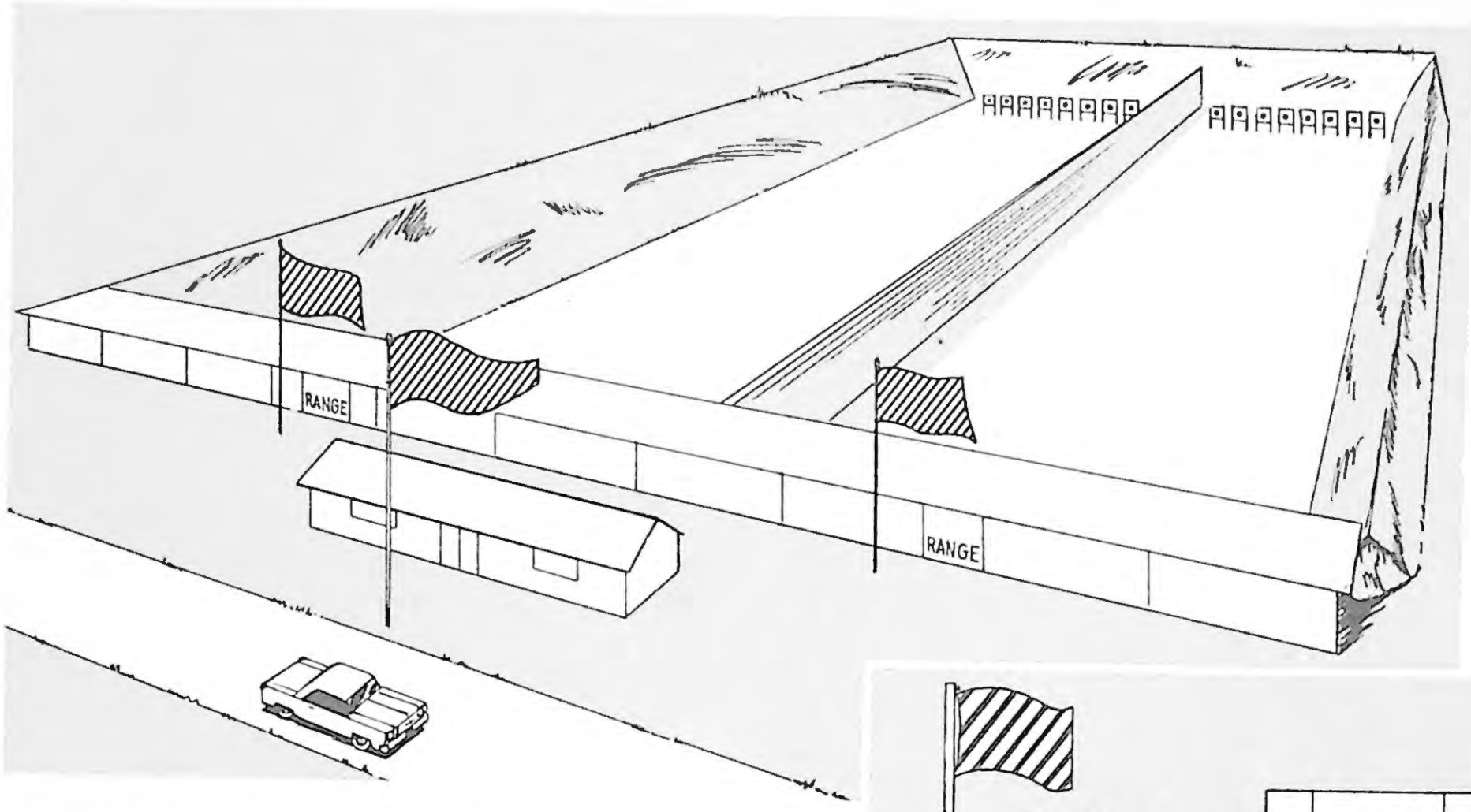


Figure 12. Range Flags on Individual Bays

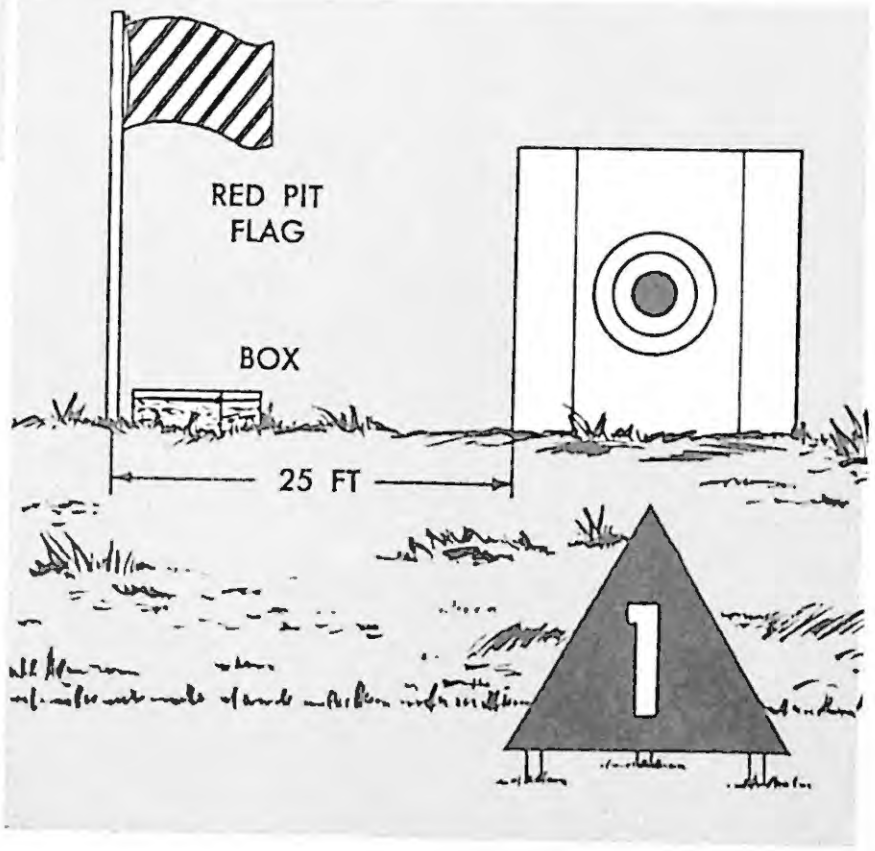


Figure 13. Target Pit Flags

see it. Where feasible, it must be high enough that all personnel from the impact area can see it. The average flagstaff is about 25 feet above the ground. Local conditions may require a taller flagstaff, but as mentioned before, it must never be less than 20 feet high to permit hanging of the 18-foot fly streamer. A telephone pole or a metal pipe makes a good flagstaff. Install a large eyebolt pulley at the top to hold the rope so that the flag is easy to raise or lower. Install a weatherproof metal or wooden box near the base of the flagstaff to store the danger flag in.

28. Signs.

a. Location. Small arms range signs inform personnel of impending danger and give safe weapon handling procedures. Other signs give directions and designate facilities.

Define the perimeter of a small arms range or range system by using signs along the normal boundaries. Make the signs with a white background and red characters. As shown in Figure 14, the wording of the sign indicates danger, type of range, and a trespass restriction.

The size of the sign shown in Figure 14 is suitable for small ranges that have a backstop and small area. However, some small arms ranges consist of large tracts of land where entry into the danger zone is possible and probable. On these larger ranges, place a large danger sign adjacent to logical entry points, such as roads and paths. In addition to the usual information, the sign directs individuals to contact range personnel before entering.

Space small arms range danger perimeter signs close enough together to give reasonable and proper warning to approaching persons. Local conditions govern the spacing of danger signs.

In a prominent position in front of the firing line, place a sign giving range safety rules. It is permissible to use small duplicates of the sign on the firing line and as instructional aids in safety briefings before firing. Post and enforce the following safety rules on all ranges.

- Treat all weapons as if they were loaded.

Figure 14. Small Arms Range Perimeter Sign

- All weapons will have bolts open, slides back, or cylinders swung out when not in use or when being transported on the range.
- Before firing, check all barrels for obstructions.
- Keep the muzzle of the weapon under control at all times. Do not point a gun at anything you do not want to shoot; avoid all horseplay while handling a gun.
- Unless it is absolutely necessary, do not handle weapons behind the firing line.
- Clear the weapon and ground it after each firing cycle. (Make sight adjustments only by command or permission of the range or block officer.)
- Place the selector of an automatic weapon on semi-automatic, unless directed otherwise. The above rules are basic. Local conditions may require additional rules. Add them as required while maintaining the safety objectives without being overly restrictive.

Plainly mark all buildings, such as the range office, ammunition storage, weapons maintenance, target storage, and latrine with building number and title. Post these signs so that people approaching from the most used route can see them.

Target and firing-line sign data are discussed in paragraph 19d and shown in Attachment 2.

Post any other signs that are necessary to give direction, warn of danger, improve safety, and aid instruction.

b. Language. Small arms ranges operating in foreign countries, ranges training foreign nationals, ranges operating near foreign borders or in localities where foreign languages are prevalent—all of these ranges may require the use of bilingual or multilingual range signs. The officials at the base or installation determine the language or languages to be used on signs.

At Air Force installations in foreign countries where foreign nations are not trained, post bilingual or multilingual danger warning signs around the range perimeter and normal approaches. For example, an Air Force installation in Northern Morocco might require danger signs in English, Arabic, French, and Spanish.

To minimize accidents, clearly define USAF-operated small arms ranges in foreign countries. Accidents involving foreign nationals can result in adverse publicity.

c. Size. As stated above, size requirements of signs for small arms ranges vary according to local conditions and range sizes. Use about one-inch letters for safety-rule signs on the firing lines; personnel read these signs at only short distances. For a large unobstructed approach area, use small arms range perimeter danger signs about 6 x 6 feet with large lettering. If the view is obstructed, smaller signs are permissible, but they must be at close intervals. This assures that personnel approaching the danger area receive proper warning. The size of the sign and the size of the lettering depend upon the area the sign commands and the distance from which it must be read. In the best interests of safety, make all warning signs large enough.

29. Utilities.

a. Types. Because small arms ranges exist in all geographical locations, local authorities must determine utility requirements. Ranges are manned during normal duty hours and often at night or on weekends. Outdoor ranges require latrine, water, electrical, and heating facilities. Latrine requirements depend on the size of the range and the number of personnel, instructors, and trainees. Water must be available for drinking and sanitation. Where ranges are off base or in an extremely remote section of the installation, explore the practicability and cost of drilling a well and using a pressure pump system. Small arms

ranges require electricity to light offices, turn power equipment in maintenance rooms, heat melting pots in reloading rooms, and furnish power for public address systems and target-turning mechanisms. Electricity is also needed for power drills, soldering irons, and appliances. Range offices and indoor ranges generally require heat during part of the year. The ammunition reloading and weapons maintenance room also requires heat. Use the source of heat that is cheapest: either electricity, bottled gas, or natural gas. Classrooms on a range require additional utilities. The construction of drinking water facilities, permanent latrines, etc., may be too costly. In this case, consider the temporary use of lister bags and chemical latrines.

b. Location. After determining the site of the range proper, use care in placing the utilities so as to prevent damage by normal firing. Do not place them in the area in front of the firing line nor in the area 5° to the right and left of the line of fire, extending through the impact area. This area may be reduced considerably by using a backstop or side berm, or baffle, or both. When placing utilities directly behind backstops, make sure there is enough clearance for repair or renovation. Where side berms are used, the 5° zone from the line of fire may be disregarded and utilities placed adjacent to the berms. Again, allow enough room for maintenance and rehabilitation.

Any part of the range may be used for underground utilities. It is usually cheaper to use carriers above the ground for high voltage power lines and telephone wires, constructing lines that circumvent the restricted area mentioned above.

30. Buildings.

a. Storage.

(1) TARGETS AND TARGET MATERIALS. Small arms ranges require well-constructed storage buildings to protect range equipment from pilferage and the weather. There must be adequate buildings to house targets and target repair activities.

Store all targets and target materials for high-power rifle ranges in target storage sheds located in the target pits. Each shed should service from 10 to 15 targets. Locate the target shed on either end of the target line. On ranges with 20 to 30 targets, a shed may be placed at each end of the target line. The sheds must be out of sight of all firing lines so that they cannot be hit by misplaced or accidentally fired bullets. Position them close to the target pit retainer wall to get maximum protection from the wall. To protect target sheds, it may be necessary to raise the parapet or to sink the target floor below the level of the ground in the target pit.

Construct target sheds with double doors to permit easy entry and exit of target frames which measure 6 x 9 feet for ranges up to 600 yards. For ranges greater than 600 yards, using the "C" rifle target, the target frames are 9 x 10 feet. Make the double doors large enough to accommodate these larger frames. A target storage and repair shed should have enough storage space for target frames, rolls of targets, pasters, spotters, markers, pit flags, and target repair material. It should also accommodate a table for pasting on new targets or for repairing centers. Install enough windows or electrical lights to assure adequate lighting.

For pistol and 100-yard rifle ranges without target pits, locate the target storage and repair shed behind the firing lines. These sheds should have sufficient floor space to accommodate storage of target frames, target materials, and target repair facilities. When electricity is not available, the sheds must have enough windows to provide adequate lighting. Heating must also be available in these buildings. A quonset hut or some other prefabricated building provides an economical structure for such a facility.

When two ranges are located side by side, such as a pistol and a small-bore rifle range separated by a berm or baffle, they may share a target storage shed. However, if the ranges contain more than 25 firing points each, construct separate sheds on each range.

Indoor ranges require a target storage and repair facility of about 75 square feet. Because of this reduced area in indoor ranges, make maximum use of all space. Targets and other target materials require lockers or shelf space for proper storage.

(2) AMMUNITION. Ammunition storage facility requirements on small arms ranges vary considerably from installation to installation. A bomber or interceptor base has adequate ammunition storage facilities to warehouse small arms. Missile installations and remote sites may not have an ammunition storage area, and the small arms range section will have to warehouse all of their ammunition. Because of differences in mission, in-

stallations locally determine the requirement for ammunition storage space.

Where adequate ammunition storage facilities are available, the small arms range requisitions a 30-day supply of all required ammunition and replenishes this supply monthly. At installations that do not have ammunition storage areas, the range section programs, requisitions, and stores small arms ammunition for training and competition.

Small arms ammunition on range premises must have proper storage. Ammunition is safe to be handled and stored, but it must be handled carefully to avoid damage to containers. Do not damage the metal containers or wooden boxes as this may either damage the ammunition or cause it to deteriorate.

Do not store flammables, such as gasoline, oil, grease, paint, solvents, etc., in the same building with ammunition.

To prevent fires, house all electrical wires in ammunition storage buildings in metal conduits. Properly ventilate the structures to protect ammunition from high temperatures that can cause deterioration of the propellant.

Mark the storage building of small arms ammunition with a fire symbol sign showing the type of material in the building, as shown in Figure 15. The symbol for small arms ammunition is number 1. Make the symbol at least 24 inches high and 20 inches wide. Fire-fighters must be able to see it from each road of approach. It is best to use a reflective or luminous material on the sign. For firefighting purposes, materials under this symbol are classified as fire hazards. Small arms ammunition does not explode violently in a fire. Individual cartridges may explode and the case or bullet or both fly through the air. Hot fragments may fly up to 600 feet at a velocity of about 200 feet per second. The greatest danger from these projectiles comes from the hot cases or bullets which may inflict minor burns.

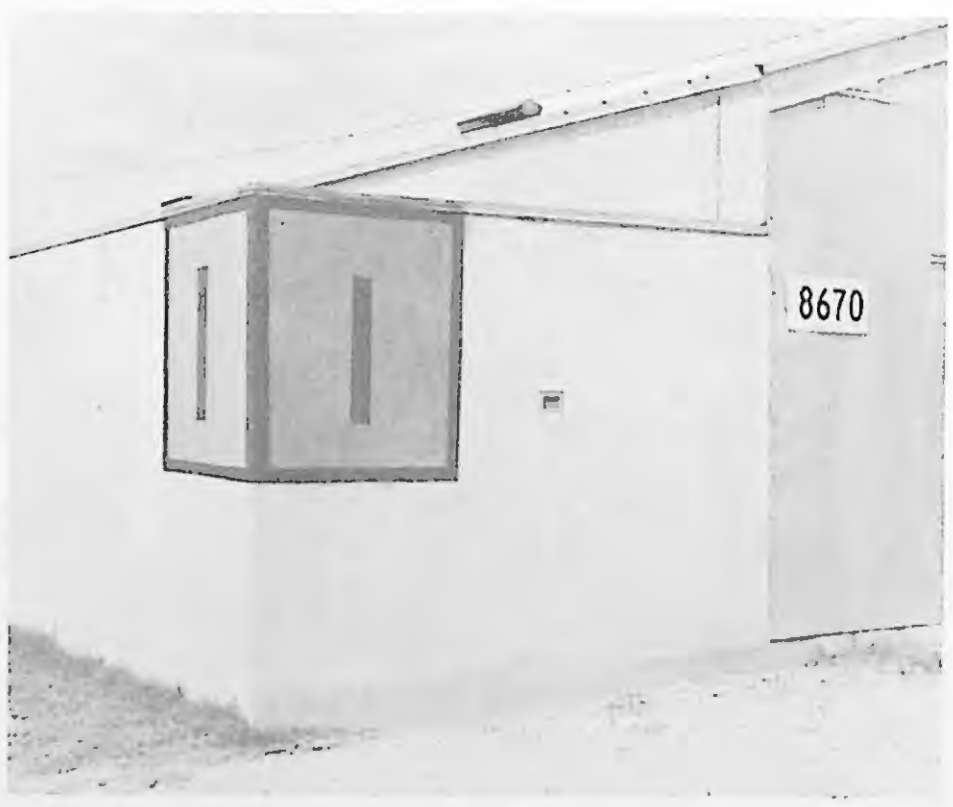


Figure 15. Fire Symbol 1

Indoor ranges or small arms outdoor ranges supplied by the installation storage area have a limited need for ammunition storage. Several metal lockers and a small room either in the administrative section or in the target storage facility provide adequate space for ammunition storage. On large ranges or where the range section stores all of the small arms ammunition, use a separate building for this purpose.

Regardless of ammunition storage, whether in lockers, closets, rooms, or buildings, it must have adequate security to prevent pilferage and unauthorized handling. Storage facilities must conform to existing directives.

Ranges must have training and competition ammunition available at all times for training and competition cycles. Storing at least a 30-day supply of ammunition on the range, and replenishing it monthly, saves money, man-hours, and vehicular mileage. It is time-consuming and costly to draw and return ammunition to the storage area each day.

(3) Weapon Storage and Maintenance. Small arms instructors are responsible for the maintenance of small arms weapons. Locate the small arms maintenance shop on one of the ranges of the installation where maintenance personnel are assigned and where testfire facilities are available. This shop maintains all of the small arms weapons on the installation. Usually, 300 square feet provide enough shop space. Equip the shop with several work benches, small drawer cabinets for storage of weapons parts, cleaning tanks, vises, air compressors, a grinder, a degreaser, a drill press, and possibly a sand blaster. Store the maintenance tool kits, listed in Table of Allowances 503, *Air Force Technicians Tool Kits,* in this shop and also the special tools listed in T.O.s 11W3-2-2-3, 11W3-3-3-42, 11W3-5-3-102, 11W3-5-3-122, 11W3-6-1-154, and in other pertinent publications.

Weapons being repaired and inspected require storage. Also, the training weapons for the range

require security. Weapons storage and security must conform to existing directives. When the maintenance shop weapons storage and the range weapons storage facilities are combined, only one weapons storeroom is necessary. To save additional space, put the maintenance facility, weapons storage, range office, ammunition reloading room, and similar functions in the same building.

The weapons maintenance shop must have a lavatory. Maintenance personnel often employ caustic or irritating solvents that must be removed from the skin soon after contact. Soap and water safely remove these solvents.

b. Administrative. All small arms ranges require office and schoolroom facilities. Range personnel need facilities where they can compute scores, file records, program requirements, maintain a reference library, and keep statistics during competitions.

If small arms ranges are adjacent to one another, a large single office provides enough space. If ranges are separated making it inconvenient to use one office, then each range must have an office. The range office or offices require the usual office furniture, such as chairs, desks, book racks or cases, and file cabinets. Installations locally determine the amount of furniture needed. The size of the office, number of range personnel assigned, frequency and size of competition and training loads, and administrative responsibilities—all of these items determine furniture requirements for the range office. Table of Allowances 006, *Organizational and Administrative Equipment,* lists the furniture for range offices. Consult the unit supply section for the selection of the right type of furniture and for proper supply procedures for furniture authorization and requisition.

Classroom facilities are also necessary for premarksmanship and academic instruction. In addition, annual recurring trainees must have classrooms to demonstrate their proficiency in disassembling and reassembling the issue weapons. Make sure the classrooms are large enough to provide proper ventilation and heat for the number of students using the facility. Also, install chalkboards and a raised platform for the instructor. Each trainee needs a chair and a table so that he will have a place to prepare written material, a place to work on, a place to lay out study material or training aids, and, most important of all, a place for practicing weapons assembly and disassembly. Provide a means for darkening the room so that audiovisual aids can be used. Also, provide the adequate electrical outlets during the planning and construction stage. Table of Allowances 006 lists classroom furniture. Consult the supply section for proper procedures to follow in obtaining classroom furniture. Classrooms must have good lighting so that students can look into the shadowed recesses of weapons. Also, when small parts are dropped or pushed from the working table, they are much easier to find in a well-lighted classroom.

Locate adequate latrine facilities near the offices and classrooms.

c. Latrines. Each installation determines the type of latrine needed for the small arms range. If water and sewage lines are within a reasonable distance, extend them to the small arms range. Where the range is in a remote section of the installation, extension of water and sewage lines is not economically feasible. In this case, ranges may use septic tanks, or if water is not available, an earth pit or chemical latrine. Provide latrine facilities for women if ranges are used for activities, such as competitions, rod and gun club, junior rifle club teams, and WAF rifle teams.

31. Related Equipment.

a. Target Actuators. Target actuators are generally limited to pistol targets. The annual recurring training and competition courses of fire contain various strings of fire of less than one minute. For accurate and consistent timing from relay to relay, use an electrically operated target timer and actuator. Place the actuator on the 25-yard line of targets so that it will turn all of the targets simultaneously. The targets are held edgewise towards the shooter, and when the range operating official starts the timer unit, it turns the targets 90° to squarely face the shooter. After the time limit, which the operator presets, the actuator turns the targets edgewise again to a cease-fire position.

Place the actuator mechanism at the center or end of the target line. The center location is preferable. Shield the actuator from possible damage by direct fire and ricochets. The unit at the target line consists of an electric motor to operate a compressor, an air tank to store air for air-operated solenoid valves, and a piston and cylinder unit to convert pressure into a push-pull force to

turn the targets 90° and back. Place the control box on the operator's chair or stand behind the firing line. The control box contains the switches that operate the timing and actuating mechanisms. The electronically controlled time selector is graduated in minutes and seconds to enable the operator to select the length of time the target is to face the shooter. This timer-turner unit is not stock listed and must be purchased locally or furnished by a contractor. It becomes installed property when it is placed on the range. For technical details on this unit, contact the USAF Marksmanship School, Lackland AFB, Texas.

Target turners can be actuated manually by a lever and linkage system. This manual system, shown in Figure 16, is adequate for combat course training but does not meet the rigid requirements of competitive timing. All pistol ranges that support a base pistol team, air police pistol team, or that host local or military pistol matches require an electronic target timer-turner unit for proper conduct of training and competition. A manually operated system must be available in case the electronic device breaks down. Disconnect the manually operated lever system at the target line, but make sure that it is ready for operation when needed. If the electronic unit fails, unbolt it and link the manual unit into the target system with a bolt or pin. The manual emergency system permits training to continue while the target timer-turner unit is being repaired. Outdoor pistol ranges at Air Force installations in northern areas and in places that have much inclement weather must have the manual emergency system. This enables these installations to take full advantage of all available training days. Equip indoor ranges with a manual system to offset any failure of the electronic unit. Attachment 9 gives details and specifications for pistol range target-turning units and hookups.

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Figure 16. Manual Target Actuator, Pistol Range

b. Target Holders.

(1) PISTOL. There are two types of pistol target holders, fixed and turning. The frames are usually the same width but may vary in length. Use wood to construct that portion of the target frame which is visible to the shooter. This does not include the nails, thin metal clips, and numbering signs. To prevent unsafe ricochets, do not expose the metal pipe or angle iron portions of the target holders. To protect the lower metal portions of the target holders and turning mechanisms, construct an earthen berm or baffle in front of the target line. All types of berms must be vertically cut, and the vertical cut must face the shooter. As shown in Figure 17, cap the tops of berms in the same manner used for capping wooden ground baffles. If only a baffle is erected, check Attachments 8 and 9 for proper baffle specifications. Be sure the top of the baffle is several inches higher than the top of the metal work on the target holder.

Construct the upper portion of the target holders for the 50-yard target line from wood. Use metal or concrete, or both, to construct a good stable base for the target holders. Erect ground baffles in front of this target line to prevent ricochets from striking the metal or concrete bases. Place the ground baffles at least 5 feet from the front of the target line. Personnel then have enough clearance to score and change the targets.

The outside dimensions of training and competition targets may vary from 21 to 24 inches in both width and height. Use cardboard backers to attach nonstandard size targets to target holders and frames. The suggested target frame meas-

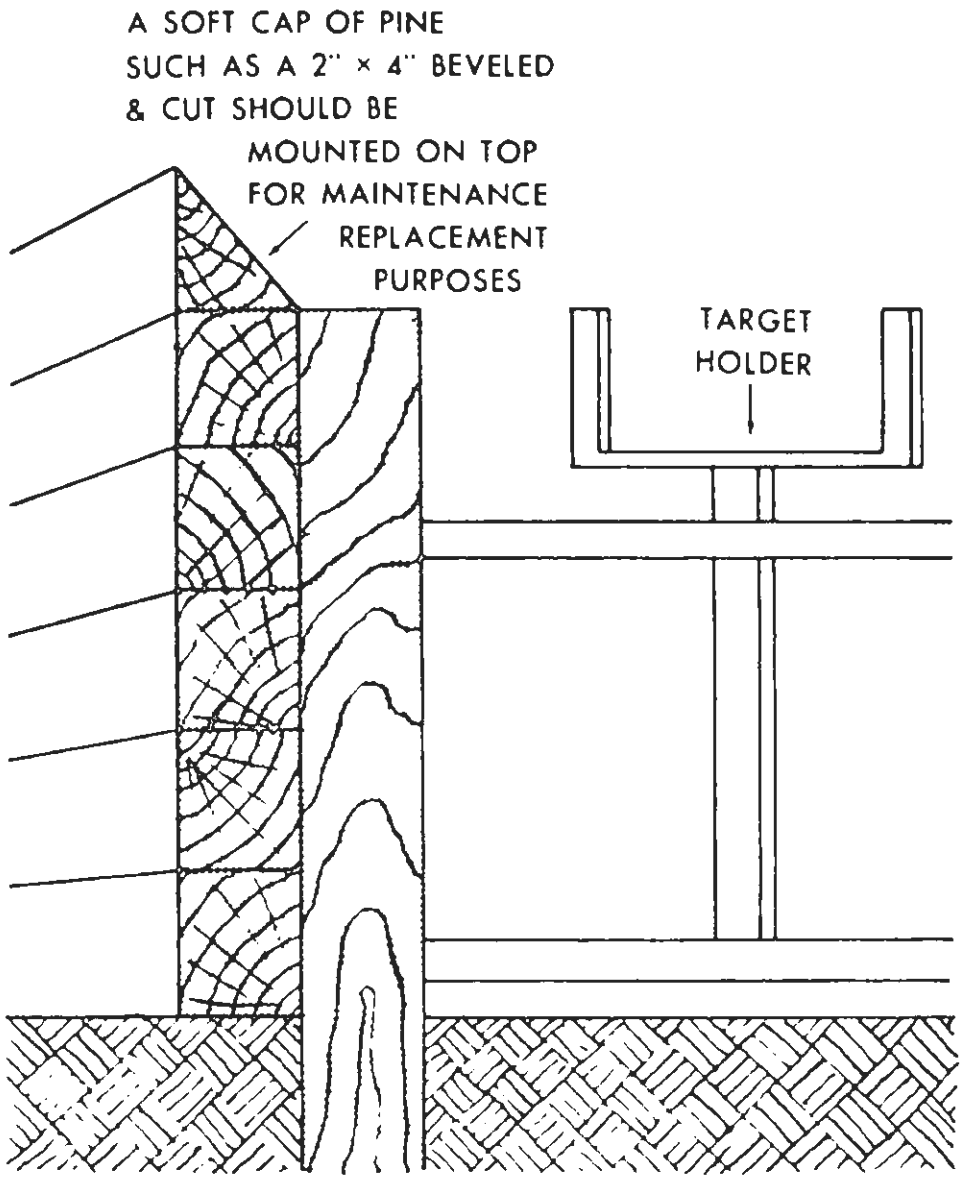

Figure 17. Side View of Protective Berm

ures 24 by 24 inches. Take six thin metal clips and bend them at right angles. Nail two metal clips to each side and to the bottom of the frame, as shown in Figure 18. Set the metal clips forward of the wooden frame about one-half inch to form a channel for the cardboard target backer to slide into. The four side clips and the two bottom clips hold the cardboard backer into position. Slide the cardboard backers in and out of the holder from the top. Make sure the clips are all evenly spaced so that they give good support to the backer. The wind and the fast turning of the target have a tendancy to dislodge the backers. The use of thin metal for the clips prevents ricochets. Fasten the clips with small nails. If they are damaged by a bullet, they can be rapidly bent out of the way or torn off with a pair of pliers and replaced in a few seconds. For day-to-day maintenance, keep a supply of clips at the range. To make these clips, take a piece of galvanized tin and cut it into strips 1¼ by 2 inches. Bend them lengthwise to form a 90° angle. Take a center punch and make two small holes about ¼ inch from one end of each clip. This makes it easier to nail the clips to the frame.

Cut the cardboard backer to measure 24 x 24 inches so that it will accommodate the largest target normally used. Put the targets and repair center on the corrugated cardboard backer with paste or staples. If feasible, use staples—stapling is much faster than pasting. Before firing, attach targets to a large quantity of cardboard backers so that targets can be changed rapidly after each firing order. At the same time and if available, a detail can resurface the targets. Otherwise, trainees or shooters must resurface their targets after firing.

Target holders and frames on all target lines must be detached quickly. As the firing changes from target line to target line, remove the holders or frames and lay them flat on the ground. Ready the next target line by picking up the frames and inserting them into the receptacles. Then, slide the targets into the frames. Next, remove the frames from the receptacles. This provides a clear view of the targets and prevents damage to the frames.

(2) SMALL-BORE RIFLE. Universal small-

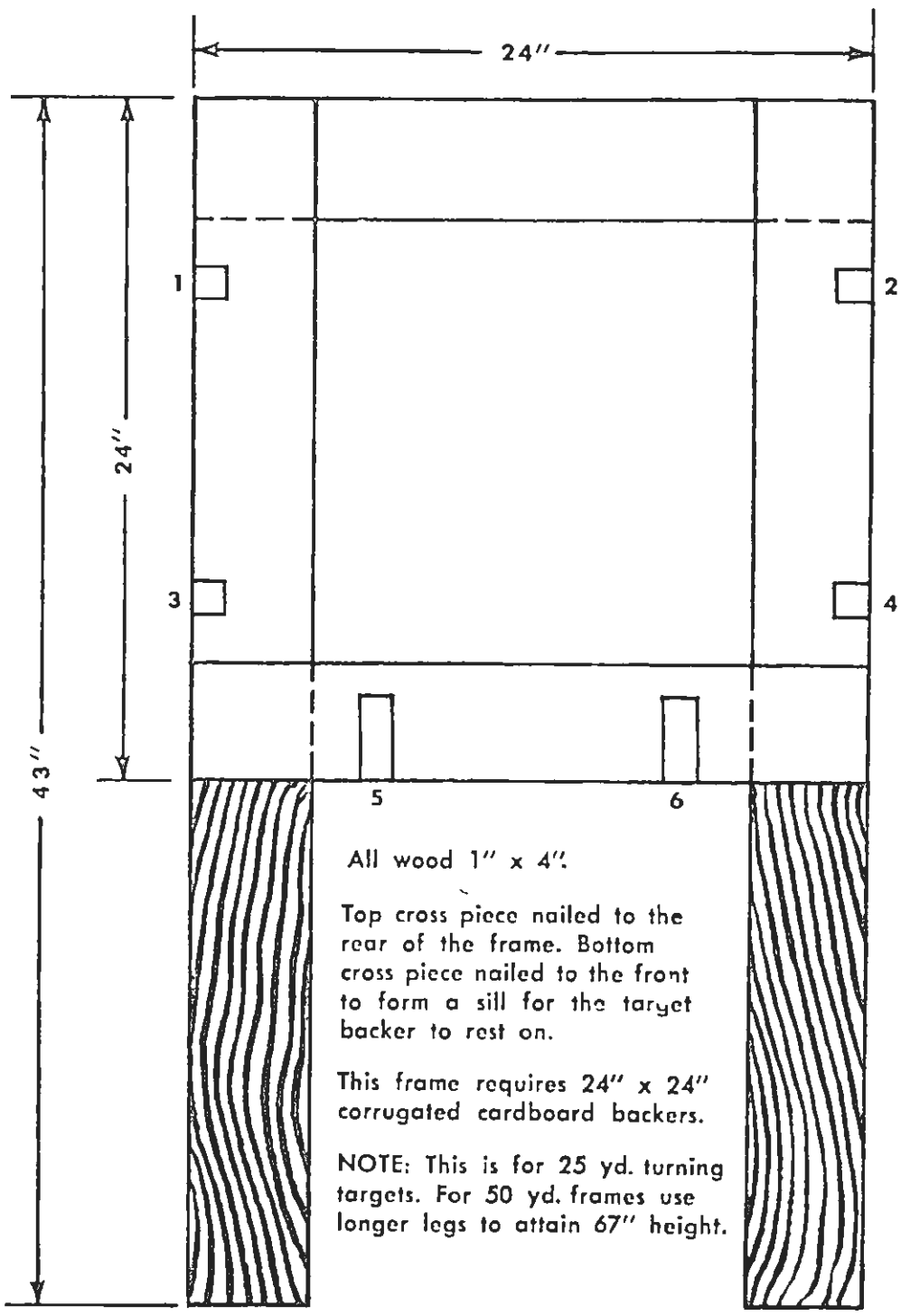

Figure 18. Target Holder Frame Dimensions, Pistol

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Figure 19. Small-bore Rifle Target Holder

bore rifle target holders have been designed to fit all types of targets for various ranges. This target holder or frame is prefabricated locally and has the specifications given in Figure 19 and Attachment 12. Secure the target to the frame with eight No. 1 paper clips. The paper target backer requires six No. 1 paper clips to attach it to the cardboard backer. The target frames are of the detachable type that can be set up or pulled out of the pipe housing rapidly. Then, they can either be laid on the ground or carried to the next firing line. If the metal pipe for the target legs is above ground level, a ground baffle may be necessary to prevent ricochets. Local conditions determine this requirement.

(3) HIGH-POWER RIFLE. When feasible, fire the issue carbine or rifle at a range of 100 yards. Conduct annual recurring training on high-power rifle ranges if they are available. On 100-yard carbine ranges without target pits, use a larger target holder or target similar to a pistol target. Prefabricate the target frames locally. As shown in Figure 20, install metal clips on both sides and the bottom to guide and hold the corrugated cardboard target backers. It is permissible to cover the frame with target cloth and paste targets to it. However, this method is slow and consumes much time. Paste the "A" rifle targets to the cardboard backer. Targets may then be changed rapidly and scored later. After daily firing, range personnel can rapidly collect and store all paper target components in the target shed. With this system, one man can carry approximately 20 targets pasted to cardboard backers. If the targets were pasted on target cloth attached to the target frames, one man

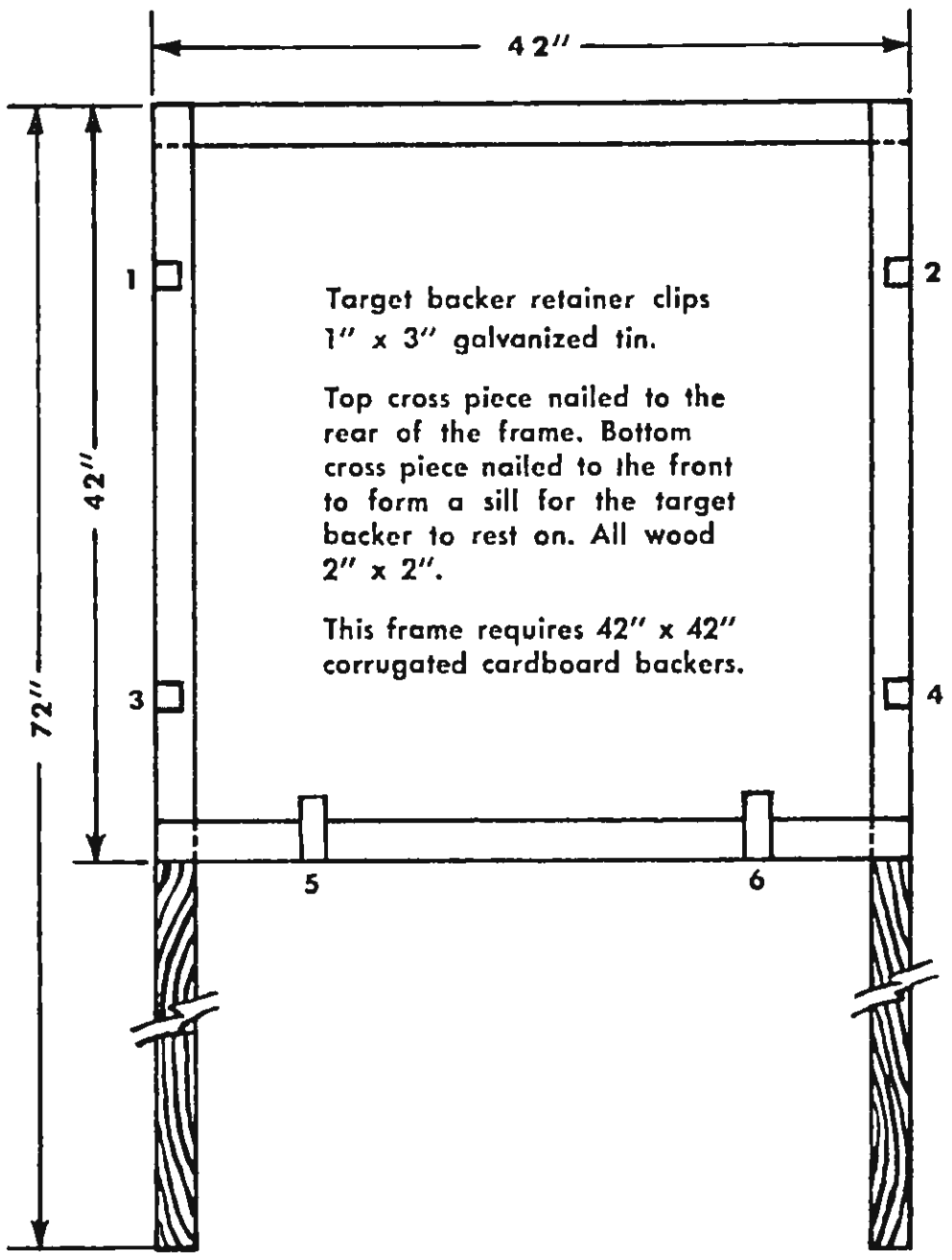


Figure 20. Caliber .30 Carbine Target Holder, 100-yard Range

could handle only one frame. On ranges that are heavily used and that are short of range personnel, use cardboard backers and metal clips. This is a good system and it works well.

c. Target Marking Boards. Use target marking boards in high-power rifle competitions. They are a form of chalkboard divided into blocks and columns with titles. Use them to record rifle match data and scores. The marking boards are made locally by either the carpenter, sign shop, or training aids section. The dividing lines and titles are painted on the boards. Information block titles consist of letters about 1 inch high. However the block needs to be large enough to permit chalk entries of letters and numbers that are 2 inches high. Put all the column titles in bold letters and make the column numbers about 2 inches high. Bold divider lines and column titles as well as large information areas permit the shooter on the firing line to read and understand the entries at a glance. In Figure 21, "S1" and "S2" stand for sighter shots 1 and 2. Target marking boards require the minimum of 10 lines under the name and scoring columns to accommodate scoring of one complete relay.

d. Weapon Racks. Issue racks provide a means of securing and stocking many weapons in a limited area. They also eliminate possible damage to the weapons from falling over or dropping. Issue weapon racks are authorized in Table of Allowances 006. Air Force Manual 67-1, *USAF Supply Manual*, directs adequate supply discipline of weapons by proper security and accountability.

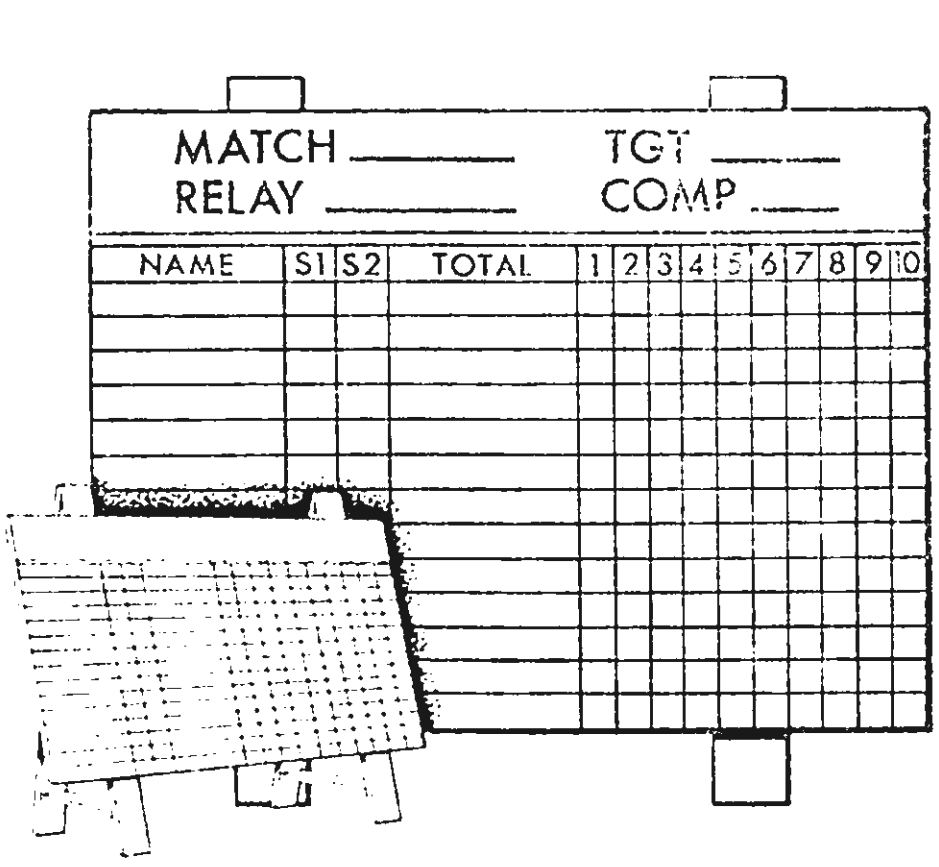


Figure 21. Target Marking Board, High-power Rifle

All weapons in storage or on the range must have adequate facilities for racking. For several types of service weapons in limited use, issue weapon racks are not available. These weapons must have the same rack protection and security as other weapons. Local manufacture of storage facilities is necessary for those weapons without issue racks. Storage and security measures may vary with local conditions. Steel lockers or lockers modified to include weapon holders or racks may be used. The racks may be issue weapon racks modified to accept the weapon, or wooden racks with no locking devices, provided other security measures are adequate.

When locally fabricated weapon racks or storage lockers are desirable, request the installation chief of security and law enforcement to survey the adequacy of the facilities. His guidance is sought to determine adequate weapon security when planning only a weapons storage facility. Also, he is required to inspect the security of weapons storage facilities and to report any discrepancies to the base commander. The chief of security and law enforcement makes a minimum of two inspections each year and issues certificates of inspection to agencies inspected.

Equip rifle and carbine ranges with adequate rifle racks to prevent weapons from falling or getting unnecessarily dirty. These racks add to the safety of the range by reducing weapon handling. This type of rack is constructed locally and is not intended for security purposes but only as a parking place for range weapons. It is left on the range permanently.

On all small arms ranges, place weapon racks behind the firing line for the shooter's convenience. Where ranges conduct small arms competitions, construct and arrange the racks so that they accept any weapon the shooters normally use.

All weapon racks are to be well constructed, neat, and clean, as shown in Figure 22. Paint the racks to improve their appearance and to prevent deterioration.

e. Furnishings. Small arms range offices, target repair facilities, and weapon maintenance facilities require furnishings, such as desks, chairs, file and storage cabinets, and work benches. Range personnel needing various furnishings should not only discuss the requirement with their supply and authorization personnel but should also give supply

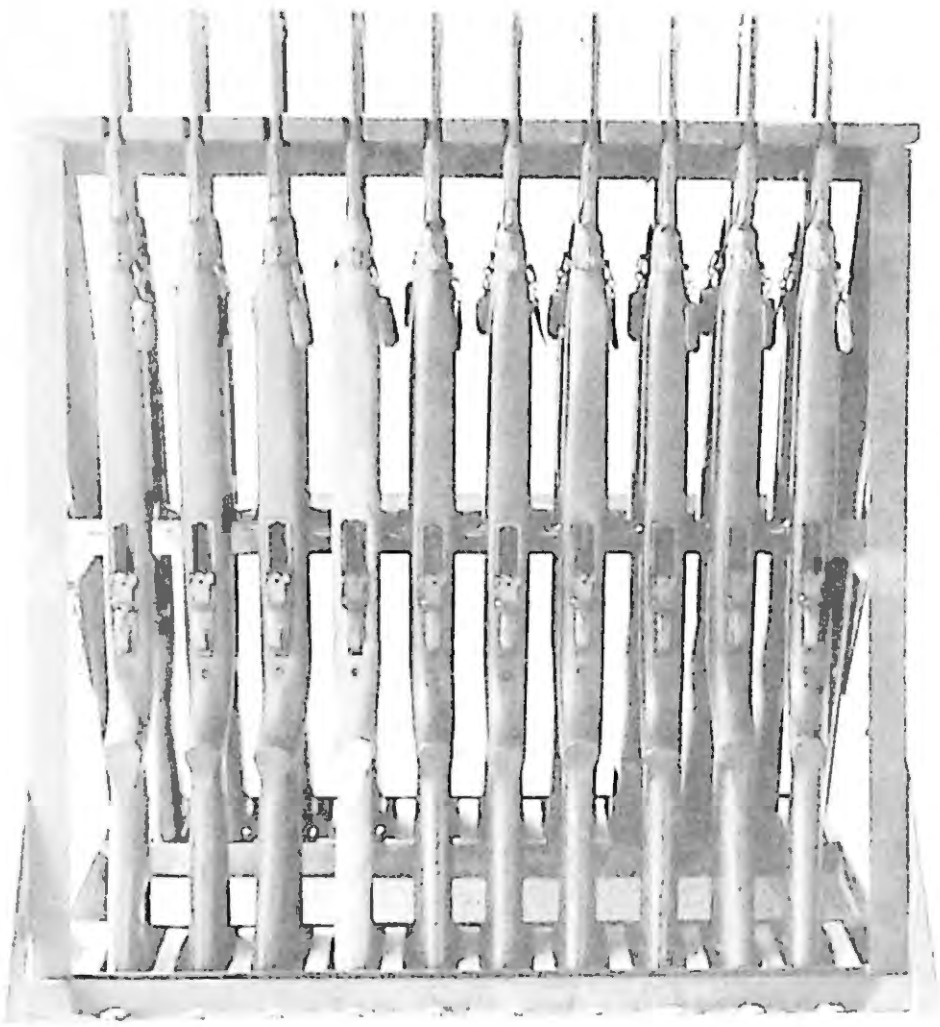


Figure 22. Weapon Rack

any needed information and submit justification for furnishings when required.

Because Air Force installations vary in size, it is difficult if not impossible to list furnishings adequate for a variety of needs. Furnishings must be adequate to perform the mission intent in this manual.

f. Instructional Aids. Many types of instructional aids are available to the small arms instructor to assist him in meeting his training objectives. It is important that he take full advantage of these aids. Good instructional aids and techniques shorten the time needed for teaching and learning.

Table of Allowances 915, *Small Arms Marksmanship Training,* contains an excellent marksmanship training aid kit. It comes in three parts, Kits A, B, and C. The using activity must requisition the kits.

There are several small arms films available for various phases of training with issue weapons. A 16 mm movie projector equipped for sound is necessary for this type of training. Dependent on training load and the availability of projectors, the range section may have a projector on permanent issue or can draw one when needed. These projectors are simple to operate; however, they require a qualified operator. Range personnel must receive instruction on the use and operation of the 16 mm sound projector from a qualified projectionist. All range personnel need to be good movie projectionists as well as skilled users of other visual aid equipment. Also, range personnel must follow instructional procedures of pertinent Air Force publications to insure a high standard of instruction.

Careful planning is necessary to develop and use effective training aids. It is costly and unwise to plan and construct a new training aid which no instructor uses. This occurs too often. Consider using training aids from another field if they assist in the attainment of training goals. Use aids, such as weapon racks, enlarged mockups of firearms or their functional parts, lecterns, and chalkboards. Window shades or darkening material may be needed to darken the classroom. Apply ingenuity in using materials, both new and salvage. Make sure the equipment fits the particular training needs for which it is intended.

Support activities or range personnel, if they possess the capability, can make training aids. It is not always necessary to use standard type training aids. For instance, when making different range signs, make some additional signs for classroom use. However, small arms ranges often do not have the personnel, stencil machines, paint, and lumber necessary to construct such training aids.

SECTION C — ACCEPTANCE

32. Specifications Check.

a. Materials. The installation civil engineer is responsible for assuring that proper materials, as prescribed by contract and blueprints, are used in the construction of small arms ranges. Range personnel, working in a technical advisory capacity, must also check range construction to assure that proper materials are used. Baffle materials are the most critical; however, any item that affects safety must meet rigid specifications. Comply fully with all wood and metal specification of baffles. Do not make any changes in materials and specifications without first getting the approval of Hq USAF (AFPTRTC). Observation and technical consultation during construction are the best ways to assure the use of proper materials. Save money on the project by catching any specification deviations during the time of construction.

b. Measurements. Range measurements are critical. Check them closely during construction and again upon completion of the range. The two most critical measurements are the distance from the firing line or lines to the target line, and the spacing of targets and firing points. Check the firing lines and target lines by sight for alinement. If these are in a straight line, then check the distance from the first and last firing positions on all firing lines to the respective target line or lines.

Check the thickness of baffle material before the trial operation. Also, look closely at the baffles to see if they are adequate. Baffles are engineered to overlap sufficiently so that the shooter cannot see between them from the lowest firing position. When gaps are visible between baffles, the baffles are not fully effective. This compromises and violates range safety.

33. Trial Operation.

a. Target Actuating Devices. Check all target actuating devices before accepting them. Installing personnel must conduct a trial operation on completion of the target installation. The small arms range NCOIC or similar technical advisors must observe the trial operation to determine proper functioning and to give technical assistance if adjustment or alteration is required. Fire a complete training or competition course to check target actuating mechanisms before accepting the range as serviceable. Generally, the target actuating devices include the high-power rifle combination sliding targets located in the target pits, and the target-turning and timing units of the 25-yard target line of the pistol range. Trial operation also includes checking actuated and fixed targets that are constructed for quick takedown.

Trial operation may also include the operation, functioning, and adjustment of trap machines that throw clay pigeons. These machines must conform to the principles set down by certain governing bodies, such as the National Skeet Shooters Association (NSSA), American Trapshooters Association, and the International Shooting Union.

b. Communications. All communications on ranges must be operative before firing begins. This is a requirement for safety as well as for operation. On high-power rifle ranges, all telephone circuits from all firing lines to the target pits and the circuit from the range to the parent installation must be operational. Test any public address systems that have been installed. Pistol, small-bore rifle, carbine, and indoor ranges generally require only a public address system and telephones to the parent installation. Test these also before accepting them and before range operation.

c. Utilities. Check all range utilities before acceptance. Also, check all electrical outlets and light fixtures, the heating system, latrines, and water facilities before test-firing on the range.

d. Test-fire. After the construction of a small arms range and before operation for training and competition, conduct a controlled test-fire to determine range safety and adequacy. Conduct the test-fire in two phases: first, the safety check and second, the operational check. In the safety check, fire several rounds of the most powerful ammunition authorized for range use at the baffles to determine adequacy of baffles. Make sure the person firing these rounds is an experienced shooter. Also, have the shooter fire the rounds from a position or elevation so that any bullets that go through the first baffle are stopped by the second baffle. This procedure prevents any rounds from escaping from the range should they penetrate the first baffle and determines the need for additional baffle material. If ground baffles or contours are not installed, the possibility exists that bullets may ricochet off the range floor and over the backstop. Fire bullets at all exposed areas of the backstop and side berms to determine if a bullet catch or vertical cut, as shown in Attachment 11, is required. A bullet catch must be strong enough to stop ricocheting bullets. Fire tracer rounds at night to determine the ricochet potential of the range floor and the backstop. If ricochets are numerous, extend a wooden shelf 4 inches thick outward over the normal bullet-impact areas so that it will contain the bullets. Before a range acceptance test-fire using tracer or any ammunition containing burning substances, examine the surrounding area for any fire hazards. A grass, brush, or forest fire could result from incendiary bullets ricocheting outside the range proper. If feasible, fire tracer ammunition after a rain or when weather conditions (high humidity, fog, or condensation) reduce the fire hazard. Notify the base fire marshal before test-firing with tracers and coordinate these activities with him. Firefighting equipment standing by can prevent fire damage.

NOTE

Do not fire tracers into wooden structures, including target frames or baffles, as they may catch fire.

After the range is safe from ricochets, conduct various courses of fire to check all target-actuating mechanisms, target availability in all positions, the public address system, communications, and all other features of the small arms range. A small arms range must be safe and fully operational before acceptance and use.

SECTION D — MAINTENANCE

34. Requirements.

a. *Facilities.* Maintain small arms range facilities in good operational condition. Target frames, chalkboards, stands, benches, baffles, etc., require a close and regular maintenance program to insure safe conditions and serviceability.

b. Grounds. Range grounds must be neat in appearance. Plant shrubs and grasses not only to control dust, which impairs training, but also to enhance the beauty of the landscape.

35. Programming.

a. Scheduled. Civil engineering programs for range maintenance at least once a year and more often if extensive use of the range makes it necessary. Since scheduled maintenance affects training, control it rigidly. During the maintenance periods, civil engineering:

- Replaces sections or completely overhauls overhead and ground baffles that are no longer effective.
- Surfaces unserviceable range grounds, such as roadways, range floors, etc.
- Contracts an agency to reclaim lead from backstops. The contract must stipulate that the agency must dress the backstops according to definitive instructions.
- Paints all worn wooden surfaces and uses low cost paint on bullet penetration areas.
- Repairs all unserviceable support utilities.

b. Unscheduled. Civil engineering mows the grass, replaces target frames, and performs all other necessary maintenance for day-to-day operations. Civil engineering must comply with all of the above requirements to prevent the deterioration of range facilities. By maintaining range facilities and grounds in good operational condition, it will be unnecessary to expend large sums of money for renovation.

CHAPTER 3

Range Operation

SECTION A — POLICIES

36. Utilization of Range.

a. Military. Military small arms ranges are costly training aids. Installations must make full use of them by getting the greatest possible small arms training return on the money invested. The installation constructing the range is responsible for range scheduling and operation.

In areas where there is a shortage of small arms ranges, Air Force small arms ranges are available for use by other military services. The parent installation programs and uses the range to comply with all training and competition directives. If the range or ranges of the installation can accommodate additional scheduling, active military services, National Guard units, and Reserve components may use such facilities on an "as available" basis. Joint range usage requires close coordination in the scheduling of dates and hours. All units using any range must adhere to local safety policies and be responsible for proper supply discipline, equipment, security, storage, and policing the range.

For small arms ranges being used jointly by two or more military services—rehabilitation, maintenance, and supply may be resolved by local agreement. Air Force small arms training and competitions have first priority on the individual small arms range. After Air Force training and competitive requirements are fulfilled, Air Force range facilities and range personnel are available to assist other military services with their training.

Make the range available during nonduty hours to military personnel and their dependents. However, they must have demonstrated a reasonable state of proficiency and maturity in handling small arms as well as a satisfactory knowledge of safety rules.

b. Civilian. Civilian use of small arms ranges built in part or wholly with funds appropriated by the Congress of the United States is authorized by the United States Code, Title 32, Chapter 12, "Rifle Instruction and Practice for Civilians."

Rifle and pistol clubs, schools, colleges, law enforcement agencies, and other organized units may use Air Force ranges. They may do so only during those times when the ranges are not required for the Air Force or any other military mission. Air Force small arms training and competition receive first priority. Other military services including the National Guard and Reesrve components receive second priority. Organized civilian units affiliated with the National Rifle Association and the Director of Civilian Marksmanship and law enforcement agencies may use ranges when such ranges are not required by military components and when there are no security restrictions. Installations must make every effort to extend small arms training facilities to civilian units, within security limitations. The Director of Civilian Marksmanship may furnish or sell various arms, ammunition, components, targets, and related materials to civilian units affiliated with the NRA. For detailed information on weapons, ammunition, and targets issued and sold to NRA-affiliated clubs and individuals, write the Director of Civilian Marksmanship, Department of the Army, Washington, D.C.

Installations normally require civilians and civilian units to furnish their own weapons, ammunition, and targets for training. In competitions, such as service pistol and rifle matches, and as other competitive rules may direct, civilians may be issued service ammunition. Civilians attending

official service small arms schools, courses of instruction, clinics, or acting in an official capacity as evaluators may be issued weapons, ammunition, target materials, etc., as required for completion of small arms exercises.

Civilian units using Air Force small arms range facilities must exercise good housekeeping policies and procedures. They must return the range to its original condition by policing the area, storing the targets and target frames, refacing the targets used, policing the brass, and by performing other necessary duties.

Where feasible and within personnel limitations, Air Force small arms range instructors should assist in civilian marksmanship activities. They do this by giving instructions in shooting and range operation, and by giving other technical guidance on small arms marksmanship activities.

37. Weapon Authorization.

a. Government Issue. Small arms ranges are often built to accommodate specific calibers or cartridges; therefore, limit range use to these cartridges or to similar or less powerful cartridges. For example, an indoor pistol range that uses a metal deflector plate and sand trap is a small arms range built to specifications, permitting no deviations to types of cartridges fired. If the backstop metal withstands .45 and .38 special ball ammunition velocities only, do not permit the use of a weapon or cartridge that develops higher velocities or foot pounds of energy. Weapons of such potential as the .357 or .44 magnums would probably penetrate the metal backstop, or at least buckle or dent the metal surface, rendering it unsafe for use. The same restrictions apply to the use of armor-piercing (or metal-piercing) bullets of any type. Bullet deflector plates depend on the smooth surface to deflect bullets into a trap or catcher. Any dents or bullet holes in the surface produce unpredictable ricochets, making the range unsafe. If such damage does occur, weld over the holes and then grind them smooth. When damage is extensive in one area, cut the damaged area out, and weld another repair plate in. Use a ground butt weld for this type of repair. To determine the strength of the deflector plate, take a sample of the plate and fire the appropriate ammunition at it. All .22 caliber rimfire ammunition of long rifle or less power fired in a pistol or rifle may be used on all ranges authorizing .22 caliber or larger ammunition. Ban all .22 centerfire cartridges from the range until tests are made with sample backstop material to determine damage or acceptability.

Small arms ranges that use overhead baffles and earthen backstops for safety also have a weapons limitation. All students training with semi-automatic or automatic weapons will use only those weapons that fire cartridges which the baffles can stop.

b. Privately Owned. Privately owned small arms may be fired on Air Force small arms ranges provided they do not exceed the range limitation, are in serviceable and safe condition, and the owners receive permission for the occasion.

Privately owned weapons are often used in high-power rifle, pistol, small-bore rifle, and trap and skeet competitions; rod and gun club events; hunter-safety courses; junior rifle clubs; Boy Scout and Girl Scout practice; etc. These events may include zeroing in of weapons.

Qualified range personnel or some other responsible authority must supervise the use of privately owned weapons on Air Force ranges. ("Other responsible authority" pertains to competitions, rod and gun club events, and other activities where a responsible commissioned officer, NCO, or properly certified civilian assumes the responsibility for range operation.) To be properly qualified and certified, personnel *must have* the following requirements: they are normally assigned range instructors; NRA-certified range officials; NRA-certified instructors; hunter-safety course certified instructors; or similar persons with experience in range safety and the proper conduct of range firing.

Maintain maximum vigilance during the above events to assure that personnel follow all safety procedures. In many instances, personnel at such events include dependents or civilians who are not familiar with military small arms safety measures. It is the responsibility of instructors, safety personnel, and those managing the event to brief participants on operating procedures, methods, and commands. Identify all officials by using distinctive arm bands, insignia, etc. Use the public address system to further identify officials and to remind the participants that each official needs their cooperation. Failure to cooperate or adhere to instructions are causes for removal of offenders. All personnel on the range property are under the control of the range official, including spectators.

These events which civilians attend offer excellent opportunities for small arms range instructors to better educate the public in the safe handling of weapons. They can also create a better relationship between the Air Force and the public. In the best interests of the service, use tact and courtesy when handling civilian personnel at such events. The discipline, demeanor, and deportment of Air Force personnel during these events must be in the highest traditions of the Air Force.

The firing of privately owned weapons will take place only if the range is made available and at times that do not conflict with military training requirements.

Do not allow privately owned weapons to be fired if they are unsafe or in a questionable condition.

The range backstop must stop any bullets coming from privately owned weapons. As previously discussed, a pistol range backstop deflector plate designed to withstand .45 automatic and .38 special cartridges is damaged by .357 or .44 magnum ammunition. Ban the use of these cartridges in factory loads from the range. For safe use, load magnum weapons with hand loads or reduced velocity ammunition that does not exceed specifications for the range. It is the responsibility of range personnel to determine whether cartridges have been reduced enough in power to permit their use with the backstop. Consult commercial ballistic tables for velocities and energies and compare these with those of authorized service ammunition. Commercial ballistic tables are available, on request, from the various ammunition manufacturers. Consult T. O. 11A13-1-101, *Small Arms Ammunition,* for service ammunition ballistics.

38. Ammunition Authorization. Small arms ammunition is that ammunition which is used in weapons having a bore of 0.60 inch or less, such as rifles, pistols, carbines, revolvers, machineguns, and shotguns. Even though precautions and instructions for the care, handling, and use of this ammunition are intended for peacetime, follow such directions, if practicable, at all times. The cartridge is a complete assembly consisting of all the components necessary to fire the weapon once (the bullet, cartridge case, propellent powder, and primer). The term, bullet, refers only to a small arms projectile. The primer, in cartridges that contain the primer in the center of the cartridge case head, refers to the cartridge ignition unit. The primer assembly consists of a cup, primer composition, paper disk (foils), and the anvil, as shown in Figure 23. The propellent powder is the powder in the cartridge case between the primer and the bullet. When ignited by the primer, the powder burns rapidly (does not explode), forcing the bullet through the bore of the barrel. Shotgun shell, shotgun cartridge, shot shell, or shot cartridge refers to a type of cartridge generally used in shotguns. It contains a quantity of lead shot instead of a bullet projectile. To agree with standard nomenclature, this manual uses the term "shotgun shell." There is a special caliber .45 cartridge that contains pellets and is known as a "shot cartridge." The charge or load of a shotgun shell consists of shot or pellets, a single ball, or a single cylindrical slug.

a. Service Issue.

(1) GENERAL. Federal Stock Catalog (FSC) 1300 establishes a standard nomenclature which completely describes the ammunition as to type, caliber, and model. The use of standard nomenclature is mandatory for all purposes of record.

Small arms cartridges, based upon type of case, are either centerfire or rimfire. Caliber .22 cartridges are the only current rimfire type used for military purposes. Centerfire cartridges are rimless, semi-rimmed, or rimmed, as shown in Figure 24. According to use, small arms ammunition is classified as service or special, as follows:

SERVICE

Ball, for use against personnel and light materiel targets.

Armor-piercing, for use against armored aircraft and lightly armored vehicles, concrete shelters, and other bullet-resisting targets.

Incendiary, for incendiary effect, especially against aircraft.

*Tracer, f*or observation of fire. Secondary purposes are for incendiary effect and signaling.

Armor-piercing-incendiary, for combined armor-piercing and incendiary effects.

Armor-piercing-incendiary-tracer, for combining the three effects.

Shot, for hunting small game. Shot sized from BB through OO buckshot are normally used for guard duty or for larger game at short range.

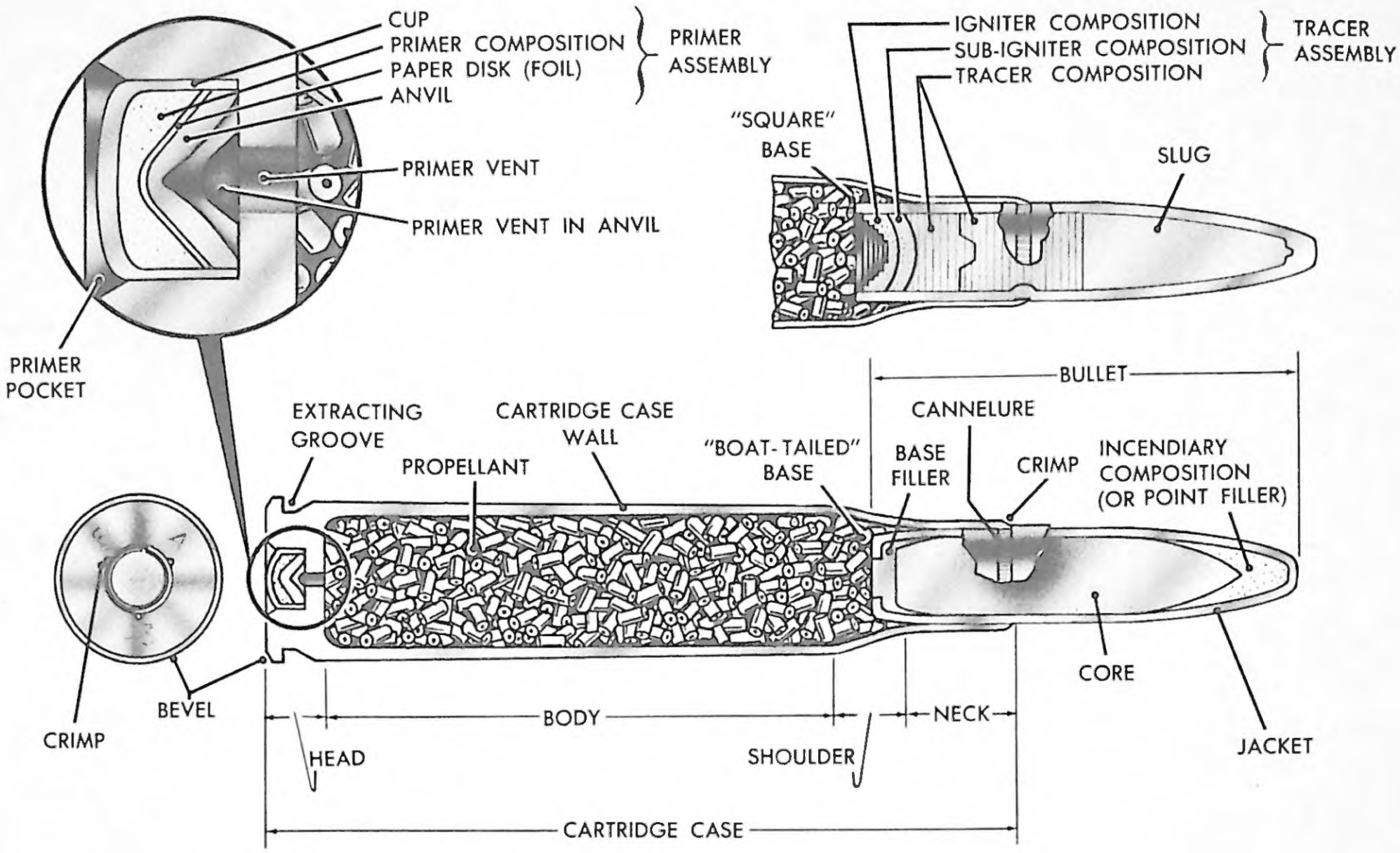


Figure 23. Cross Section of Typical Small Arms Ammunition and Primer Assembly

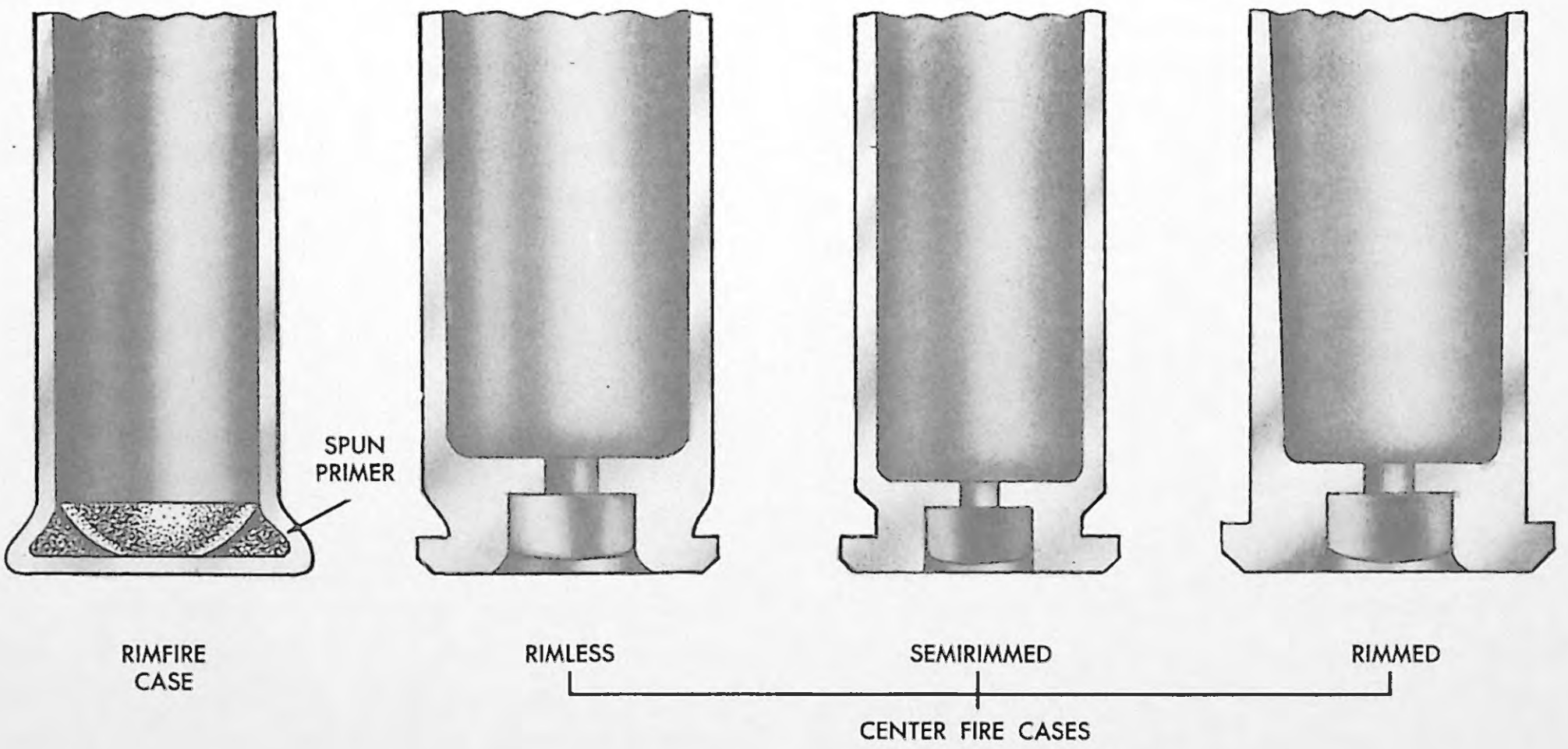


Figure 24. Centerfire Cartridge Head Classifications

Shotgun shells, for guard purposes, target practice, and hunting.

Grenade cartridge, (contains no bullet or projectile), for projecting rifle grenades.

SPECIAL

Blank, (contains no bullet or projectile), for simulated fire, salutes, sentry dog training, etc.

Dummy, (completely inert), for training.

High-pressure test, for use only in proof firing of weapons and barrels.

Subcaliber, for use in subcaliber weapons.

Frangible, (bullet disintegrates upon hitting target), for target practice against aircraft.

Match, for competition (specifically prepared and selected lots of ammunition that insure a high degree of accuracy when fired in specially designated weapons).

Normally, use service issue ball and match grade ammunition for small arms training and competitions respectively. AFR 50-22, *Ammunition Allowances for Individual Training and Pellet Training Authorizations*, contains ammunition authorization for individual training and competitions. This regulation also lists stock numbers, nomenclature, and quantities for requisition of service issue ammunition. All small arms range specifications for backstops, impact areas, baffles (ground, overhead, and side), and bullet traps are based on the issue sevice cartridge and its ballistic performance. Use of ammunition other than ball, such as tracer, incendiary, or armor-piercing is unsafe except for controlled tests for a specific purpose. Range personnel must take all of the necessary precautions to insure the safety of personnel and property while performing such tests. It is safe to use armor-piercing cartridges, instead of ball, if impact areas are used in place of backstops. Armor-piercing projectiles generally penetrate deeper than ball bullets. Before firing armor-piercing ammunition, make sure the backstop will contain the bullets. Most earthen mound backstops will stop armor-piercing bullets, but use caution with crib backstops that contain several feet of earth. Figure 25 gives penetration specification for small arms ammunition.

Cover	Thickness in inches, (To and including all caliber .30)
Concrete	4
Sandstone or granite soil	6
Broken stone	20
Dry sand	24
Wet sand	36
Logs wired together (oak)	40
Earth, packed or tamped	48
Undisturbed compact earth	52
Earth, freshly turned	56

Figure 25. Minimum Cover Thickness for Positive Protection from Small Arms Ammunition

Type of cartridge	Color band
Ball	Red.
Blank	Blue.
Dummy	Green.
Gallery practice	Brown.
Guard	Orange.
High-pressure test	Yellow.
Armor-piercing	Blue on yellow.
Tracer	Green on yellow.
Incendiary	Red on yellow.
Rifle grenade	2 blue bands ½ inch wide, ½ inch apart.
Armor-piercing and tracer	Blue, yellow, green (3 stripe band).
Ball and tracer	Yellow, red, and green.

Figure 26. Color Bands on Packing Boxes

Issue ball ammunition has a plain tip bullet. Other types of bullets, such as armor-piercing, tracer, incendiary, etc., have various colors painted on the bullet tips. Attachment 15 gives the color designaations for different types of bullets, and T. O. 11A13-1-101 has plates showing the different types in color. As shown in Figure 26, packing boxes have color bands which identify the ammunition therein. Unless it is issue ball, do not issue ammunition for firing on the range until the type is determined and the range officer or NCOIC declares it safe for use. In addition to the danger of highly penetrating armor-piercing bullets, tracer and incendiary bullets present a fire hazard. They can start a fire in any combustible substance. Use issue ball ammunition in match grade competition weapons. A match grade weapon may be an ordnance arsenal grade weapon, a commercial competitive grade weapon, or a match or premium grade weapon drawn from the USAF Marksmanship School. Match grade weapons are defined in AFR 65-7, *USAF Marksmanship Weapons and Equipment (Match Grade)*. Fire ball ammunition only in any match grade competitive weapon, using

only service issue match grade ammunition or commercial match grade ammunition. Do not fire tracer, incendiary, or armor-piercing ammunition in these weapons. Check the ammunition allowances for individual training in AFR 50-22. Do not fire service ammunition manufactured before 1953 in match grade weapons under any circumstances. The year of manufacture is stamped on the cartridge case head. Do not fire corrosive primer ammunition in match grade or competitive weapons.

(2) GRADES AND USES. Ammunition is manufactured to rigid specifications and is inspected and tested thoroughly before acceptance. Since rifles, ground machineguns, aircraft machineguns, etc., have different requirements, production orders and specifications call for the classification of lots for use in specific weapons. Because of mass production of ammunition, variations in manufacture may occur. Considering variations from lot to lot and the different requirements for each type of weapon, grades are assigned for their use in the different types of weapons. Serviceable grade designations do not signify that one grade is better than another but that a certain grade is better for some particular class of weapon.

Ammunition inspections establish the current grades of all existing lots of small arms ammunition, and T. O. 11A13-1-3. *Small Arms Ammunition Lots and Grades*, as amended, lists them. Grades are not marked on packing boxes or on slips inside the box. Do not issue or fire any lot other than that of the grade appropriate for the weapon, as specified in T. O. 11A13-1-3, as amended.

The grades for caliber .30 ammunition are as follows:

AC—aircraft and antiaircraft machineguns.

ACorR—aircraft and antiaircraft machineguns and rifles.

R—rifles.

MG—ground machineguns.

3—unserviceable, not to be issued or used.

The grades for caliber .30 carbine ammunition are as follows:

R—carbines.

3—unserviceable, not to be issued or used.

The grades for caliber .50 ammunition are as follows:

AC—aircraft and antiaircraft machineguns.

MC—ground machineguns.

3—unserviceable, not to be issued or used.

The grades for caliber .45 ammunition are as follows:

1—revolvers, pistols, and submachineguns.

2—pistols and submachineguns only (when available issue this grade for these weapons in preference to grade 1).

3—unserviceable, not to be issued or used.

It is permissible to authorize more than one grade for certain weapons. For example, grades ACorR, AC, and R may be used for ground machineguns, and grade MG or R used for antiaircraft machineguns. Grades R and ACorR may be used in rifles. Check T. O. 11A13-1-3, as amended, for authorized substitutes.

When small arms ammunition become unserviceable, designate it as grade 3 and withdraw it from service. Ammunition that cannot be identified by lot number is considered as grade 3. Before classifying ammunition as unserviceable, make every effort possible to establish its identity. Limited use can be made of ammunition placed in grade 3 because the lot number has been lost. However, it must be identified as having been in serviceable lots issued to a specific organization. The use of this ammunition is limited to local training with caliber .30 carbines, caliber .45 submachineguns, and with caliber .30 and caliber .50 ground machineguns (see T. O. 11A13-1-3).

The only two grades of small arms ammunition suitable for use in the infiltration course are grades AC and ACorR.

Do not, under any circumstances, fire small arms ammunition which has been graded "for training use only" over the heads of troops.

(3) GRADE 3 AMMUNITION AT AIR FORCE INSTALLATIONS. Ammunition of caliber .30 and caliber .50 which has become grade 3 because a proper record of its lot numbers has not been kept, falls into the following three classifications:

- Ammunition identified as serviceable lots issued to a specific organization. This category includes caliber .30 and caliber .50 ammunition lots which are serviceable and suitable for use in machinegun training. After a visual inspection to eliminate defective rounds, reissue these rounds for

immediate use to such units as directed by the senior commander at the station. Use this ammunition for local training with ground machineguns, only.

- Ammunition that is not identified as grade 1. Designate this ammunition as "Grade 3 Ammunition Due to Loss of Identity."
- Ammunition regraded to grade 3 by direction of the Air Force Inventory Manager (OOAMA) during the period that such lot or lots have been in the possession of the organization that returns it. Designate this ammunition as "Grade 3 Ammunition."

(4) IDENTIFICATION. The type, caliber, model, and ammunition lot number, including the symbol of the manufacturer, are necessary for complete identification of small arms ammunition. Except for lot number, the ammunition can be identified from the appearance of the cartridge, from the painting on the cartridge, or from the stamping on the base of the cartridge case. The manufacturer's initials and year of manufacture are stamped on the base of the cartridge case. For example, "FA 55' means that the Frankford Arsenal loaded the lot in 1955. The manufacturer stamps the ammunition with a "5" or "55" to indicate that 1955 was the year of manufacture. On lots manufactured before 1940, the caliber is also stamped on the base of some cartridge cases. National match ammunition has the initials "NM" stamped alongside the date of loading.

Ammunition may be identified from the markings on the original packing boxes and cartons, as indicated in Figure 26. A repacked reference data card inserted in each packing box containing repacked lots of ammunition identifies the ammunition. As shown in Figure 27, manufacturers stamp the pockets of bandoleers. Web belts are stamped with the repacked lot number.

(5) MODEL. To distinguish a particular design, a model designation is given to ammunition. The model designation becomes an essential part of the standard nomenclature of the item and one of the means of identification. The present system of model designation is to use the letter M followed by an Arabic numeral, for example, CARTRIDGE, ball, cal. .50, M2.

(6) AMMUNITION LOT NUMBER. When ammunition is manufactured, it is given an ammunition lot number in accordance with pertinent specifications. The lot number is on all packing boxes containing carton-packed cartridges, on the cartons packed therein, and on the repacked reference data card inclosed in each packing box containing repacked lots. The lot number is required for all purposes of record and for all ammunition reports.

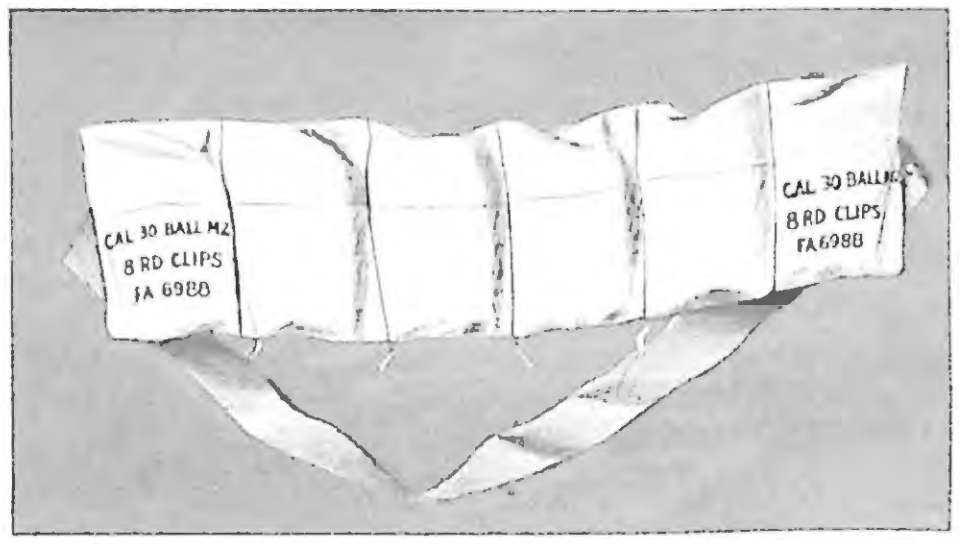


Figure 27. Bandoleer M1

Cartridges for which the ammunition lot number has been lost automatically become grade 3. Therefore, when removing cartridges from their original packing, mark them to preserve the ammunition lot number or the repacked lot number.

The letter "S" appearing before the serial number of the lot number indicates a steel cartridge case. Older lots containing steel-cased rounds may have the letter "X" at the end of the ammunition lot number. Ammunition lots having gilded metal-clad steel or copper-plated steel jackets may have the letter "C" following the lot number.

(7) REPACKED LOT NUMBERS. Ammunition packed in web belts and metallic link belts may consist of more than one type of cartridge. This would require two or more lot numbers marked on packing boxes and entered in the records. To offset this, the repacker replaces the original ammunition lot numbers with a single repacked lot number. He then marks the repacked lot number on the packing box or crate and on the repacked reference data card inclosed in the box.

The repacked lot number consist of the words "REPACKED LOT," the repacker's initials, the letter "B" or "L" indicating belted or linked cartridges, and the serial number assigned by the repacker. Each such serial number may be assigned to one lot each of caliber .30 and caliber .50 repacked ammunition. Lots of caliber .30 ammunition in 8-round clips are identified by the original ammunition lot numbers bearing the letter "C" be-

tween the manufacturer's initials and the serial number.

(8) REPACKED REFERENCE DATA CARD. A repacked reference data card is inserted in each ammunition box containing cartridges in clips, web belts, and metallic link belts. This card lists the ammunition lot or lots comprising the repacked lot and the ratios of packing.

(9) AMMUNITION IN BANDOLEERS. Cartridges in 8-round clips packed in bandoleers have the ammunition lot number, caliber, type, model of ammunition, and the type of functional packing stamped centrally on the end pockets of each bandoleer, as shown in Figure 27.

(10) IDENTIFICATION OF AMMUNITION TYPES. Generally, all types ammunition of one caliber have the same profile. Except for ammunition lot number and grade, identify these types by the physical characteristics outlined here and illustrated in Attachment 15. Be careful not to confuse original markings with any subsequent markings made with lithographic marking ink which is used for an entirely different purpose. As Attachment 15 shows, the colored tips of bullets identify the type of ammunition.

Only high-pressure test cartridges have a tinned cartridge case.

Blank or grenade ammunition have no bullets. The grenade cartridge is easy to identify by the rose petal crimp of the case mouth. The blank cartridge has a sealed mouth with a paper cup, disk, or wad.

CAUTION

The blank cartridge should not be confused with CARTRIDGE, shot, cal. .45, M15, which is also sealed with a paper disk.

Drilled holes in the cases indicate dummy cartridges. In addition, dummy cartridges of recent manufacture have empty primer holes; those of older manufacture have inert primers.

(11) IDENTIFICATION OF ALTERNATIVE AMMUNITION TYPES. These are indicated on ordnance drawings, packings, and certain records as "Alternative," for example, "CARTRIDGE, ball, cal. .30, M2 Alternative." Although this designation is on some packing boxes for purposes of issue and use of ammunition lots, disregard the word "Alternative."

NOTE

Set T. O. 11A13-1-101 for ammunition packaging details.

(12) CARE, HANDLING, AND PRESERVATION. Compared with other types of ammunition, small arms ammunition is not dangerous to handle. However, be careful not to break or damage boxes; repair all broken boxes immediately. Transfer all markings to the new parts of the broken box. If a metal liner is present, air-test and seal it, provided the proper equipment is available. Open boxes carefully so that they will remain serviceable for long use. Do not open an ammunition box or metal can nor break a metal liner until the ammunition is required for issue or use. Ammunition removed from airtight containers is apt to become unserviceable from corrosion. This is especially true in damp climates.

After a box of ammunition is opened and cartridges issued, each man must take care of his own ammunition. Protect the primer from blows by sharp instruments which might explode the cartridge. Also, protect ammunition from mud, sand, dirt, and water. If it becomes wet or dirty, wipe it off immediately. If verdigris or light corrosion forms on cartridges, wipe them off with a dry wiping cloth. However, do not polish cartridges to make them look better or brighter. The use of abrasives is forbidden. Do not expose ammunition to the direct rays of the sun for any length of time. Heated powder results in excessive pressure when the bullet is fired and affects the performance of the ammunition. The use of oil or grease on cartridge cases is prohibited. Greasing or oiling cartridges used in machinegun and automatic arms causes a collection of dust and other abrasives that damage weapons. Grease or oil on cartridge cases or on the walls of the chamber in nonautomatic rifles creates excessive and hazardous pressure on the rifle bolt. This may result in damage, such as that described in T. O. 11W3-1-2, *Small Arms Accidents, Malfunctions, and their Causes.* An oiled cartridge case does not adhere to the weapon chamber. During firing the case expands and then slips back, causing the bolt to receive too great a rearward thrust. Use a clean, dry wiping cloth to remove oil or grease from cartridges. Apparent

exceptions are the caliber .22 and caliber .38 lead bullets; however, only the bullet is waxed or greased at issue. When taking cartridges from cartons to load into belts or clips, tag the belts or clips or mark them with the ammunition lot number. This prevents serviceable ammunition from being placed in grade 3.

Store and stack small arms ammunition according to type and ammunition lot number. Use extreme care to prevent the mixing of ammunition lots in one stack. When small arms ammunition is received, issued, checked, stacked, or restacked, reliable personnel must check the ammunition lot number on each box.

Whenever practicable, store small arms ammunition under cover. This applies particularly to tracer and shotgun ammunition. Tracer ammunition deteriorates rapidly when damp and may even ignite spontaneously. Shotgun shells are usually not packed in waterproof metal-lined boxes except for overseas shipment. Even though small arms ammunition is packed in metal containers in wooden boxes, tests have shown that leaks may develop during handling and shipping. Though small, the leaks admit moisture when the ammunition is exposed to weather or extreme variations in temperature. If it becomes necessary to leave small arms ammunition out-of-doors, raise the stack at least 6 inches from the ground, and cover it with a double thickness of serviceable tarpaulin. Position the tarpaulin to give maximum protection to the ammunition and also to allow the air to circulate freely. Dig drainage trenches to prevent water from flowing under the stack. Protect small arms ammunition in storage from extreme heat to avoid decomposition of the propellent powder. The combination of high temperature and a damp atmosphere is particularly detrimental to the powder. When only a portion of a box is used, protect the remaining ammunition against unauthorized handling and use by fastening the cover firmly in place. Small arms ammunition is not an explosive hazard in storage although under adverse conditions it may become a fire hazard.

(13) PRECAUTIONS IN FIRING SERVICE AMMUNITION. Observe the general precautions outlined in the definitive for firing ammunition on "impact" ranges. The precautions given in the following paragraphs are particularly applicable to small arms ammunition.

- Do not fire any small arms ammunition, other than blank ammunition, caliber .22 cartridges, and shotgun shells, unless it has been positively identified by ammunition lot number and grade, as published in the latest revision or change to T. O. 11A13-1-3.
- When using armor-piercing ammunition, remember that bullet cores rebound when they fail to penetrate the target. The radius of rebound depends on several factors but is safe at a maximum of 100 yards for caliber .30 and 200 yards for caliber .50.
- Before firing, make sure that the bore of the weapon is free from foreign matter, such as cleaning patches, mud, sand, and snow. This may prevent an injury and also prevent damage to the weapon.
- If a bullet lodges in the bore of a rifle, pistol, or machinegun, remove it by applying pressure from the muzzle end of the weapon. Do not attempt to shoot the bullet out; to do so is dangerous and is prohibited.

(14) MISFIRES AND HANGFIRES. Because a hangfire cannot immediately be distinguished from a misfire, it is unsafe to open the bolt or action of the weapon for at least 15 seconds after a misfire occurs. If the weapon cannot be manually recocked without opening or unlocking the breech mechanism, allow 15 seconds to pass. The malfunctioning round can then either be ejected or cleared. If the weapon can be manually cocked without unlocking the weapon, recock it and attempt to fire it again after the 15-second waiting period. For safety, keep the muzzle of the weapon pointed in a safe down-range direction during the 15-second waiting period and while it is being recocked or the round rejected. Maintain the same control over the weapon as during normal firing, just in case the misfire proves to be a hangfire.

(15) PROPELLENT POWDER. The volatile material in smokeless powder is composed of residual amounts of solvent (alcohol-ether mixture) and moisture. Finished powder has a certain amount of residual solvent to insure toughness of the colloid and also to retard decomposition of the powder. Grains that have lost a considerable part of their residual solvent become brittle and burn faster, resulting in high pressures and erratic performance.

The amount of moisture powder absorbs increases with the humidity in the atmosphere. Therefore, a percentage of moisture is left in the

finished powder to minimize changes in moisture content of powder, resulting from changes in the atmosphere. By keeping the solvent and moisture content constant, changes in pressure and velocity are avoided. Therefore, always keep smokeless powder tightly sealed either in fixed ammunition or standard packing containers. Storage in a damp atmosphere causes powder to absorb moisture resulting in deterioration, especially in hot climates.

The weight of charge for a given lot of powder is usually established by test firings with a powder temperature of 70° F. The weight of charge determines the muzzle velocity of the bullet. When the temperature of smokeless powder increases, the powder burns faster and consequently produces a greater muzzle velocity. An increase in temperature above 70° F. increases the standard muzzle velocity, and a decrease in powder temperature below 70° F. decreases the standard muzzle velocity. Because it is not always possible to have the powder temperature at exactly 70° F., there are velocity corrections for temperature variations. The change in velocity per Fahrenheit degree is approximately 1.5 feet per second for pyro DG powder and 1.7 feet per second for coated powder.

The life of powder, or the period of serviceability varies from about 5 to 20 years or more, depending upon the care used in its manufacture and storage. Smaller grains decompose more rapidly than larger grains. Powder emits heat during decomposition, making it unsafe to store because of the danger of spontaneous combustion. The accumulation of such heat further increases decomposition which produces more heat until the ignition temperature is reached.

(16) REPORT OF ACCIDENTS. Promptly report any serious malfunctions of ammunition to the ammunition officer who supervises its maintenance and issuance. This will permit a prompt investigation to eliminate the danger so that a reliable supply of ammunition can be maintained. Give immediate and detailed reports of dangerous malfunctions, such as hangfires in rifles, so that use of the ammunition lot can be temporarily discontinued. Immediately after an accident, collect and preserve all parts of the gun, the cartridge case, and the remaining cartridges in the box, pending instructions from the ammunition officer or the board appointed to investigate the accident. AFR 127-4, *Investigating and Reporting USAF Accidents/Incidents,* requires the range officer or range NCOIC to make an immediate report of the accident or incident. In making reports of malfunctions, give as much of the following information as possible to the ammunition officer:

(a) Data pertaining to weapon.

- Caliber, type, model.
- Air Force Form 105.
- Name of manufacturer (plant or arsenal).
- Range distance.
- Condition of weapon before malfunction.
- Description of weapon after malfunction (including any photographs, sketches, and measurements of important features).
- Number of rounds fired in weapon on day of malfunction.
- Total number of rounds fired in weapon to date.
- Any other pertinent information that is available.

(b) Ammunition markings.

- Standard nomenclature (type, caliber, and model).
- Manufacturer.
- Lot number or repacked number (given on outside of packing box).
- Lot number (as shown on bandoleer or bandoleer ticket, machinegun belt or belt tag, or carton).
- Initials marked on head of cartridge case.
- Method packed (whether in bandoleers, metallic link or web belts, or cartons).

(c) Visual inspection.

- Total number of rounds visually inspected.
- Number of season cracks found out of total number of rounds inspected.
- Condition of case as to corrosion and cause of corrosion—either stains (due to metal strains) or actual verdigris formed above the surface of the cartridge.
- Number of bullets that can be extracted by hand from the cartridge case.
- Condition of box and metal liner.
- Other defects, such as deformed cartridge cases.
- Quantity remaining on hand of a particular lot.

(d) Firing data for defective lot of ammunition.

- Approximate number of rounds fired.
- Number of hangfires and approximate time of each.
- Number of blown-out primers (also gas leaks or punctures).
- Number of cartridge cases failing to extract normally.
- Number of cartridge cases which were difficult to extract normally.
- Number of ruptured cartridge cases.
- Number of shots failing to reach target.
- Number of shots failing to leave bore.
- Condition of storage (type of building, proper separation by spacers).

(d) Details of accident.

- Name of man firing weapon.
- List of eyewitnesses.
- A detailed description of the accident, and other pertinent data not covered above.

b. Commercial. Commercial ammunition is frequently used in issue service weapons. See AFR 50-22 for authorized local purchase of ammunition. Locally purchased ammunition is either in match grade, not normally stocked at ordnance depots, or in calibers of limited use that do not warrant central procurement and depot stocking.

All commercial .22 caliber, .38 special, and .45 automatic cartridges have noncorrosive primers. With the exception of various Air Force activities that are authorized special weapons and weapons testing, the above calibers are all that an Air Force installation normally requires through local purchase.

After obtaining all locally purchased small arms ammunition required for training and competitions, warehouse it in the installation's designated small arms ammunition storage facility. Compute stock levels from consumption figures, and use the same issue and accounting procedures as used for regularly issued service ammunition.

The range officer or NCOIC assures proper programming and funding for local purchase of small arms ammunition during each funding cycle. Previous annual consumption of ammunition plus programmed increases or decreases in training and competition provide a basis for estimating forthcoming local purchase requirements.

Installations must maintain adequate quantities of match grade locally purchased ammunition to support competition and competition training. See Section B of AFR 50-8 and AFR 50-22.

Three types of .22 long rifle rimfire ammunition are normally used in small arms training and competition. These are standard velocity, match grade rifle, and match grade pistol. Standard is "off the shelf" .22 long rifle ammunition, and it is readily available. The standard velocity .22 long rifle cartridge maintains a velocity and trajectory that closely approximate those of the match grade rifle and match grade pistol cartridges. The primary difference between match and standard velocity ammunition is that a more critical quality control is exercised on components and assembly of match grade ammunition to insure greater accuracy. Do not use high speed or high velocity .22 long rifle ammunition for training, and never use it in match grade weapons. Changing from a high velocity or high speed cartridge to a lower speed match .22 cartridge requires unnecessary and excessive sight adjustment. Standard velocity .22 ammunition requires little or no sight adjustment when changing from standard velocity to match grade ammunition.

Installations must assure that proper ammunition for competition and competition training is available. This places Air Force personnel on a par with other military and civilian units equipped with the most accurate match grade ammunition available. Any attempt to use other than match grade ammunition in competition makes a loss almost certain. The lack of proper match grade ammunition, resulting in poor competition scores, is false economy after the cost of equipment, training, and TDY to field a winning team.

All competitions and competition training require pistol match grade ammunition and rifle match grade ammunition. The quality control that goes into the manufacture of match grade ammunition makes it more accurate than other .22 long rifle ammunition.

NOTE

Pistol match is designed for pistol, and rifle match for small-bore rifles. The two types are not interchangeable in the two weapons; each is designed for its respective weapon and may cause malfunctions in the other.

SECTION B — PERSONNEL REQUIREMENTS

39. Range Personnel.

a. Range Officer. All Air Force installations that possess or use a small arms range must appoint a commissioned officer as small arms range officer. Senior or chief master sergeants may perform this duty when deemed appropriate. The small arms range officer is appointed by the appropriate commander, who in turn is responsible to the installation commander for programming, maintenance, and use of all small arms ranges on the installation. The small arms range officer must possess a good working knowledge of weapons and ammunition. Knowledge, interest, and experience in small arms range operation, small arms competition, and ammunition handloading are desirable. The range officer assures that all marksmanship training equipment and supplies are properly budgeted during the annual budget cycle. He corrects unsafe practices on the spot and contacts commanders of personnel who are dismissed from the range, stating the circumstances. Where feasible, the range officer is a nonflying officer assigned to the range on a full-time basis. Commanders who do not assign a range officer on a full-time basis must assure that the officer filling the position can devote adequate time to this duty, so as not to reduce the effectiveness of marksmanship training. Also, the small arms range NCOIC and other assigned personel must be well qualified and competent to complete all phases of marksmanship training during the absence of a part-time range officer. The range officer requests quotas and programs range personnel to attend Marksmanship Instructor (Rifle and Pistol) Course ALR75330. He also procures enough qualified range instructors to comply with marksmanship training directives.

The range officer, in conjunction with ground training units, programs new small arms ranges, range modifications, and range rehabilitation. He makes sure that this programming is commensurate with the installation's mission, manning, weapons authorization, and current small arms training directives. He evaluates the condition of the range or ranges and makes arrangements for maintenance and repairs as necessary. He monitors the scheduling of marksmanship training and range utilization and advises training units of range availability. He represents the small arms range section during all meetings or committee actions on the ranges assigned to him. The range officer periodically observes firing to assure proper procedures and safe practices. Commanders will appoint additional range officers, as required, during special events, such as small arms competitions, and weapons testing and evaluation.

b. Range NCOIC. All Air Force installations that possess or use a small arms range or range system require the appointment of a noncommissioned officer as small arms range NCOIC. He must be a graduate of the Marksmanship Instructor (Rifle and Pistol) Course ALR75330 or AAR 75330. It is desirable that he have previous experience operating a range and that he be familiar with weapons and ammunition. Knowledge of small arms competitions and ammunition handloading is desirable. He must be competent and reliable. During the absence of the range officer, he may have to act as range officer and conduct firing. He should have some knowledge of supply and administrative procedures.

After his appointment by the appropriate commander, the range NCOIC is responsible to the small arms range officer. He assists the range officer in the execution of his duties and responsibilities. Specific duties of the small arms range NCOIC are as follows:

- Conducts firing.
- Determines and effects required maintenance.
- Requisitions weapons, parts, ammunition, targets, materials, and other necessary supplies.
- Supervises and gives OJT to other range personnel.
- Prepares material consumption lists for budget programming.
- Enforces safety procedures on all small arms ranges, including the removal of any personnel from the firing line for unsafe practices.
- Coordinates availability of range and student quotas with training units.
- Provides technical advice on range programming and construction, training, and competitions.
- Assists competition project officer in small arms competition training and competitions.

The small arms range NCOIC or another range NCO may be appointed range officer and conduct firing in the absence of the commissioned range officer. With two exceptions, NCO s must be graduates of the Marksmanship Instructor (Rifle

and Pistol) Course ALR75330 or AAR75330 to conduct or supervise small arms range firing at such times. An air police supervisor, AFSC 77170, may conduct training for Air Police only when insufficient or no 753X0 personnel are available. Within OSI, qualified OSI personnel may also conduct training for OSI when 753X0 personnel are not available.

c. Other Personnel. In accordance with Chapter 8, AFM 50-15, small arms training requires well-qualified marksmanship instructors. Personnel assigned to any small arms range should be familiar with, or show a strong desire to become familiar with, small arms ammunition and training.

Personnel assigned to small arms ranges instruct officers and other airmen in the correct use of their assigned weapons. To satisfactorily perform these duties, they must speak clearly and distinctly. All range instructors must complete the Marksmanship Instructor (Rifle and Pistol) Course ALR75330. Personnel assigned to small arms ranges must meet the course entrance requirements contained in AFM 50-5, *USAF Formal Schools Catalog*.

Except for work details or special projects, such as small arms competition, personnel of the small arms range should be permanently assigned. These personnel are responsible to the small arms range officer and NCOIC, assisting them, as directed.

40. Support Personnel.

a. Military Training. A small arms range or range system properly manned with well-qualified personnel does not generally require additional support personnel during normal operations. For safe and efficient range operation, assign an instructor to each block of seven firing positions. The instructor observes the trainee for safety practices, answers technical questions, gives on-the-spot training and assistance, clears malfunctions, and relays the operating information about his block to the range officer or person conducting the firing. Rather than watch each individual on the firing line, it is easier for the range officer to watch block officers. If there are not enough range instructors, use only those firing positions that instructors can supervise.

b. Competition. During annual qualification programs, encourage individuals to fire the best possible score. The highest scoring shooters can then represent their organizations at a base "shoot off" event to determine which unit has the best shooters. Authorize awards for these individuals and use nonappropriated fund sources, such as squadron funds, and the commander's welfare fund. This added attraction to annual qualification programs provides increased incentives. Also, the information gained from such programs is valuable when forming base rifle and pistol teams.

SECTION C — RANGE PROCEDURES

41. Pit Operations.

a. Briefing. Make sure that all personnel who occupy a target pit during firing are given instructions in the proper and safe methods of operating the targets. Target operation during firing cycles is safe if several basic safety rules are followed.

Annual recurring training conducted on target-pit ranges requires half of the trainees to pull targets while the other half of the class fires. Give these trainees a thorough briefing before target operation.

Select target pit details for competitions several days before scheduled events. Instructors then give them classroom training and training in actual target pit operations. The day before scheduled matches is usually set aside for practice. This gives range personnel a chance to review the target pit detail in action and to correct all deficiences in operation.

(1) SAFETY. Before target operation, brief personnel on the following safety rules:

- Never expose yourself to the firing line after entry into the target pits without permission of the target pit officer or NCOIC.
- Never proceed behind the targets during a firing cycle or without permission of the target pit officer or NCOIC.
- Where combination targets are used, operate both targets by actuating the front target. Never reach through the frame and actuate the rear target.

(2) DUTIES. The briefing before target operation should include the following duties:

- Target hanging.
- Target changing and repair.
- Scoring.
- Communications.

b. Displaying Warning Flags and Lowering Targets. The first person to enter the target pits

immediately raises the target pit flags located at each end of the target pits. (See paragraph 27 and Figure 13.) A raised flag warns the firing line that someone is in the target pits. The last person to leave the pits hauls down and stores the flags.

In case of emergency, use the telephone service between the target pits and firing line. However, if the telephones are inoperative, lower the targets into the target pits to signal an emergency. The range officer then effects an immediate cease fire and proceeds to the target pits to determine the trouble.

c. Establishing Communications. As soon as the flags are raised, detail personnel to connect the field telephones to establish communications with phones located on the firing line. This is necessary for safety, proper execution and command of courses of fire, and scoring. Do not expose yourself to the firing line until the firing line is all clear (weapons grounded, shooters off the firing line). The range officer or telephone operator (upon command of the range officer) informs the target pit of the clear firing line. If requested to do so, the target pit detail may then expose itself above the surface of the pits. If telephone service is interrupted, complete the course of fire before ceasing the fire, clearing the firing line, and repairing the trouble. (See TA 915 for communications equipment.)

d. Servicing Targets. Replace or repair targets as necessary. Each day before closing the small arms range, the range NCOIC assures that he has adequate targets of the proper type, size, and condition for the next day's firing cycle.

After raising the target pit flags and connecting the telephones, have the target pit detail get the targets from the target storage shed and hang them on the carriers. Distribute the necessary spotters and spindles, markers, black and white pasters, flags, etc., to all firing points that are in operation. (See Attachments 4 and 5 for correct sizes, necessary amounts of spotters, etc., for the various courses of fire.) Pasters come 500 to the roll, and one roll of black and one roll of white pasters per target are adequate. Also, use one flag per target for signaling misses. Make this flag locally by tacking the 24-inch by 36-inch fly red danger flag to a marker staff. (See Attachment 5 for marker staff and flags, dimensions, and specifications.)

The course of fire determines the target servicing requirements. The target pit officer or NCO informs the pit detail of the forthcoming courses of fire and target service required. For example, slow fire, ten rounds, pull targets, score and paste after each shot; or rapid fire, ten shots, raise and pull targets on command only. The range officer informs the target pit officer or NCO of the next course of fire and also of special requirements or instructions.

42. Firing Procedures. Before opening the range for firing, the range operating official makes certain that the range and impact areas are clear.

a. Briefing. Before firing begins, range personnel are to brief all personnel scheduled to fire a course or string of fire. Make this briefing short, and it should include, but is not limited to, course of fire, positions used, time limits, and so forth. Be sure to include safety in this briefing, re-emphasizing the procedures given in this manual, plus any general or special instructions applicable to a specific range. Verbal instructions on the courses or strings of fire reduce confusion and accidents. Answer any questions the trainee or competitor may have at this time so that later he can concentrate on shooting and not on something else which might result in an accident. This briefing is much more critical when the shooter is an annual trainee and is not thoroughly familiar with the courses of fire or competition.

b. Assembly Line. The assembly line is behind the ready line and parallel to the firing line. Have the shooters assemble here behind their respective firing points to inventory and prepare their shooting gear before proceeding to the ready line. The assembly line generally pertains to high-power rifle ranges. Only on the command of range officials do shooters proceed from the assembly line to the ready line.

c. Ready Line. The ready line is immediately behind the firing line. Make sure the shooters remain here directly behind their assigned firing positions until the preceding firing order has cleared the firing line. Range officials then order the ready line to the firing line. The ready line is generally used on high-power rifle ranges during competition. However, it has a practical application in annual recurring training where it is necessary to conduct several firing orders one after the other and where constant control of personnel is desirable.

d. Firing Line. This is the imaginary or actual

line where the shooter occupies a predetermined position and actually fires his course or string of fire at his target.

The firing line is occupied on command only. Here, give the shooters additional reminders of safety or operation, procedures to be observed, and the course or string of fire to be performed. Range personnel must observe personnel approaching, occupying, or departing the firing line because this is one of the times when a breach of safety is likely to occur.

Transport all weapons to and from the firing line with the actions open, slides locked open, and cylinders swung out, or carry the weapons cased. When uncasing weapons, make them safe immediately, being sure to hold them in a down-range direction.

After weapons have been transported to the firing line, ground them at the firing position with the actions open and muzzles pointed down range. Then, handle these weapons upon command only.

Do not permit anyone forward of the firing line until it is cleared. "Cleared" means all weapons grounded with actions open, safeties on, and visually inspected for these conditions by range personnel. During cycles of fire, range personnel must make sure that no one assumes a firing position in front of the firing line and that all shooters are alined. Closely observe the shooters when they take their preparatory or dry firing positions, and make any necessary corrections.

Allow only shooters and range officials on the firing line during courses of fire. However, authorization may be given to coaches and personnel to occupy the firing line during special events or training, as required. It is the responsibility of the operating range officer to control shooters and non-shooters on the firing line.

e. Scoring. Small arms ranges have two types of scoring: scoring for annual recurring training and scoring for competition.

The four targets used most often in annual recurring training are: the Rifle Target A; Target, Rifle, SB-A 50-Yard; the 25-Yard Standard American Pistol Target for revolver and automatic handgun; and Target, Silhouette, E, for rifle and pistol. These targets are shown in Figures 30, 35, 41, and 45 respectively.

Count only the hits in the 3, 4, and 5 rings for score on the A and SB-A targets for annual recurring training with the .30 caliber carbine.

Count and score all the hits in the 5 through 10 ring of the Standard American Pistol Target when used for annual recurring handgun training.

Give outside shot holes that touch the scoring ring, as shown in Figure 28, the higher value.

Score targets after each string; however, when conducting .30 caliber carbine training on 100-yard ranges that do not have target pits, it may

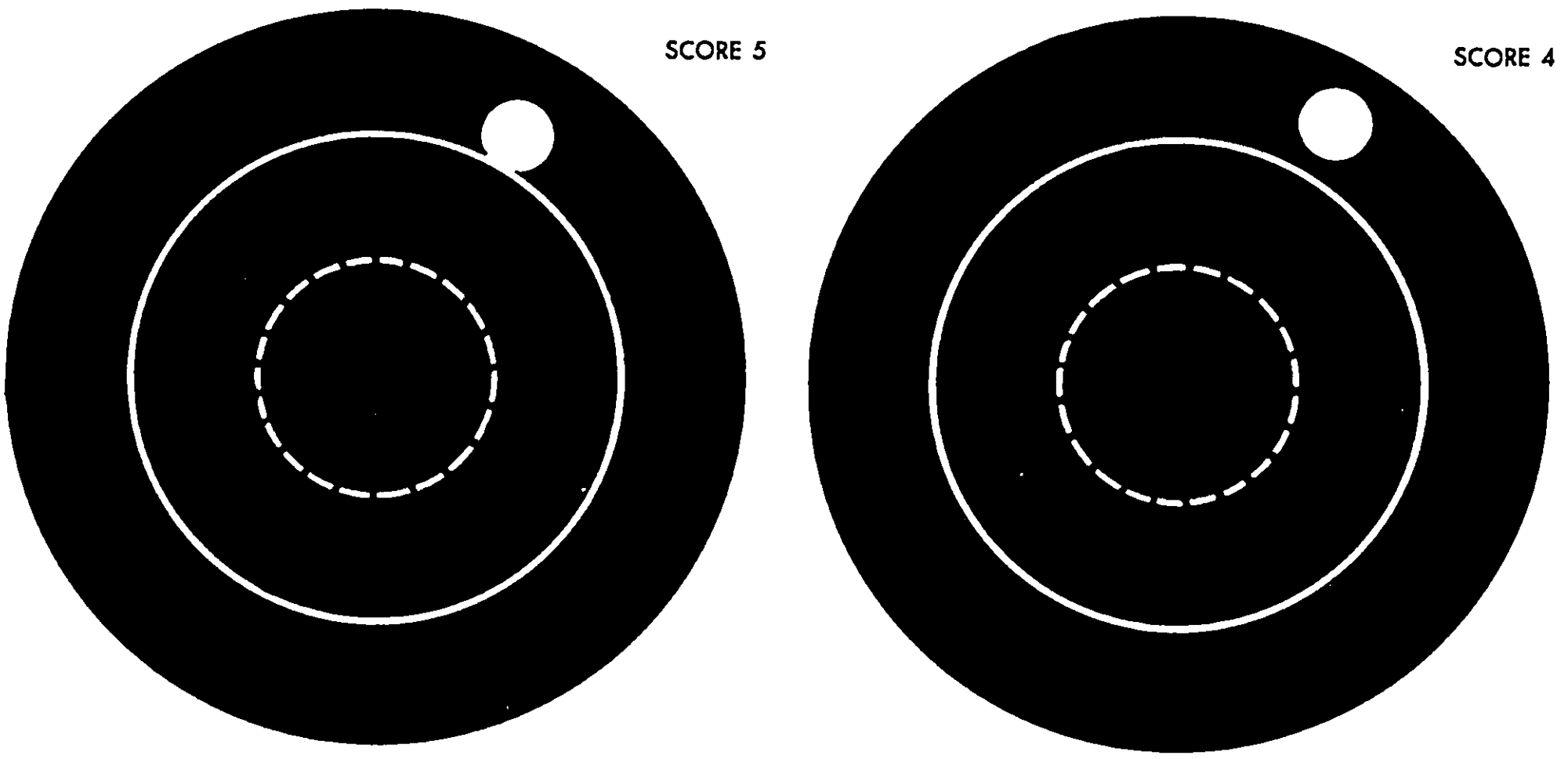


Figure 28. Scoring Shot Holes

be too time consuming walking to and from the target to score and paste. In this event, visually examine and paste the sighting shot groups, and complete the whole course of fire before scoring. The course of fire trains personnel to fire from various positions. The total score measures the trainee's accuracy with a weapon. Range sections must have a complete set of scoring gauges in their possession. (See TA 915.)

Score competitions as prescribed by applicable rule books, and by regulations published by the governing body of the appropriate competition, such as the NRA, NSSA, and ISU. Small arms competitive rules, published by the controlling agencies, are subject to constant change and revision. Therefore, the small arms range section of each installation must maintain current rules and directives published by these various shooting organizations on the types of competition to be conducted on the local ranges.

SECTION D—RANGE SAFETY

43. Rules of Safety. To prevent accidents while handling small arms weapons, adhere to the many rules of safety. The following safety procedures are general but cover most potential accidents.

- Treat every gun with the respect due a loaded gun. This is the first rule of gun safety.
- When carrying guns into camp, home, or to other places, and when not in use, unload them; make sure the actions are open; or case them. This applies going to and coming from the shooting area.
- Always be sure that the barrel and action are clear of any obstructions and that the ammunition is the proper size for the gun. Remove all oil and grease from the chamber and barrel before firing.
- Always carry the gun so that you can control the direction of the muzzle, even if you stumble. Keep the safety on until you are ready to shoot.
- Be sure of your target before you pull the trigger. If positive identification of the target has not been made, *don't shoot*. Know the identifying features of the game you intend to hunt and their vital areas that assure fast kills.
- Never point a gun at anything you do not want to shoot; avoid all horseplay while handling a gun.
- Unload unattended guns. Store guns and ammunition separately, beyond the reach of children.
- Never climb a tree or fence or jump a ditch with a loaded gun; never pull a gun toward you by the muzzle.
- Never shoot a bullet at a flat, hard surface or the surface of water. When shooting at targets or game, be sure that your backstop is adequate.
- Avoid alcoholic drinks before and during shooting activities. Certain drugs and medications may temporarily impair sight and reflexes; avoid them before and during shooting.
- During night firing, it is recommended that there be one instructor to two trainees, depending on local conditions.

44. Unsafe Acts and Conditions. Military or civilian personnel (shooter or spectator) may occasionally commit unsafe acts on small arms ranges. These unsafe acts include, but are not limited to, proceeding in front of the firing line before command, pointing a weapon in an unsafe direction, shooting unsafe ammunition, using a mechanically unsafe or inadequate weapon, disobedience of orders, horseplay, and loud language.

To operate a safe range, correct all unsafe acts immediately by command or physical correction, as the circumstances require. Then, give a brief explanation of the act to the offender, the reason for the correction, and the safe policy or procedure to follow. Use tact and diplomacy during corrective actions; however, make the corrective action immediate and firm. Immediately remove any person or persons from the firing line who repeat infractions, disregard instructions, or flagrantly violate safety practices. All range personnel have the responsibility of enforcing proper safety procedures and practices on small arms ranges. They have the prerogative and duty to remove from the firing line or range any persons that are considered unsafe. Range personnel must maintain safety discipline on small arms ranges by close surveillance of shooting activities.

Range condition can constitute a safety hazard. Excessive rains can erode berms and backstops so that they do not contain bullets; overhead and ground baffles rot or are shot away and no longer absorb bullets; electrical wires become frayed and are no longer properly insulated. If these conditions exist, take immediate action to advise the proper officials.

45. Road Guards. On some small arms ranges, road guards may be necessary to direct or block traffic. Roads that approach the firing line from a safe direction do not require road guards. Signs denoting approach to a small arms range (see paragraph 28) and range flags (see paragraph 47) give adequate warning to personnel approaching in vehicles. However, roads entering impact or similar danger areas that do not have fences, gates, or adequate barriers to prevent vehicles from trespassing must have road guards posted on the range perimeter. A road guard prevents entry into the danger area until daily firing is completed, and he is then withdrawn from his post. Road guards are generally selected from personnel who are scheduled for training but are awaiting their relay, or who have completed their firing. When special traffic problems exist, use road guards to direct traffic to places, such as special parking areas or over designated routes. For example, when heavy traffic is anticipated during competitions, contact the local air police unit for skilled personnel to handle traffic.

Post road guards along trails or footpaths that are frequently traveled and at places where children might trespass into danger areas of the range where adequate fences or barriers have not been erected.

Road guards are not required where adequate gates or barriers prevent approaching persons from trespassing and where signs provide proper warning.

46. Trespass Notices. There are two types of trespass notices; those posted by signs and those printed in publications. Publication notices are usually printed in local commercial newspapers and in the Air Force installation's daily bulletin. Twice each calendar year place legal notices to the public in the newspaper or newspapers serving the local area. In such notices, give the location of the range or ranges, state that trespassing is not only illegal but also dangerous because of gunfire. Also, give the offices, personnel, and phone numbers to call in case there is a valid need for entry.

Small arms ranges are off limits to all unauthorized personnel. Anyone who needs to enter a range area must first contact the range office for permission. This is a routine safety precaution to prevent personnel from entering a designated danger area as the range may be scheduled for live fire.

Air Force installations with large range areas may have a potential for hunting, fishing, picnicking, or for other recreational activities. (See AFR 125-5, *Natural Resources—Fish and Wildlife Conservation Program.*) Recreational activities must not conflict with the marksmanship training requirements of Chapter 8, AFM 50-15, which have priority. Personnel, both military and civilian, must first demonstrate their proficiency and knowledge of fire-arms safety, to designated officials, before they are allowed to use the range for hunting. Local requirements dictate the content and scope of examinations for hunters; however, an NRA-approved hunter safety course should be included in each examination. In determining standardization and restrictions for the course, range officials must coordinate with ground safety personnel. Ground safety officials assist with local requirements for range usage as outlined in AFR 125-5.

When the range area is used for recreational purposes, post the date and hours of occupancy in the installation's daily bulletin once a week. After the recreational season is over, put the range back on a no-trespass basis, and place this information in the daily bulletin for several weeks. Also, small arms range use and firing schedules must be published in the daily bulletin. Small arms range instructors, the small arms range officer, and persons with written permission from the range officer or range NCOIC may enter and use the range property during other than normal duty hours.

47. Display of Flags and Streamers. Small arms ranges use flags and streamers for several reasons, but primarily for safety. Adjacent to the road or entrance to the range or range system, locate a tall flagstaff with a red streamer which has an 18-foot fly and a width of 5 feet 9 ⅜ inches. Fully raised, this flag signifies that firing is scheduled or is in progress. At half mast, it signifies that the range is occupied but that no firing is permitted. The first person to enter the range system raises the flag to the proper position for the scheduled activity, and the last person to leave the range area hauls it down and stores it. If no flag is displayed, the range is not in use and not occupied.

A range has one type of firing, such as pistol, rifle, or carbine, and contains one firing line. A range system is a range complex comprising two or more types of ranges or one type of range

divided into separate bays or ranges. Use an additional range flag for each range and each bay or firing line of a range system. Flag positions have the same meaning given in the above paragraph but signify the condition of the individual range, bay, or firing line. The first person to occupy the individual bay or firing line raises the flag to the appropriate position for the activity that is about to begin.

One flag is enough for a single range (one bay consisting of one firing line) if the range flag can be clearly seen from the approach road and firing line. Range systems that have multiple types of ranges or multiple firing lines require a range flag on the entrance road and individual flags at each firing line. There is one exception, a high power-rifle range where the flag at the entrance of the range or bay is sufficient to indicate firing in progress on each firing line; that is, 200-yard, 300-yard, and 600-yard firing lines. Fly individual range flags during firing, and leave them in the fully raised position during scoring, target changes, and while successive relays are ready to occupy the firing line. Lower them to half mast during long breaks between firing and at any other time the range is occupied and not actually being used. such as for lunch breaks and rest periods.

When the flags are lowered on bays or individual ranges of a range system, firing must cease immediately and must not resume until the flags are raised. All firing on the range or range system must cease immediately if the range flag proper is lowered, and must not resume until the flag is fully raised.

Requisition range flags and streamers through normal channels (see Target and Target Material Chart, Attachment 5) or manufacture them locally. The most prominent danger flag is the streamer which is 5 feet 9 inches at the halyard end, has an 18-foot fly, and is 3 feet wide at the fly end. The halyard end is bound with webbing and has a 1½-inch "D" ring with a roller sewed on each end. The streamer material is scarlet cotton bunting. Because this is usually the largest flag on the range, use it as the range flag. On a range system of multiple ranges or bays, use this flag or the smaller 24- x 36-inch flag for the individual ranges or bays. Use the large 18-foot fly for target pit flags on all high-powered rifle ranges of more than 300 yards. For 100- to 300-yard training and competition courses of fire, the smaller 24- x 36-inch fly is optional for target pit use.

The danger flag, 24- x 36-inch fly, is reinforced on one end with webbing and has a 1-inch "D" ring sewn on each end. Use this flag at target pits for ranges that do not exceed 300 yards. It is also permissible to use this flag on bays or individual ranges that display the large flag elsewhere on the range system. It may be fastened to a target staff (see Attachement 5) and used in the target pits to signal misses.

When it is necessary to replace a rope or cable halyard, inspect all range flag halyards to see if any others need replacing. Change halyards by splicing new cable or rope to the old one and pulling the new one into place. Many Air Force installations have vehicles with hydraulic ladders which they use for elevating personnel to aircraft or to missiles, or for changing street lights. When it is necessary, use these ladders to change flagstaff pulleys, eyebolts, or halyards.

48. Cease-fire Commands. The range officer or NCOIC conducting range firing normally gives the command, "Cease firing," and follows it with the command, "Make the line safe." If there is an emergency, however, such as an accident or an unsafe condition, anyone who sees it, whether he be range personnel, shooter, or spectator, immediately commands "Cease firing" in a loud, clear voice. The same person then commands "Make the line safe." Regardless of who gives the command, all shooters must cease firing immediately. Even though he may be ready to get a shot off, each shooter must immediately remove his finger from the trigger and trigger guard and then clear and ground his weapon. After range personnel correct the condition that has caused the emergency, firing may resume. Give the shooters an alibi course of fire to compensate for the interference. There are several permissible ways to execute the "Cease firing" command: verbally, by a blast on a horn or whistle, by exposing only the targets' edge on a pistol range, or by pulling the targets down into the target pits out of view.

49. Communications. For safety, ranges require communications from the range to the parent installation, from the firing line to the traget pits, and from the range official to the shooter. Good communications affect safety precautions, and a study of accident statistics shows that it is no longer necessary to have an ambulance on ranges

during firing. Considering that an installation operates small arms ranges several years without an accident requiring medical attention, it is much too costly to have a driver and ambulance standing by during range firing. Most range injuries are similar to those that occur at other places on the installation and are not, as might be believed, gunshot wounds. Instead of an ambulance, it is necessary to have a serviceable vehicle (GI or private), a first aid kit, and telephone communications with the parent installation. If the injury is serious, use the telephone to request an air police escort, and advise the hospital that an emergency case is on the way. Before daily firing, check the telephone system that links the range with the parent installation to see whether or not it is serviceable. Also, check the communications between the firing line and the target pits before firing begins. (See paragraph 41c.)

For reasons of safety, execute all commands on the firing line so that they can be clearly heard by anyone on or near the firing line. A command not heard can result in confusion and misunderstanding and could cause an accident. Give all commands properly the first time so that it is not necessary to repeat them.

To project range commands that are audible and clear, all small arms ranges require a public address system. (See TA 915 for PA systems.) Electrical service is desirable; however, if such service is not available, use portable generators. Use the megaphone listed in TA 915 for small firing orders. It projects the voice so that it is easily heard at both ends of the firing line, and the megaphone is a good emergency standby for the public address system.

50. Control of Spectators. Spectators frequently come to small arms demonstrations, training courses, competitions, and other types of firing. Encourage them to watch all phases of small arms training and weapon firing. Watching other personnel train with and fire weapons can stimulate interest in marksmanship and the safe use of small arms.

Properly position all spectators to the rear of the firing line or firing activity. Normally spectators are required to stay behind the firing line. There may be exceptions when experienced personnel are making weapon demonstrations or when there are several persons in an inspection party observing firing activities. In either case, carefully observe the spectators and shooters when the spectators are allowed on the firing line. Caution the spectators to remain behind or to the side of shooters and to the rear of the muzzle of all weapons on the firing line. Make sure the firing line and the area authorized for spectators are well defined with the proper signs and markings.

Range personnel are responsible for range safety and the control of all spectators. Remove all spectators that either compromise safety or distract shooters or range personnel.

SECTION E — SUPPLY PROCEDURES

51. Weapons.

a. Procurement. Small arms ranges require training weapons for annual recurring training and competition as outlined in Chapter 8, AFM 50-15 and in Section B, AFR 50-8. These weapons are prescribed in TA 915. The type and size of the range or ranges help to determine the type and quantity of weapons required for markmanship training. Weapons for annual recurring training, such as the issue service handgun for officers and the issue service shoulder weapon for enlisted personnel, are usually prescribed in the ratio of two for each available firing position. This means, for example, that an installation that has or has use of a 20-firing-point rifle range would have forty .30 caliber carbines available for training. Then, if weapons break down or malfunction, there are enough spare weapons for replacement. Increase the quantity of training weapons prescribed in TA 915 where small arms training loads require additional weapons. Where range firing and premarksmanship classes are being conducted concurrently, two weapons per firing point may not be enough. With two weapons per point, the quantity of serviceable weapons may still fall below operational levels. Where two types of weapons are used on one range, such as the .45 automatic pistol and the .38 special revolver, make sure each firing point has two weapons of each type. This will be necessary until the .45 automatic is phased out of Air Force inventories and no authorization exists for its issue. Training must be with the type of service weapon issued or authorized. In cases where .38 revolvers are authorized but only .45 automatic weapons are available for issue, it will be necessary to train with the .45 automatic. The weapons requirement of

a small arms range or range system is computed on the basis of personnel assigned to the respective installation, including attached units. It may also include other units, such as radar sites, if their marksmanship training is the responsibility of the parent installation.

Basically, all officers are armed with a handgun. This may be a .45 automatic or a .38 special revolver, depending on the duty assignment. Aircrew members and headquarters personnel are generally authorized .38 revolvers, and others are normally armed with .45 automatics. Weapon authorizations for enlisted personnel are more complex, depending on the duty assignment. All are authorized the .30 carbine, M-16 rifle, or an issue replacement service weapon. A few crew members may also be authorized a .38 revolver or a .45 automatic. Courier, finance, crypto, and other such personnel may also employ a handgun in execution of their duties, thus requiring training with two weapons annually instead of one. (See Chapter 8, AFM 50-15.) After determining the types of personnel, weapons authorizations, and number of firing points of each range, compute the types and quantities of training weapons needed. Then, consult TA 915 for nomenclature and stock numbers of weapons. Submit all requirements to the unit supply servicing the range section. Personnel of the supply unit must assist in the preparation of the requisitions and Unit Authorization List Change Requests. If UAL change request information is not available at unit supply, acquire it from the installation director of materiel. Range personnel must furnish justification and other supporting data for all marksmanship training equipment to be entered on the UAL.

Caliber .22 rimfire pistols and rifles are frequently used in training. General purpose training (nonmatch-grade) .22 caliber rimfire pistols and rifles are listed in TA 915. AFR 50-22 authorizes training ammunition for these weapons. The use of these small caliber weapons for small arms training has several advantages. The cost of ammunition is only a fraction of the cost of larger calibers. The life expectancy of .22 caliber weapons is several times greater than that of centerfire weapons, and they require less maintenance. Also, it is possible to fire these weapons on ranges that are small, indoors, and unsuitable for larger calibers. Small AF detachments, remote sites, and similar installations that cannot fire large caliber weapons, because of inadequate ranges, can use .22 caliber weapons for the course of fire. See Chapter 8, AFM 50-15, for procedures in requesting permission to use these weapons for annual qualification. Installations that have frequent or lengthy spells of inclement weather can continue marksmanship training indoors on low-cost ranges using .22 caliber rifles and pistols. All premarksmanship training, such as disassembly and assembly, dry fire, and nomenclature, can be given the trainee with the issue service weapon, and the .22 weapon can then be used to fire the course. In this way much of the service weapon training can be given to the trainee even though a .22 caliber pistol or rifle is used in firing the course. General purpose training weapons of .22 caliber are also excellent for interbase or interunit competition. They are of adequate quality to train potential competitors. Novice and tryout competitors can use these weapons while learning, until they establish minimum competition score averages.

Competition is a form of advanced marksmanship training (see Section B, AFR 50-8). Authorization of advanced marksmanship equipment is based on range availability and individuals or teams selected to represent the installation. Even though they do not have a high-power rifle range, installations are encouraged to field a high-power rifle team. They can do this by training on other military or civilian ranges in the area. The same applies to all small arms competitive teams. Installations can requisition weapons if they have or can use a range to fire them on (see TA 915). Installations may equip all teams. For example, a large installation that has good range facilities and competitive interest may have several pistol or rifle teams requiring equipment. There is no restriction on the number of active teams per installation. Conversely, a small installation may have difficulty fielding one team. Make every effort to select the best shooters available and to field a base team even though several members may be inexperienced as competitive shooters. Base the selection of such inexperienced competitive shooters on potential marksmanship ability, shoulder-to-shoulder base eliminations, and on whether or not they show a bona fide interest in marksmanship. Installations that cannot field a team should support National Rifle Association qualified individual competitors at competitions. Issue competitive or

match grade weapons only to personnel who take part in organized practice and competitions. To retain possession of competitive or match grade weapons on a hand receipt, the recipient must shoot in three NRA-approved or registered competitions annually. For this purpose, an Air Force command match is considered as one competition. If the weapon recipient does not properly use or maintain the competitive weapon or does not attend organized training sessions or competitions, he must turn all competitive equipment in. Upon advice from the respective team captain or small arms project officer, the range officer recalls the weapons and equipment.

Requisition weapon racks, in sufficient quantities, concurrently with weapons. If racks specifically designed for a weapon are not available, explore the feasibility of altering issue racks or of locally manufacturing them. The chief of security and law enforcement reviews all weapons storage facilities for adequate security. He issues certificates to indicate safe storage. Competitive weapons and equipment require the same supply procedures and security as other weapons, equipment, and ammunition.

b. Repair and Maintenance. The possessing installation must maintain, repair, and service weapons. To inspect and repair issue weapons, installations must have capable personnel, facilities, and equipment. Installations are responsible for field maintenance and compliance with technical orders. For tenant and attached units and sites receiving logistical support, the parent installation provides weapons maintenance and related services. Small arms range instructors, or small arms repair or maintenance personnel, must inspect and maintain all installation small arms with the exception of air police weapons. The weapons repair facility should be located on the range system and may be a part of the range office building. This facility requires water, heat, a source of compressed air, and electricity for power tools, lights, and degreaser tanks. Air Force installations must perform normal field maintenance on issue service weapons. This usually involves changing all parts of the service weapon except the receiver and barrel (.45 caliber automatic barrels excepted). Unless authorized by appropriate directives, small arms range instructors and maintenance personnel must not replace parts or perform any maintenance on match or competition grade weapons other than field stripping and cleaning.

NOTE

Many of the moving parts of a match or competition grade weapon are mated by precision hand fit, making them noninterchangeable in similar weapons. When any match grade or competitive weapon is field stripped for cleaning, make sure that all its parts can be identified. (See AFR 65-7, *USAF Marksmanship Weapons and Equipment (Match Grade)*).

Organizations or installations sending weapons to the USAF Marksmanship School for maintenance under the authority of AFR 65-7 may receive substitute weapons, or weapons whose configuration and specifications have been altered. The USAF gunsmiths' workload, the availability of similar weapons already reworked, and the end of a weapon's service life may result in a return shipment of weapons with different stock numbers or serial numbers. When this happens, the returned weapons will have a grade equal to or higher than that of the ones received. A similar situation exists on initial issues of competition weapons, including master shooter weapons. In checking with base supply on the receipt of match or premium grade weapons, range personnel must alert supply personnel to the possibility of substitution of stock numbers and serial numbers. (See TA 915 for stock listings.)

The weapons maintenance section maintains the following list of publications for technical guidance in the repair and inspection of small arms.

(1) GENERAL TECHNICAL ORDERS.

11W-1-10, Recording of Historical Data for Ground Weapons.

11W3-1-2, Small Arms Accidents, Malfunctions and Their Causes.

11W3-1-5, Small Arms Materiel and Associated Equip.

11W3-1-9, Packaging of Small Arms Materiel with Volatile Corrosion Inhibitor (VCI).

11W3-1-12, Serviceability Standards and Field Inspection for Small Arms and Material.

(2) TECHNICAL ORDERS ON RIFLES.

11W3-2-2-3, Carbines, Caliber .30M1A1, M1, M2, M3.

11W3-2-2-14, Org Maint Allowances—

Carbine Caliber .30, M1, M1A1, M2.

11W3-2-2-24, Field and Depot Maint Allowances—Carbine, Caliber .30, M1, M1A1, M2.

11W3-5-2-24, Org Maint Allowances—Rifle, Caliber .22, Stevens, Model 416-2, Target; Rifle, Caliber .22, Remington, Model 513T, Matchmaster; Rifle, Caliber .22, Winchester, Model 52, Heavy Barrel; Rifle, Caliber .22, Winchester, Model 75, Target.

11W3-5-3-74, Org Maint Allowances—Rifle, U.S., Caliber .30, M1, with Equip, M1, National Match, with Equip, M1C (Sniper's), with Equip, and M1D (Sniper's), with Equip.

11W3-5-3-102, Field Maint—Rifles, U.S., Caliber .30, M1, M1C(Sniper's), M1D (Sniper's).

11W3-5-3-122 Field Maint—Automatic Rifle, Browning, Caliber .30 M1918A2

11W3-5-4-4, Field Maint Repair Parts and Special Tool Lists—7.62 mm Rifle M14, Rifle Bipod M2.

11W3-5-4-24, Operators and Org Maint Repair Parts and Special Tools List for Rifle, 7.62 mm, M14.

11W3-5-5-1, Opr, Maint and Repair with Repl Parts—Automatic Rifle, 5.56 mm, M16, Accessories and Armorer's Kit.

(3) TECHNICAL ORDERS ON PISTOLS.

11W3-1-13, Instr for Storing—Air Crewman Revolver Caliber .38, in M1920 Combination Arm Rack and M1920 Pistol Arm Rack.

11W3-3-3-14, Org Maint Allowances Pistol, Automatic, Caliber .45, M1911, M1911A1, National Match, with 1955, 1956, 1957 Improvements.

11W3-3-3-54, Field and Depot Maint Repair Parts and Special Tool Lists-Automatic Pistol, M1911A1, .45 Caliber.

11W3-3-3-42, Field Maint—Automatic Pistols, Cal. .45 M1911, and M1911A1.

11W3-4-2-44, Org Maint Allowances—Revolver, Colt, Caliber .38 Special, Detective Special, 2-inch barrel; Revolver, Colt, Caliber .38 Special, Official Police, 2, 4 In Barrel; Revolver, Smith and Wesson, Caliber .38, Military and Police, 4 In Barrel; Revolver, Smith and Wesson, Caliber .38 Special, K38 Masterpiece; Revolver, Smith and Wesson, Caliber .38 Special, Military and Police, 2, 4 In Barrel.

Fill out Air Force Technical Order Form 105 upon receipt of the weapon from supply. This form is not required from depot to supply, but the indivdual or unit receiving the weapon will fill out the form. It accompanies the weapon for the remainder of the weapon's service life. Enter all inspections, failures, rounds fired, and modifications in the proper place on the form. (See T. O. 11W-1-10, *Recording of Historical Data for Ground Weapons.*) AFTO Form 105 does not have to accompany training weapons on small arms ranges. However, the range section must file the form and log the required entries. Attach this form any time the weapon is removed from range control, such as for turn-in or issue on a hand receipt to other units or individuals.

c. Disposition. Turn in to supply for proper disposition all weapons that have reached the end of their service life or that require repairs beyond the capability of the installation's maintenance facilities. Turn in, through channels, all competition or match grade weapons that are unserviceable or that are excess serviceable to the USAF Marksmanship School, Lackland AFB, Texas 78236. Before returning weapons to supply units for disposition, clean them and attach the proper stock number and nomenclature. This is important since match grade and premium grade competition weapons are basically the same as issue service weapons. Properly identify them on turn-in, or they may be lost in service weapon inventories. Warner Robins Air Materiel Area Depot, Robins AFB, Georgia 31094, is the office of primary responsibility on issue service small arms. Direct all queries about the maintenance and disposal of issue service weapons to that depot.

52. Ammunition.

a. Procurement. Small arms ammunition is necessary for annual recurring training with issue weapons and for competition training and competitions. AFR 50-22 contains annual individual training ammunition authorizations. The small arms range section programs and requisitions all training and competition ammunition for the installation. Air police units are an exception because they program and requisition their own requirements. Where small arms range personnel administer marksmanship training to air police units, the small arms range section programs and requisitions the ammunition. For greater econ-

omy, consider procuring local purchase ammunition in one lot for the entire year.

Small arms ammunition is normally warehoused in ammunition storage areas. Air Force installations that do not have ammunition storage area facilities as such, require that the range section have an adequate building or structure for this purpose. Stocks of ammunition must be available on the range for annual recurring training or competition training. Requisition ammunition on a daily, weekly, or semimonthly basis, depending upon the scope of training, the availability and security of on-range storage facilities, the number of personnel undergoing training, etc. Make sure that ranges have ammunition available at the beginning of the duty day. Daily requisition of ammunition from ammunition storage areas may not be desirable because of transportation problems and the time-consuming functions of requisitioning, drawing, and moving stocks.

There are two types of ammunition normally used in marksmanship training. Use issue service ball ammunition in training or service issue weapons for annual recurring training. Advanced marksmanship training, commonly referred to as competition, uses weapons that have special fitting of parts, alterations, and rigid quality control. Consequently, they are more accurate than similar weapons used in combat and annual recurring training. The competition grade weapons require match grade ammunition to take advantage of their great accuracy. Match grade ammunition is centrally procured and available for the following weapons: Rifle, U.S., Cal. .30, M1; Rifle, 7.62 mm, M14; and Pistol, Automatic, Cal. .45 (ball only). For Cal. .38 Special weapons, mid-range, 148-grain bullet (wad-cutter) ammunition, listed as training ammunition, is acceptable for competition. Purchase locally caliber .22 Long Rifle match grade pistol and match grade rifle ammunition. Also, purchase locally caliber .45 match grade (wad-cutter) ammunition. Program centrally procured and locally purchased match grade ammunition through normal supply channels and upon information furnished by the range section. This assures enough ammunition to meet installation requirements.

NOTE: *Do not use match grade ammunition for annual recurring training. Use it only in competition weapons for competition training and actual competition.*

When approved by base supply, it is permissible to use a special ammunition requisition form of local design for ammunition transactions between using agencies and the ammunition storage area. Should authorizations contained in AFR 50-22 prove inadequate, submit a request for authorization changes, complete with justification data.

b. Control and Security. The range section must provide adequate security for ammunition in its possession and must also provide rigid supply discipline in the expenditure of ammunition. Store it in a room or building that has a lock. Small arms ammunition has an ordnance safety classification as a fire hazard. It will not support a fire, but the wooden packing cases and paper cartons, if ignited, may generate sufficient heat to "cook off" the cartridges. Small arms ranges that maintain stocks of ammunition must exercise good housekeeping and ammunition storage procedures. Maintain local control forms on ammunition and a log of daily expenditures of ammunition. The log reflects the number of rounds of each caliber, ball or match, the number of students firing, or, for match grade, to whom issued.

c. Disposition of Fired Cases and Lead. Police the firing lines of all empty brass cartridge cases and return them to the wooden packing cases until a large quantity has been saved. Then, return them to redistribution and marketing for disposal. Before turn-in, screen all empty cases for live rounds and remove them along with other extraneous materials. Sort the brass and box it by calibers. Stencil or mark each box to identify the contents, for example, "Empty Brass, Cal. .30 Carbine." Place a certificate of inspection in each box. Either type the certificate or have base publications print it. It contains the unit's address, date of inspection, certification statement, and range officer's signature. The certificate reads as follows: "I certify that neither loaded cartridges nor extraneous materials are packed with the empty cartridge cases herein." After inspecting and certifying the brass, nail the boxes shut to prevent spillage. Stack the containers neatly until the accumulation warrants a turn-in to the redistribution and marketing unit.

The range section may retain match grade or select quality brass to support reloading activities. (See AFR 50-22.) The cartridge case constitutes about ½ the cost of a round of small arms am-

munition. Handloading these once-fired cases reduces the cost of marksmanship training. However, when cartridge cases expend their reloading service life, dispose of them through normal small arms range brass disposal procedures.

A contract may be let for lead salvage with the stipulation that the backstop surface must be rehabilitated to its original configuration after the completion of salvage operations.

53. Targets.

a. Procurement. Targets of the correct type and quantity are necessary to comply with the annual recurring training and competition requirements of Chapter 8, AFM 50-15 and Section B, AFR 50-8. (See Attachements 3 through 6.) Targets for marksmanship training may be centrally procured through normal supply channels or purchased locally. Several types of targets are necessary for training and competition. Most of the targets used in large quantities are Government printed and depot stocked, available through normal supply channels. The course of fire determines target requirements (see Section B of AFR 50-8, Chapter 8 of AFM 50-15, and NRA rule books for high-power rifle, small-bore rifle, and pistol). The quantity required is computed on the basis of the number of trainees programmed for the training.

After determining the type and quantity of targets required, check Air Force Federal Stock Catalog, Class 6920, to ascertain the availability of centrally procured targets. Purchase locally any target or targets not found in stock list 6920. (See TA 915.)

As required, requisition black and white pasters, target cloth, target repair centers, disks, spotters, and related target equipment. (See T. O. 11A13-1-114, *List of All Parts—Small Arms Targets and Target Equipment,* and Attachment 4 for official specifications.)

Only official National Rifle Association targets or military targets issued by the Armed Services are permitted in competition. The NRA identifies its official targets with the word "Official" and the eagle and shield insignia of the association. They are produced and distributed by firms and individuals licensed to do so by the NRA. To obtain a list of licensed manufacturers, send a request to the National Rifle Association, 1600 Rhode Island Ave., N.W., Washington, D. C. 20036.

b. Control. Adequate quantities of targets must be on hand to fulfill the training requirements outlined in Chapter 8, AFM 50-15. Program annual target requirements with unit and base supply. Base supply requires programmed requirements so that initial target stocks and stock levels can be properly requisitioned. Stock levels are then adjusted on the basis of target consumption. When there is need for a new target, requisition it as soon as requirements are known, giving programmed requirements for base supply stock level information. Small arms ranges that conduct seasonal outdoor marksmanship training are to program annual target requirements by quarters to assist supply in stock level operations.

Some high-power rifle and pistol targets have small, economical repair centers and use inexpensive pasters. Accurate scoring necessitates frequent target or repair center changes. Small arms range personnel determine whether to use new targets or repair centers.

To detect diminishing stocks and to allow sufficient time for requisitions to be processed, check stock levels of target materials frequently and at regular intervals. Coordinate with unit and base supply during requisition cycles and at 30-day intervals thereafter.

c. Repair. Target repair and maintenance is a divided responsibility. Repair of target frames and related mechanisms is the responsibility of the base civil engineer. Range personnel have the responsibility of daily maintenance, such as replacing target frames built by civil engineers and lubricating and resurfacing frames or target backers.

High-power rifle targets are usually pasted to a target cloth that covers the frame. Use heavy duty staplers to attach new target cloth to target frames; this is economical and saves time. Prepare the target paste as follows:

(1) Pour 41½ gallons of cold water in a 55-gallon drum.

(2) Add a 5-gallon container of flour gradually, stirring constantly until the flour is thoroughly mixed with the water and all lumps have dissolved.

(3) Pour ½ gallon of cold water in a 14-quart common galvanized iron bucket and then empty three 13-ounce cans of technical sodium hydroxide (Chemical Corps Stock No. 1162-5) into the water, stirring until dissolved.

WARNING

Use care when handling sodium hydroxide.

(4) Pour the sodium hydroxide solution into the 55-gallon drum of mixed flour and water. Stir the mixture for approximately 10 minutes. The paste is then ready to use.

(5) Based on the amount of paste required, reduce quantities of the ingredients proportionately.

(6) Flour may be requisitioned from commissary stores. See AFM 67-1 for procedures. Sodium hydroxide may be requisitioned or obtained from commissary or local purchase stores. Use wide wallpaper brushes to apply the paste rapidly over the large target areas.

Replace targets by pasting on new ones for each course of fire; however, one target may serve for several courses when black and white pasters are used to cover the shot holes. The majority of hits are in the 4 and 5 rings and the target becomes saturated with pasters. Clean the target of the excess pasters, and resurface it with a new target or repair center. Repair centers are smaller than their respective targets, are easier to handle, and cost less. They cover the highest value scoring rings, which sustain the most damage. Usually, one target may be repaired several times with repair centers before a complete new target is required. High-power rifle targets and repair centers are subject to wind damage; therefore, the only satisfactory way of attaching them to the target cloth is by pasting. Stapling is usually the best way to attach pistol targets and repair centers to target frames.

Replace targets and repair centers, as necessary, for accurate scoring. A buildup of two or more thicknesses of pasters, or indistinct scoring lines resulting from improper positioning of pasters on the scoring line, requires a target repair center or a new target. Give special attention to target serviceability during all competitions. Scoring lines must be distinct to permit plugging the shot hole with a scoring gauge to determine whether or not contact has been made with the scoring ring. (See Figures 28 and 29.) As Figure 29 shows, the use

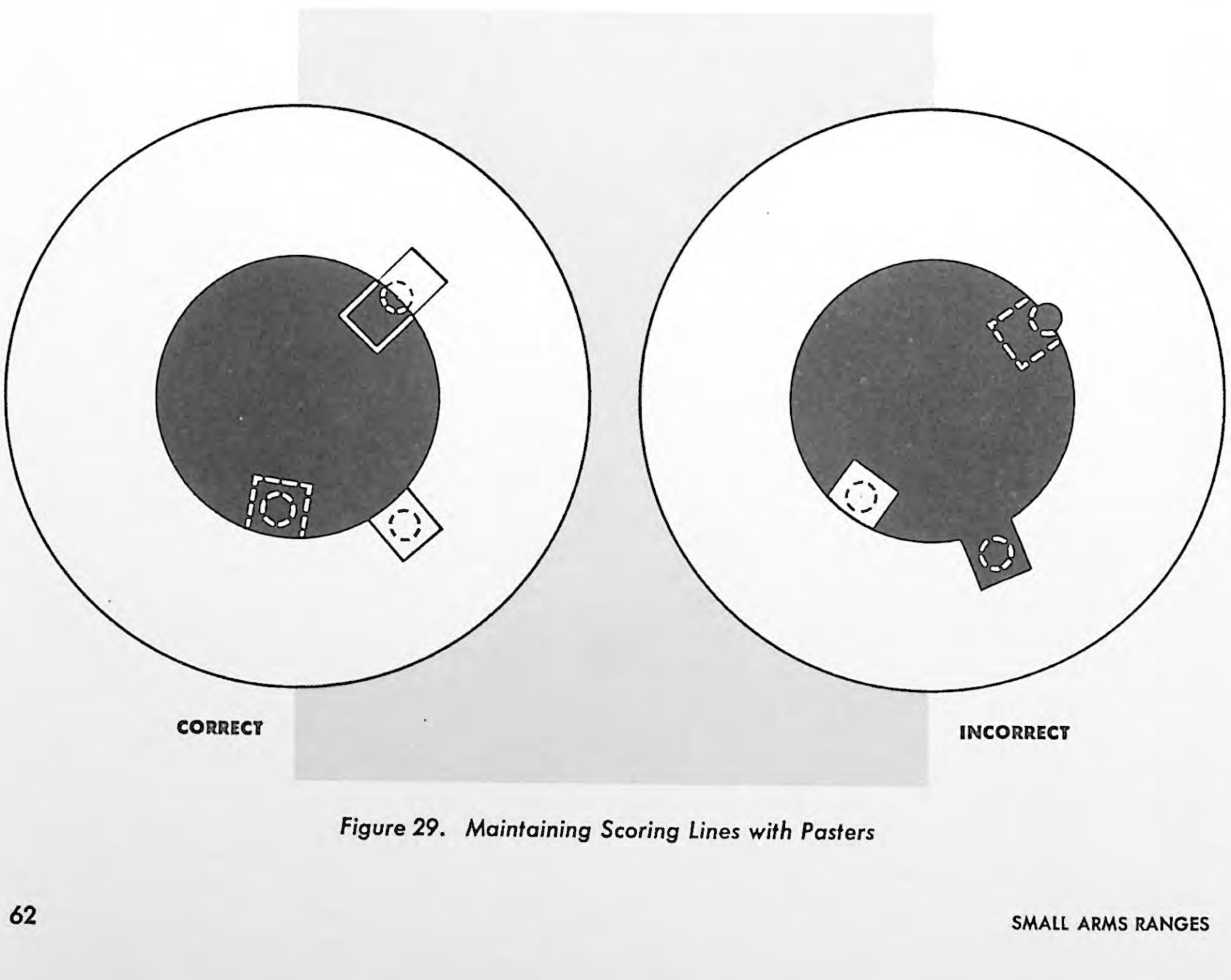


Figure 29. Maintaining Scoring Lines with Pasters

of pasters works well on shot holes that cut the edge of the bull's-eye.

Range personnel must determine the serviceability of high-power rifle targets used in annual recurring training and competition practice. During competition it is the prerogative of the individual competitor or team captain to request a new target or repair center if he thinks that the target is unserviceable. This request may be made during the preparation period before firing. To comply with such requests, make sure that spare frames with new targets or repair centers, pasters, and brushes are readily available in the target pits.

One hundred-yard targets with fixed target frames instead of pit-operated sliding targets have other requirements. Annual recurring training with the caliber .30 carbine, 5.56 mm M-16 rifle, or caliber .22 rifle requires scoring only the hits on the target regardless of the location of the hit on the surface of the target. One point is scored for each hit. Strings of fire during the course may be pasted, and after the final string the trainee should paste the entire target for the next relay, or take a fresh target to the holder to replace the one previously shot at. Target replacement and final scoring behind the line will expedite relays.

Small-bore rifle targets are not pasted nor do they have replacement centers. Fire the appropriate number of rounds on each bull's-eye of the target, as prescribed in Chapter 8, AFM 50-15 and the NRA Small-bore Rifle Rule Book. Attach new targets to the target frames for each successive course of fire. Small-bore rifle competitions conducted at 50 and 100 yards and 50 and 100 meters require a backing target. Attach this backer of plain target paper to the rear of the frame. (See small-bore rifle target frame specifications in Attachment 12.) The backing target registers hits on the scoring target and crossfires. Bullets hitting the scoring target have a tendency to disperse after hitting the heavy scoring target paper. Changes in muzzle position from shot to shot help produce the same effect. It is almost impossible to count the number of shot holes of a tight group on the scoring target, but these same shot holes are easily counted as they are slightly dispersed on the backing target. Crossfire from other positions may also be detected by the relation of shot holes on the scoring target as compared to the holes on the backing target.

d. Storage. Targets and target materials must have adequate storage facilities to prevent pilferage and to prevent damage from inclement weather. Also, insects and rodents are attracted to the flour in the paste; therefore, exercise rodent and insect control in target storage facilities. Rodents can destroy targets by gnawing into bundles or rolls of targets and into targets pasted on backers and cloth. The use of sodium hydroxide in the paste, as described above, is a deterrent to insects and rodents.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

J. P. McCONNELL
General, U.S. Air Force
Chief of Staff

OFFICIAL

R. J. PUGH
Colonel, USAF
Director of Administrative Services

ATTACHMENT 1

References

Manuals

AFM 50-4 Carbine, Caliber .30 M1, M1-A1, M2, and M3
AFM 50-5 USAF Formal Schools Catalog
AFM 50-11 Operation and Unit Maintenance: Cal. .22 High Standard Automatic Pistol (Supermatic); Cal .22 Ruger Mark 1 Automatic Pistol (Target Model) (6⅞–in. Barrel); Cal .38 Special Smith and Wesson Revolver (Masterpiece); Cal .30-06 Winchester Rifle Model 70 (Special Match Grade); Cal .22 Winchester Rifle Model 52; Cal .22 Remington Rifle Model 40X-S1 (National Match); and Front and Rear Sights
AFM 50-15 General Military Training
AFM 50-17 Pistols and Revolvers
AFM 50-18 Weapons Ranges
AFM 67-1 USAF Supply Manual
AFM 85-1 Maintenance Management of Real Property Facilities
AFM 85-6 Land Management and Grounds Maintenance
AFM 85-26 Military Construction Programming
AFM 86-4 Standard Facility Requirements
AFM 88-2 Definitive Designs of AF Structures
FM 23-5 U.S. Rifle Caliber .30, M1 (Field Manual)
FM 23-8 U.S. Rifle 7.62-mm. M14 (Field Manual)

Regulations

AFR 11-4 Host-Tenant Support Responsibilities of USAF Organizations
AFR 11-26 Gifts to the Department of the Air Force
AFR 20-20 AF Weapons Range Board
AFR 25-3 Management Engineering Capability
AFR 34-67 Support for Religious, Morale, Welfare, and Recreation Facilities and Activities.
AFR 50-8 Small Arms Marksmanship Training
AFR 50-17 Rules and Regulations for National Matches
AFR 50-20 USAF Small Arms Marksmanship Training Awards
AFR 50-22 Ammunition Allowances for Individual Training and Pellet Training Authorizations
AFR 65-7 USAF Marksmanship Weapons and Equipment (Match Grade)
AFR 67-79 USAF Munitions Report—RCS: AF-S18
AFR 85-2 Preventive Maintenance
AFR 85-4 Implementing Guarantees of Equipment Installed in AF Construction
AFR 85-5 Operation and Maintenance of Installations Facilities
AFR 85-6 Real Property Maintenance, Repair and Construction
AFR 86-4 Master Planning
AFR 87-1 Acquisition of Real Property
AFR 87-3 Granting Temporary Use of Real Property
AFR 87-5 Classification of Air Force Installations
AFR 125-3 Loss or Theft of Government Firearms, RCS: AF-X3
AFR 125-5 Natural Resources—Fish and Wildlife Conservation Program
AFR 125-22 Authorization and Use of Weapons
AFR 127-4 Investigating and Reporting USAF Accidents/Incidents
AFR 136-6 Ammunition and Explosive Materiel Quality Assurance
AFR 170-4 Funding of Morale, Welfare, and Recreation Facilities

OJT Package

JA 75370 Small Arms Technician

Tables of Allowances

TA 006 Organizational and Administrative Equipment
TA 503 Air Force Technicians Tool Kits
TA 915 Small Arms Marksmanship Training

Technical Orders

11A-1-10-25 Ammunition Inspection Procedures—Small Arms Ammunition
11A-1-20 Ammunition, Gen (TM 9-1900, including C1, 3)

11A-1-42-1 Disposal of Small Arms Ammunition
11A-1-47 Explosives Hazard Classification Procedure (TB 700-2)
11A13-1-3 Small Arms Ammunition Lots and Grades (TB 9-AMM 4)
11A13-1-101 Small Arms Ammunition, (TM 9-1305-200)
11A13-1-114 List of All Parts—Small Arms Targets and Target Equip (Ord 9, L-1)
11W-1-10 Recording of Historical Data for Ground Weapons
11W3-1-2 Small Arms Accidents, Malfunctions and Their Causes (TM 9-2210)
11W3-1-5 Small Arms Materiel and Associated Equip (TM 9-2200)
11W3-1-9 Packaging of Small Arms Materiel with Volatile Corrosion Inhibitor (VCI) (TB Ord 623)
11W3-1-12 Serviceability Standards and Field Inspection for Small Arms and Material
11W3-1-13 Instr for Storing—Air Crewman Revolver Caliber .38, in M1920 Combination Arm Rack and M1920 Pistol Arm Rack
11W3-2-2-3 Carbine, Caliber .30 M1A1, M1, M2, M3 (TM 9-1276, including C1)
11W3-2-2-14 Org Maint Allow—Carbine Caliber .30, M1, M1A1, M2 (Ord 7, B-28, including C1)
11W3-2-2-24 Field and Depot Maint Allowances—Carbine Caliber .30, M1, M1A1, M2 (Ord 8, B-28)
11W3-3-3-14 Org Maint Allowances Pistol, Automatic, Caliber .45, M1911, M1911A1, National Match, with 1955, 1956, 1957 Improvements (Ord 7, B-6)
11W3-3-3-42 Field Maint—Automatic Pistols, Caliber .45 M1911, and M1911A1 (TM 9-2951-1)
11W3-3-3-54 Field and Depot Maint Repair Parts and Special Tool Lists—Automatic Pistol, M1911A1, .45 Caliber (TM 9-1005-211-35 P)
11W3-4-2-44 Org Maint Allowances—Revolver, Colt, Caliber .38 Special, Detective Special, 2-inch barrel; Revolver, Colt, Caliber .38 Special, Official Police, 2-, 4-In Barrel; Revolver, Smith and Wesson, Caliber .38, Military and Police, 4-In Barrel; Revolver, Smith and Wesson, Caliber .38 Special, K38 Masterpiece; Revolver, Smith and Wesson, Caliber .38 Special, Military and Police, 2-, 4-In Barrel (Ord 7, B-29)
11W3-5-2-24 Org Maint Allowances—Rifle, Caliber .22, Stevens, Model 416-2, Target; Rifle, Caliber .22, Remington, Model 513T, Matchmaster; Rifle, Caliber .22 Winchester, Model 52, Heavy Barrel; Rifle, Caliber .22, Winchester, Model 75, Target (Ord 7, B-25)
11W3-5-3-74 Org Maint Allowances—Rifle, U.S., Caliber .30, M1, with Equip, M1, National Match, with Equip, M1C (Sniper's) with Equip, M1D (Sniper's), with Equip
11W3-5-102 Field Maint—Rifles, U.S., Caliber .30, M1, M1C (Sniper's) M1D (Sniper's) (TM 9-2023-1)
11W3-5-3-122 Field Maint—Automatic Rifle, Browning, Caliber .30 M1918A2 (TM 9-2-2111-1)
11W3-5-4-4 Field Maint Repair Parts and Special Tool Lists—7.62-mm Rifle M14, Rifle Bipod M2 (TM 9-1005-223-34P)
11W3-5-4-24 Operators and Org Maint—Repair Parts and Special Tools List for Rifle, 7.62-mm, M14 (TM 9-1005-223-12)
11W3-5-5-1 Opr, Maint and Repair with Repl Parts—Automatic Rifle, 5.56 mm, M16, Accessories and Armorer's Kit
11W3-6-1-154 Field and Depot Maint Winchester Riot-Type Shotgun M12; Stevens Riot-Type Shotguns M520-30, M620A (TM 9-2117)

United States Code

Title 10, Par 1802 "Continuation of Other Laws" (with respect to Army Laws applicable to the United States Air Force upon its establishment as a separate service)
Title 32, Par 181 Rifle Ranges and Equipment for Instruction and Practice
Title 32, Par 181a Promotion of Rifle Practice; National Matches; Small Arms Firing School
Title 32, Par 181b Same; Rifle and Pistol Matches open to Army, Navy, Marine Corps, Coast Guard, National Guard, Militia, Civilians, etc.
Title 32, Par 181c Same; Further Expenses; Appropriation
Title 32, Par 181d Detail of Officers and Enlisted Men for Duty at National Matches; Pay and Allowances
Title 32, Par 181e Travel Expenses of Civilian National Board Members
Title 32, Par 182 Director of Civilian Markmanship
Title 32, Par 183 Detail of Officers and Enlisted Men for Duty at Rifle Ranges
Title 32, Par 184 Detail of Enlisted Men to Instruct Rifle Clubs
Title 32, Par 185 Commutation of Traveling Expense to Members of Civilian Rifle Teams
Title 32, Par 186 Recommendations to Congress Respecting Rifle Ranges

ATTACHMENT 2

MILITARY RESERVATION
NO TRESPASSING

DANGER
FIRING
RANGES
DO NOT ENTER

HELP PREVENT
GRASS FIRES
EXTINGUISH ALL
SMOKING MATERIALS

CLOSE GATE

DANGER

SMALL ARMS FIRING
IN PROGRESS

KEEP OUT

DANGER

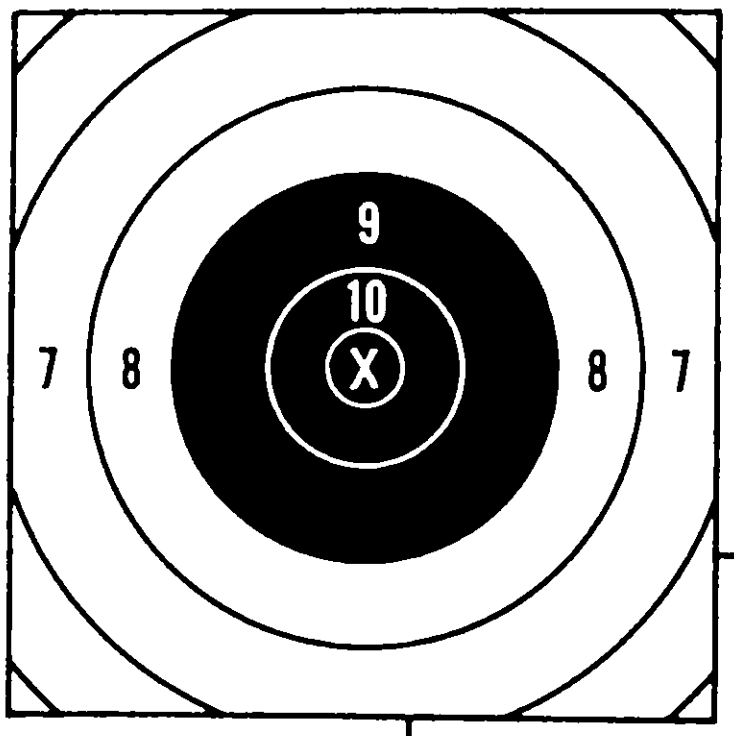
FIRING IN
PROGRESS

WHEN RED FLAG IS FLYING

FIRING RANGE

AIR FORCE BASE

KEEP
OUT



DIAMETER OF RINGS		
X RING	3.00 DIA	±.03
10 RING	7.00 DIA	±.03
9 RING	13.00 DIA	±.06
8 RING	19.00 DIA	±.06
7 RING	25.00 DIA	±.06
6 RING	31.00 DIA	±.12
5 RING	37.00 DIA	±.12

Figure 31.

Target Repair Center A—C

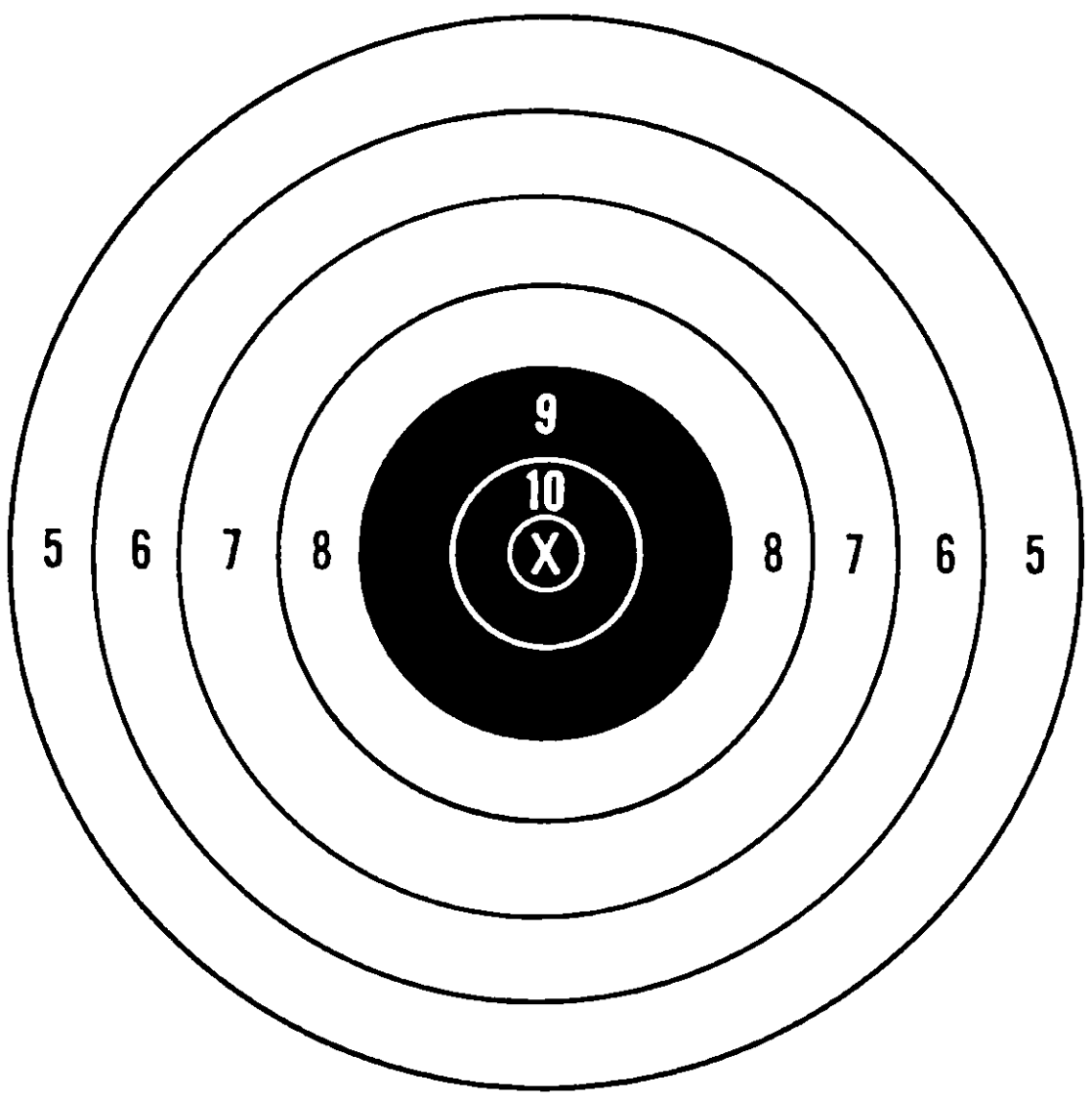


Figure 30.

Rifle Target A

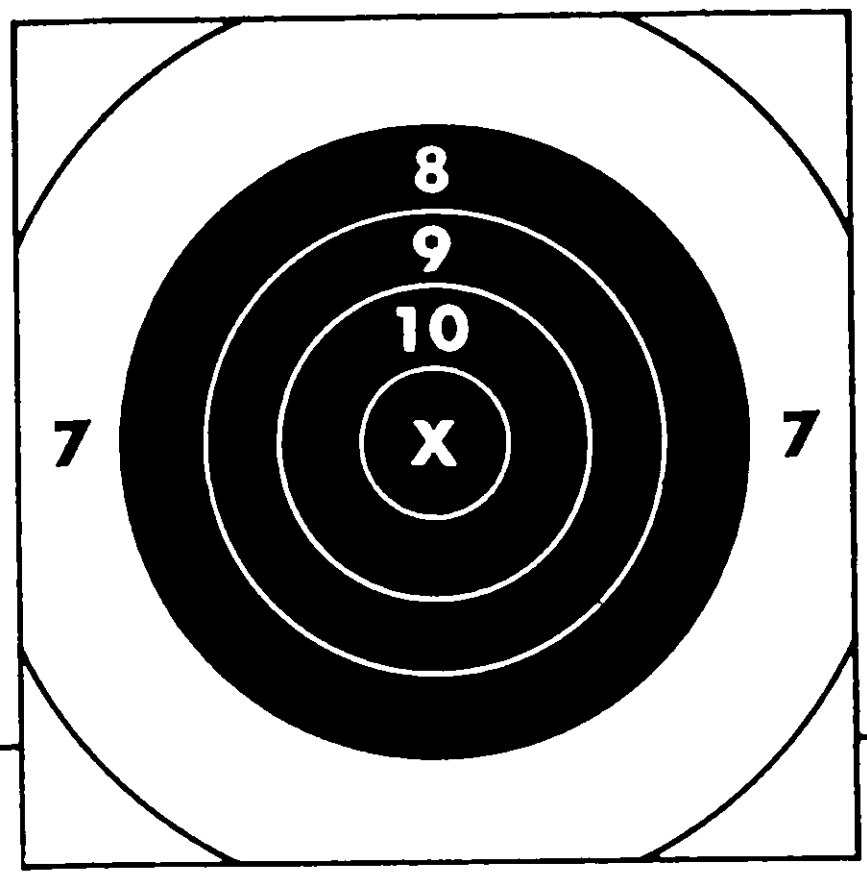


Figure 33. Target Repair Center B—C

DIAMETER OF RINGS		
X RING	6.00 DIA	± .03
10 RING	12.00 DIA	± .03
9 RING	18.00 DIA	± .06
8 RING	24.00 DIA	± .06
7 RING	36.00 DIA	± .12
6 RING	48.00 DIA	± .12
5 RING	60.00 DIA	± .12

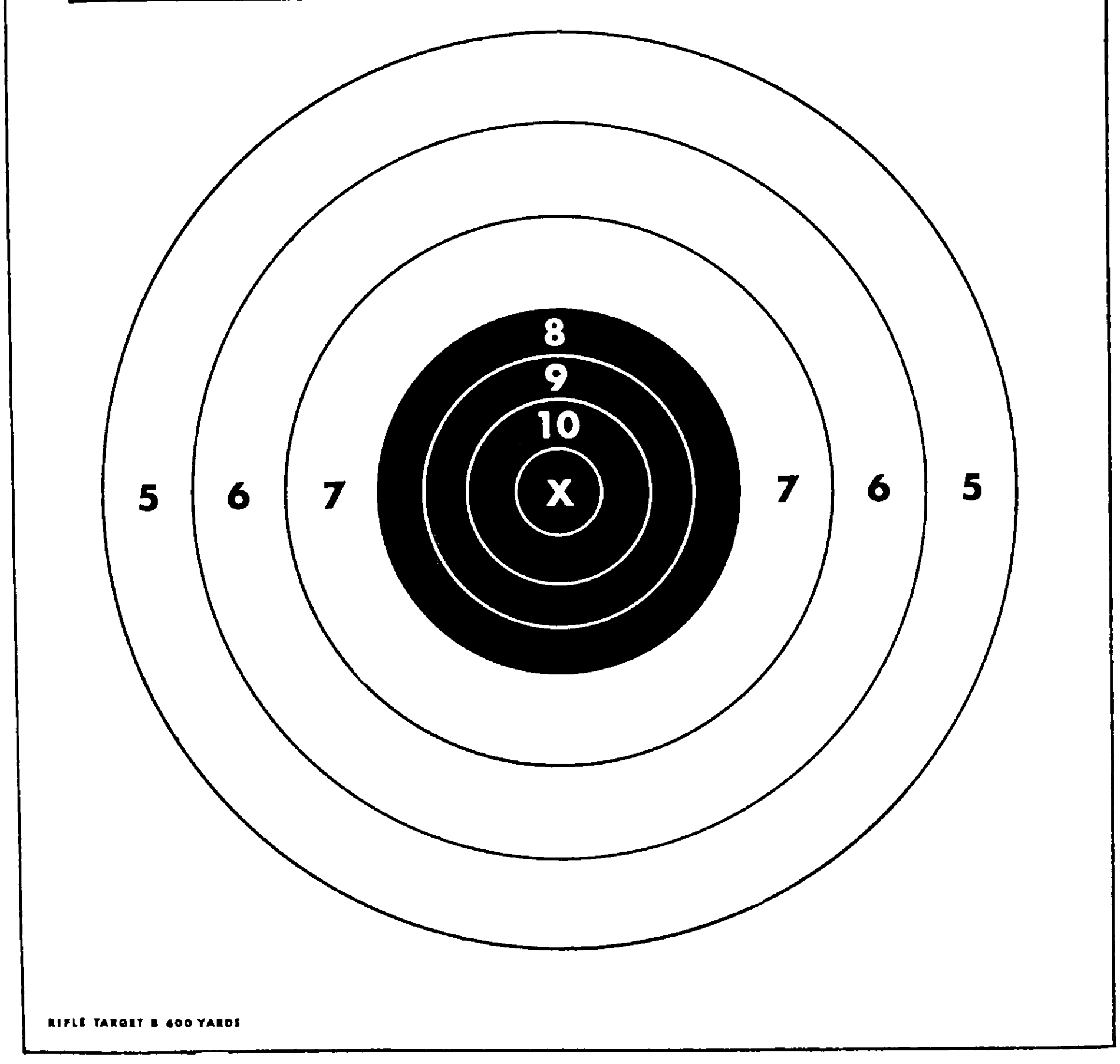


Figure 32. Rifle Target B

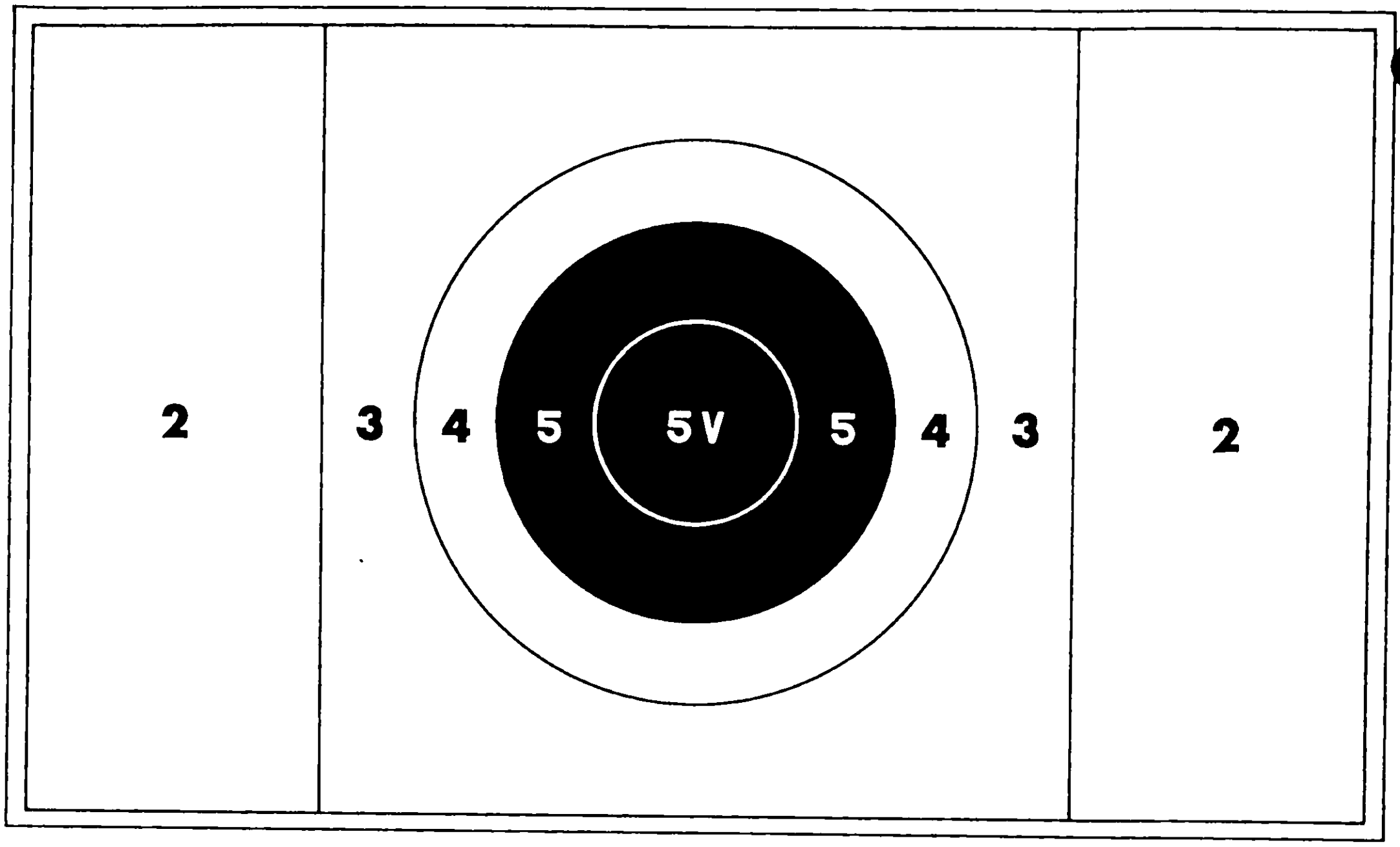


Figure 34. Rifle Target C

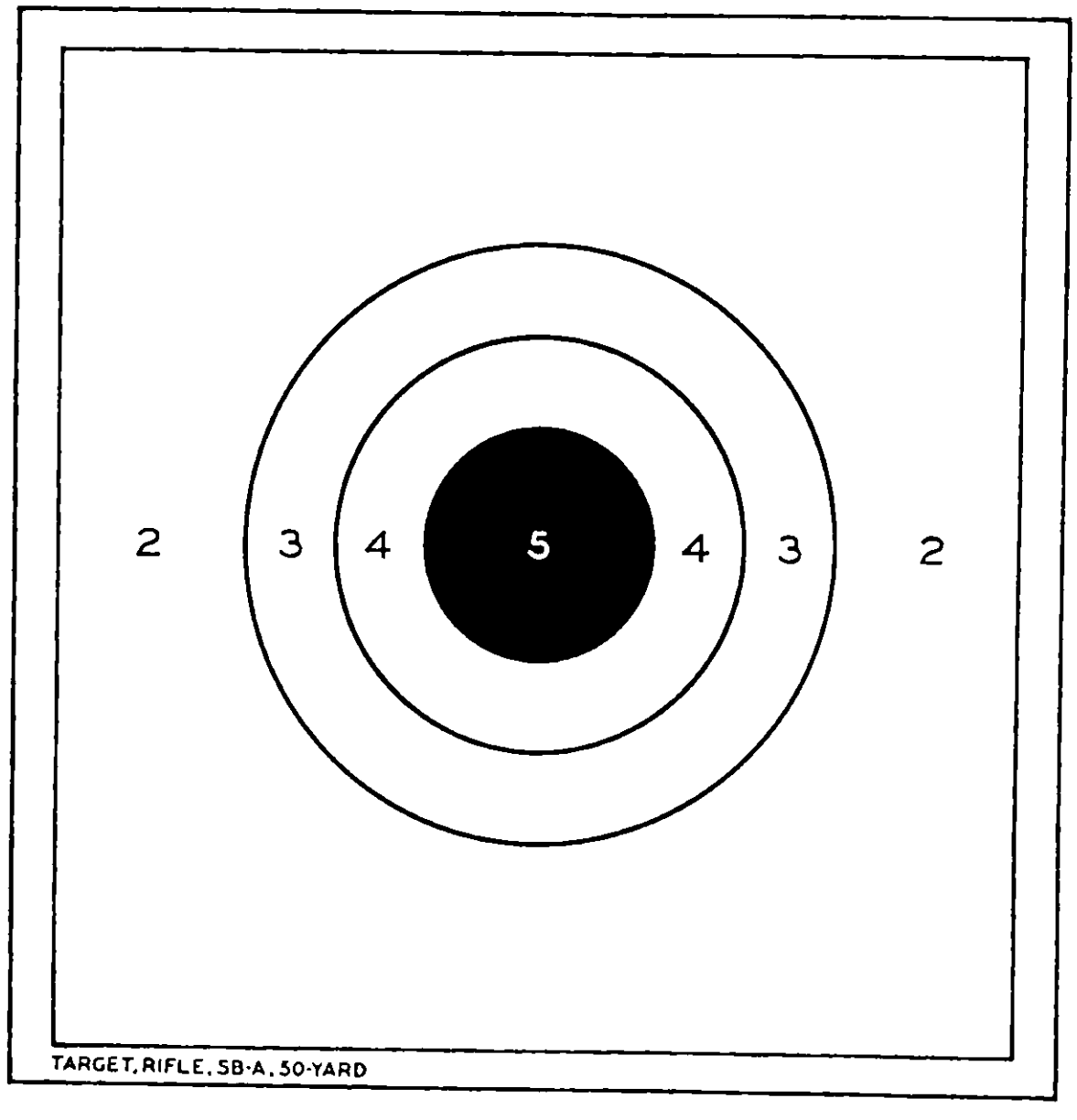


Figure 35. Rifle Target, 50-yard SB–A

Figure 36. Smallbore Rifle Target, 11-bull, 50-foot

Illustrations removed due to copyright

Figure 37. Smallbore Rifle Target P/N A–25

Figure 38. Smallbore Rifle Target P/N A–23

Illustrations removed due to copyright

Figure 39. Smallbore Rifle Target P/N A–24

Figure 40. Smallbore Rifle Target P/N A–27

Illustrations removed due to copyright

Figure 41. Pistol Target, 25-yard Standard American

Figure 42. Target Repair Center, 25-yard Standard American

Illustrations removed due to copyright

Figure 43. Pistol Target, 50-yard Standard American

Figure 44. Target Repair Center, 50-yard Standard American

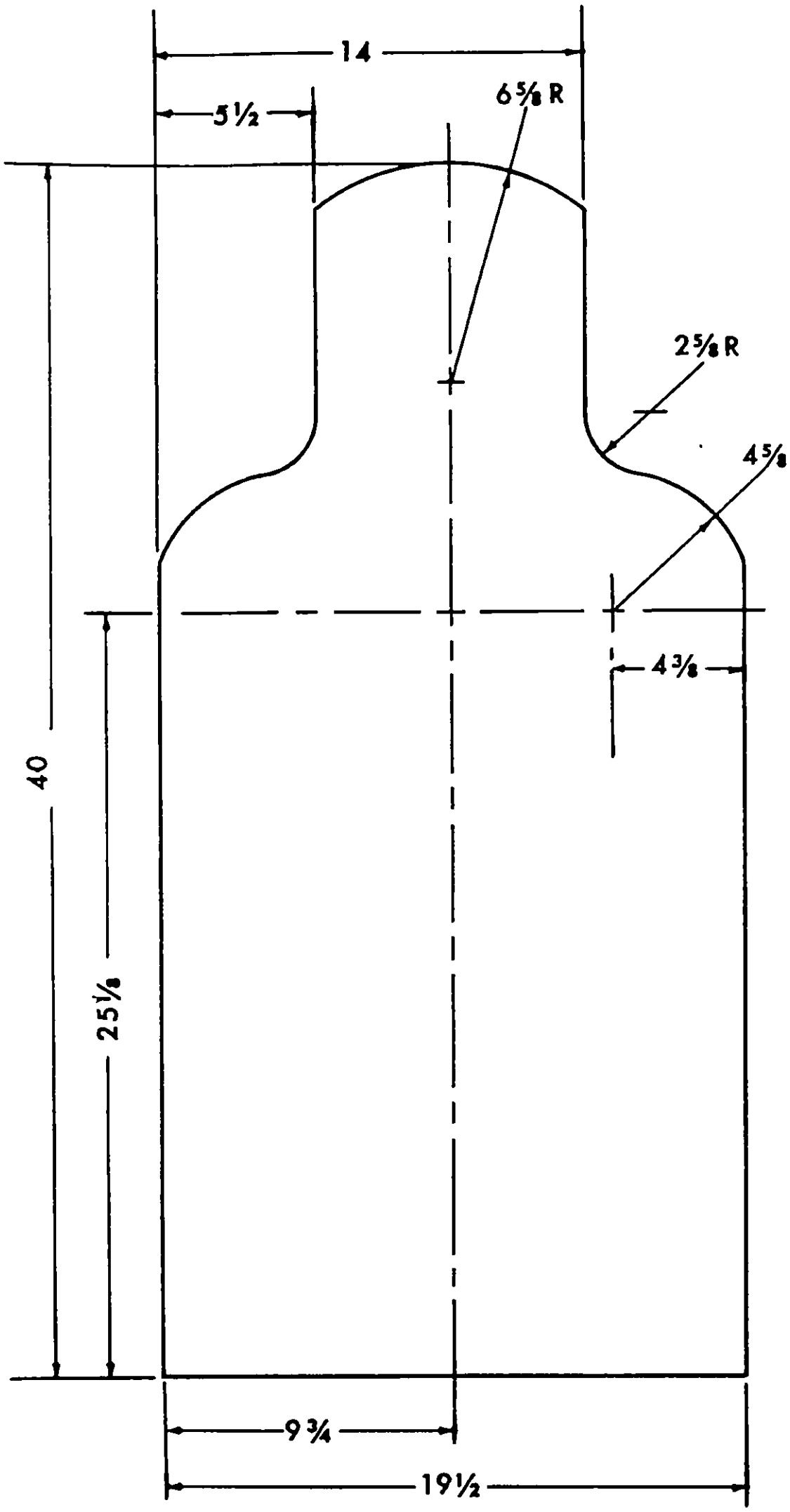


Figure 45. Silhouette Target E, Kneeling Pasteboard

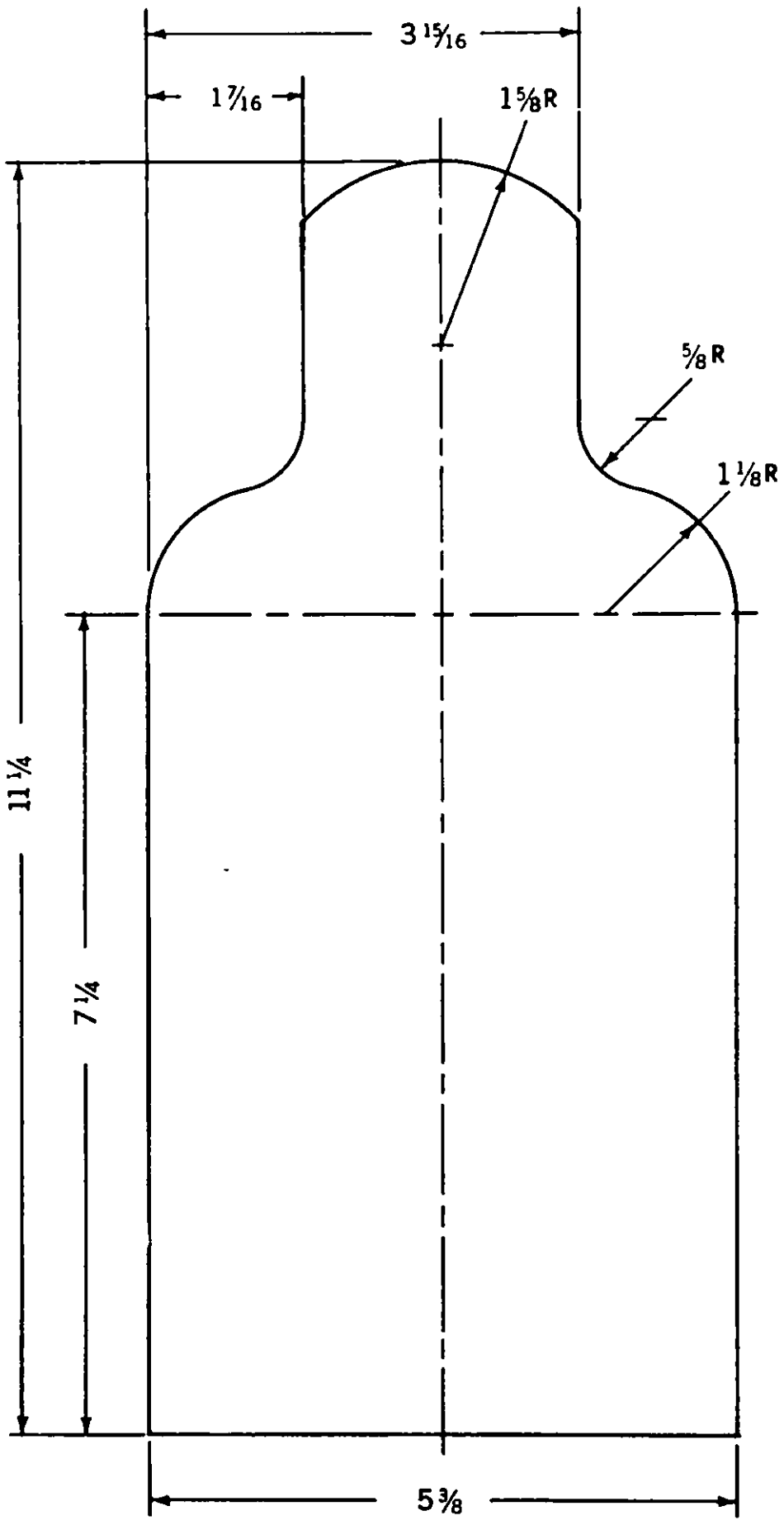


Figure 46. Silhouette Target E, 1,000-inch Range Reduced

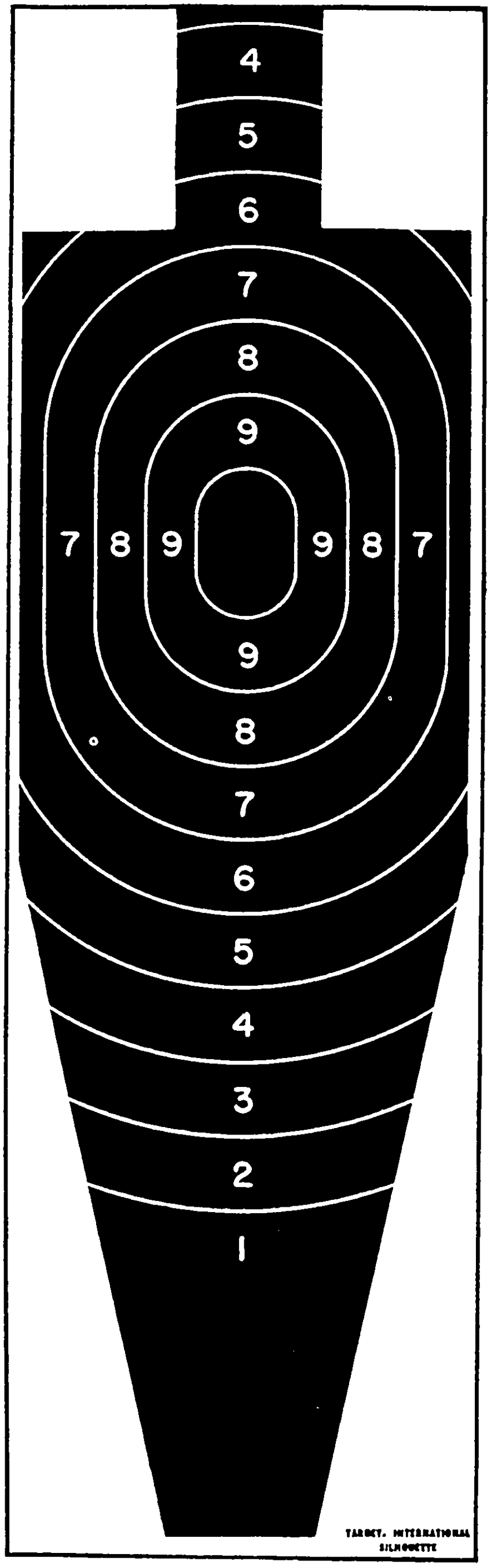


Figure 47. Olympic Scoring Target, Paper

Illustration removed due to copyright

Figure 48. Pistol Target, Slow Fire, 50-foot Gallery

Illustration removed due to copyright

Figure 49. Pistol Target, Rapid Fire, 50-foot Gallery

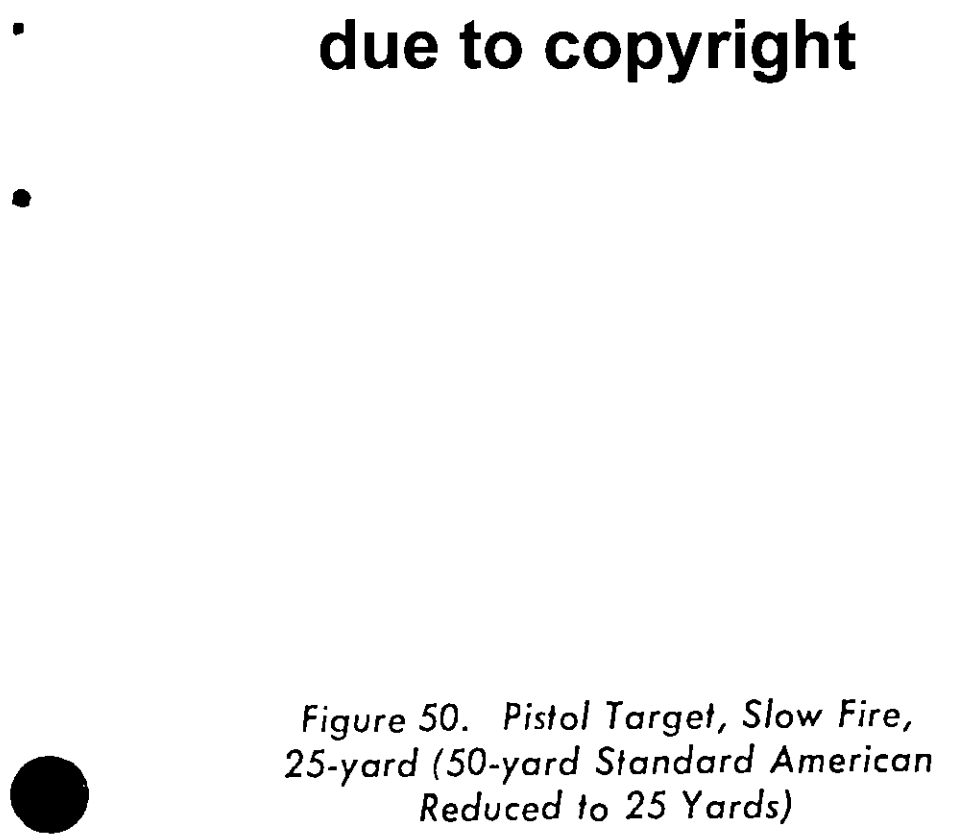


Figure 50. Pistol Target, Slow Fire, 25-yard (50-yard Standard American Reduced to 25 Yards)

Figure 51. International Pistol Target, Specification B—19, 50-meter, Reduced to 50 Yards

ATTACHMENT 4

Target Utilization Chart

Target		Air Force annual Recurring training		Competition				
Figure No.		Range	Course of fire	Range	Course of fire	Rings in black	Bulls per range	
30	Target, rifle, A	100 yds.	(1)	200-300 yds	(2)	5	1	
31	Center, repair, target A-C	100 yds.	(1)	200-300 yds	(2)	5	1	
32	Target, rifle, B			500-600 yds	(2)	5	1	
33	Center, repair, target B-C			500-600 yds	(2)	5	1	
34	Target rifle, C			800-1000 yds	(2)	5	1	
35	Target, rifle, SB-A, 50-yd.	1,000 in.	(1)			5	1	
36	Target, small-bore rifle, 10-bull, 50-ft.	50 ft.	(1)	50 ft.	(3)	6-10	10 or 11	
37	Target, small-bore rifle, P/N A-25			100 yds	(3)	8-10	3	
38	Target, small-bore rifle, P/N A-23			50 yds	(3)	8-10	5	
39	Target, small bore rifle, P/N A-24			100 yds	(3)	7-10	3	
40	Target, small-bore rifle, P/N A-27			50 yds	(3)	7-10	5	
35	Target, rifle, SB-A, 50-yd.	50 yds.	(1)			5	1	
	Backer target, P/N A-23B, A-26B, & A-27B Appl: targets A-23, A-26 & A-27							
	Backer target, P/N A-24B & A-25B Appl: targets A-24 & A-25							
41	Target, pistol, 25-yd, standard American	25 yds.	(1)	25 yds	(4)	9-10	1	
42	Center, repair, target, 25-yd, standard American	25 yds.	(1)	25 yds	(4)	9-10	1	
43	Target, pistol, 50-yd, standard American			50 yds	(4)	8-10	1	
44	Center, repair, target 50-yd, standard American			50 yds	(4)	8-10	1	
45	Target, silhouette, E, kneeling, pasteboard	7-10 yds.	(1)					
45	Target, silhouette, E, kneeling, paper	7-10 yds.	(1)					
46	Target, silhouette, E, 1000-inch range, pasteboard							
46	Target, silhouette, E, 1000-inch range, paper							
47	Target, Olympic scoring, paper			25 meters	(4)			
48	Target, pistol, slow fire, 50-ft. gallery			50 ft.	(4)	7-10	1	
49	Target, pistol, rapid fire, 50-ft. gallery	50 ft.	(1)	50 ft.	(4)	9-10	1	
50	Target, pistol, slow fire, 25-yd. 50-yd standard American, reduced to 25-yd.			25 yds	(4)	7-10	1	
51	Target, international pistol, 50-meter, specification B-19, reduced to 50-yd.			50 yds	(4)	7-10	1	

Target Specification Chart

	Dimensions—overall and scoring rings												
	Overall	X	10	9	8	7	6	V	5	4	3	2	1
	48x73″							4″	12″	24″	36″		
	24x24 3/8″							4″	12″	24″			
	72x73″							12″	20″	40″	60″		
	36x36 1/2″							12″	20″				
	73x120″							20″	36″	54″	72x72″		
	13x13″								2 53/64″	5 1/32″	7 15/64″	12x12″	
	10½x12″		.15″	.483″	.817″	1.150″	1.483″		1.817″				
	14x42″	1.″	2.″	4.″	6.″	8.″	10″		12″				
	14x24″	.39″	.89″	1.89″	2.89″	3.89″	4.89″		5.89″				
	14x42″	.8999″	1.7998″	3.5996″	5.3994″	7.1992″	8.999″		10.7988″	12.5986″			
	14x24″	.359″	.719″	1.439″	2.159″	2.879″	3.599″		4.319″	5.038″			
	13x13″								2 53/64″	5 1/32″	7 15/64″		
	14x24″												
	14x28″												
	21x24″*	1.695″	3.39″	5.54″	8.00″	11.00″	14.80″		19.68″				
	10½x10½″	1.695″	3.39″	5.54″	8.00″	11.00″	14.80″		19.68″				
	21x24″*	1.695″	3.39″	5.54″	8.0″	11.″	14.8″		19.68″				
	10½x10½″	1.695″	3.39″	5.54″	8.0″	11.″	14.8″		19.68″				
	10½x12″		.90″	1.54″	2.23″	3.07″	4.16″		5.56″	7.33″			
	10½x12″		1.80″	3.06″	4.46″	6.14″	8.32″						
	10½x12″		1.695″	2.77″	4.00″	5.50″	7.40″		9.84″				
	21x21″		1.799″	3.599″	5.399″	7.199″	8.999″		10.799″	12.599″	14.399″	16.199″	17.999″

* Commercial targets 21 x 21
(1) Course of fire in AFR 50-8
(2) Course of fire in NRA High-Power Rifle Rule Book
(3) Course of fire in NRA Small-bore Rifle Rule Book
(4) Course of fire in NRA Pistol Rule Book

ATTACHMENT 5

Target and Target Material Chart

(Consult Federal Stock Catalog Class 6920 for current stock numbers)

Target and target material	Stock number	Unit of issue	Number in unit	Central procure-ment	Local purchase
Target, rifle, A	6920-627-4071	Box	50	x	
Center, repair, target, A-C	6920-627-4072	Roll	500	x	
Target, rifle, B	6920-600-6876	Roll	50	x	
Center, repair, target, B-C	6920-714-0237	Roll	100	x	
Target, rifle, C	6920-600-6877	Roll	25	x	
Target, rifle, SB-A, 50 yard	6920-556-6631	Bundle	500	x	
Target, International rifle, 300-meter, P/N C-1		Each			x
Target, small–bore rifle, 10-bull, 50-ft	6920-557-4606	Bundle	500	x	
Target, pneumatic or CO_2 rifle, 25-ft, P/N A-19		Each			x
Target, International small–bore rifle, 50-meter, P/N A-20		Each			x
Target, small–bore rifle, 50-yard, P/N A-23		Each			x
Target, International small–bore rifle, 50-meter, P/N A-24		Each			x
Target, small–bore rifle, 100-yard, P/N A-25		Each			x
Target, small–bore rifle, 50-meter, P/N A-26		Each			x
Target, small–bore rifle, 50-yard, P/N A-27		Each			x
Target, small–bore rifle, 100-yard, P/N A-33		Each			x
Target, small–bore rifle, 50-yard, P/N A-34		Each			x
Target, small–bore rifle, 100-meter, P/N A-35		Each			x
Target, backer, A-23B, A-26B & A-27B. Appl: targets A-23, A-26, & A-27		Each			x
Target, backer, A-24B and A-25B. Appl: targets A-24 & A-25		Each			x
Target, pistol, 25-yard, standard American	6920-544-5054	Box	500	x	x
Center, repair, 25-yard, standard American P/N B-15	6920-562-0901	Box	500	x	x
Target, pistol, 50-yard, standard American	6920-550-9830	Box	500	x	x
Center, repair, pistol, 50-yard standard American P/N B-14	6920-562-0900	Box	500	x	x
Target, silhouette, E, kneeling, pasteboard	6920-600-6879	Bundle	50	x	
Target, silhouette, E, kneeling, paper	6920-600-6874	Bundle	500	x	
Target, silhouette, E, 1000-inch range, pasteboard					
Target, silhouette, E, 1000-inch range, paper					
Target, olympic, scoring, paper	6920-713-5385	Roll	25	x	
Pasters, gummed, black	6920-716-2350	Box	5000	x	
Paster, gummed, buff	6920-716-2351	Box	5000	x	
Disk, target, spotter, 1½-inch	6920-789-0864	Bag	100	x	

Target and Target Material Chart

(Consult Federal Stock Catalog Class 6920 for current stock numbers)

Target and target material	Stock number	Unit of issue	Number in unit	Central procure-ment	Local purchase
Disk, target, spotter, 3-inch	6920-713-8255	Roll	100	x	
Disk, target, spotter, 5-inch	6920-713-8254	Roll	100	x	
Disk, target, spotter, 10-inch	6920-713-8256	Roll	100	x	
Spindle, target, spotter	6920-713-8257	Box	200	x	
Disk, marker, short range, right (white & red)	6920-610-8869	Box	40	x	
Disk, marker, short range, left (white w/black cross and black)	6920-610-8868	Box	40	x	
Disk, marker, medium range, right (white & red)	6920-600-6899	Box	40	x	
Disk, marker, medium range, left (white with black cross and black)	6920-610-8866	Box	40	x	
Disk, marker, long range, right (white & red)	6920-600-6898	Box	40	x	
Disk, marker, long range, left (white with black cross and black)	6920-600-8874	Box	40	x	
Cloth, cotton, Osnaburg, 6.8-oz. white, 72-inches wide (target cloth)	8305-281-2884	Yard		x	
Flag, red, target range (streamer) 5′9⅜″ hoist x 18′ fly x 3′	8345-025-3355	Each		x	
Flag, red, target range, 24″ hoist x 36″ fly	8345-555-9733	Box	50	x	
*Hardware set, target, combination sliding, 6′x6′	6920-049-9579	Each		x	
*Hardware set, target, combination sliding, 6′x6′	6920-344-2681	Each		x	
Trainer, rifle, sighting device, M15	6910-716-0903	Each		x	
Target, pistol, slow fire, 50-ft. gallery	6920-695-0133	Bundle	500	x	
Target, pistol, rapid fire, 50-ft. gallery	6920-695-0134	Bundle	500	x	
Target, pistol, slow fire, 25-yard (50-yard standard American reduced for 25-yard ranges), P/N B-16					x
Target, International free-pistol, 50-meter reduced to 50 yards, P/N B-19					x
Target, pneumatic and CO_2 pistol, 25-ft. slow fire, P/N B-1		Each			x
Target, pneumatic and CO_2 pistol, 25-ft. timed and rapid fire, P/N B-10		Each			x
Target, International, slow fire pistol, 50-ft., P/N B-11		Each			x
Target, International, slow fire pistol, 50-meter, P/N B-17		Each			x
Center, repair, Appl: target P/N B-17		Each			x
Target, International, slow fire pistol, 50-yd., P/N B-19		Each			x

* NOTE: One set of each of the two hardware sets is required to prefabricate one 6′x6′ combination sliding target. Wooden components locally manufactured.

Federal stock No.	Repair parts for sliding combination target frames	Unit of issue	Quantity incorporated in unit	Item No.
	COMBINATION TARGET FRAME			
5306-010-9195	BOLT, MACHINE: sq-hd, S, 3/8-16 UNC-2A x 4½ (MS 35354-72).	1	12	6
6920-555-9792	CARRIAGE, TARGET FRAME ASSEMBLY: (5559792).	1	2	8
6920-875-9762	FRAME ASSEMBLY, TARGET: 6 x 6 feet (5559772).	4	2	1
6920-875-9761	FRAME ASSEMBLY, TARGET: 6 x 10 feet (5559759).	4	2	1
4730-019-0361	LOCKNUT PIPE: MI, 1 pipe size, 11½ NPSL thd, 1.75 w across flats (190361).	1	8	3
5310-011-8615	NUT, PLAIN, HEXAGON: S, phos-ctd, 3/8-16UNC-2B, 9/16 w, 21/64 o/a h (MS 35690-603).	1	44	4
6920-514-1142	PLATE, SLIDE ROD: support, S, 2½ w, ½ thk, 14¼ lg, 4 holes (5141142).	2	4	7
6920-875-9763	SUPPORT ASSEMBLY, FRAME: (5559779).	1	1	
5310-655-9549	WASHER, FLAT: S, phos-ctd, 7/16 id, 1 od, 0.083 thk, 3/8 screw size (MS 15795-115).	1	14	5

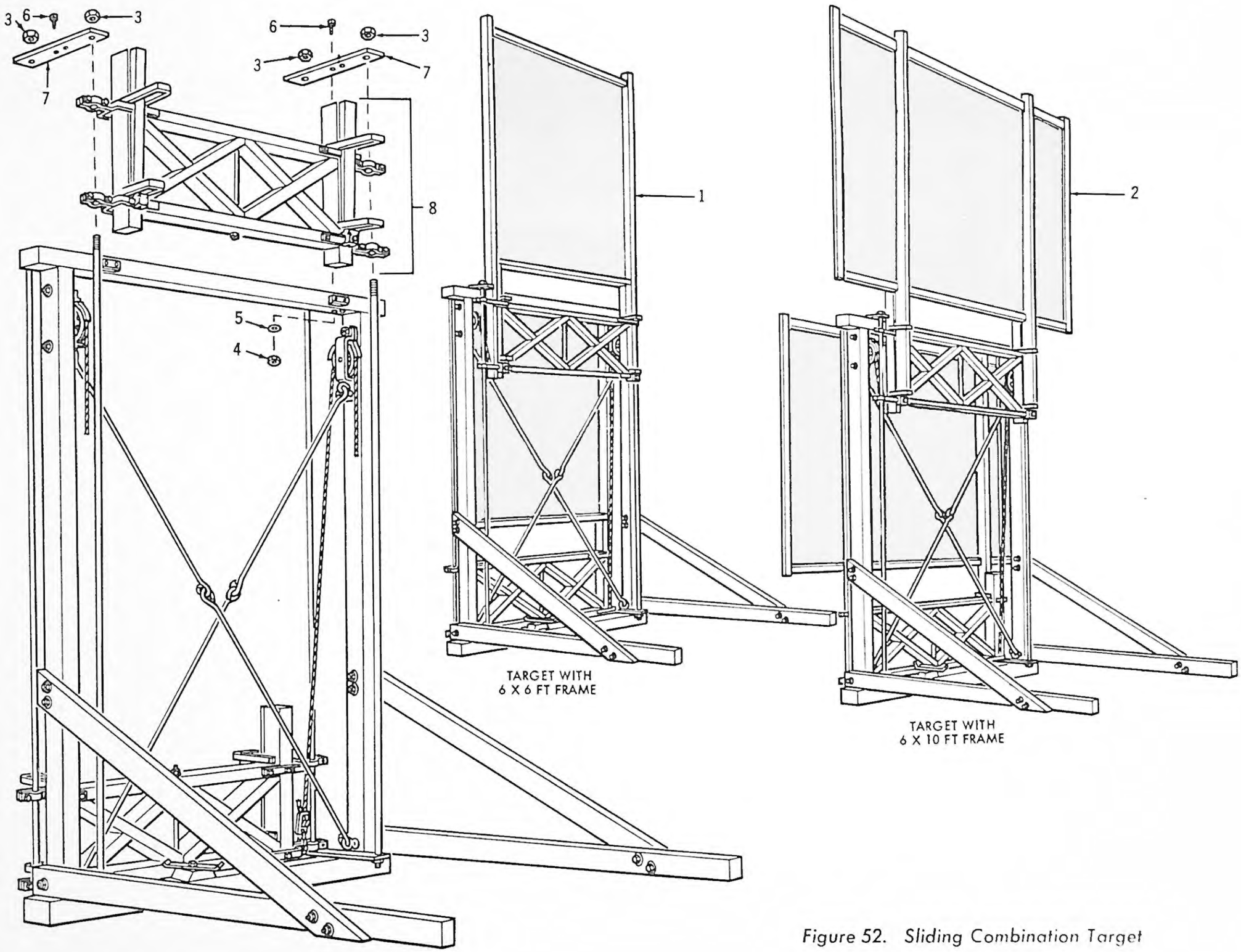


Figure 52. Sliding Combination Target

Federal stock No.	Repair parts for sliding combination target frames	Unit of issue	Quantity incorporated in unit	Item No.
	TARGET FRAME ASSEMBLY, 6 X 6 FEET			
8305-281-2884	CLOTH, COTTON, OSNABURG: 6.1 min oz, white, unshrunk, 72 w, Fed CCC-C-429 (27-C-38006-72).	yd	20	2
6920-610-8908	RAIL, TARGET: Horizontal, wood, 1⅝ thk, 3⅝ w, 72 lg (For 6 x 6 ft frame only) (6108908).	1	4	4
6920-713-7213	RAIL, TARGET: vertical, wood, 1⅝ thk, 3⅝ w, 107⅝ lg (For 6 x 6 ft frame only) (7137213).	1	4	3
5315-161-9839	STAPLE, WIRE CLOTH: S, smooth shank, side point, fl-hd, 0.065 fl stock, 7/32 inside shoulder spread, 7/16 lg (42-9012-250-160).	lb	96	1

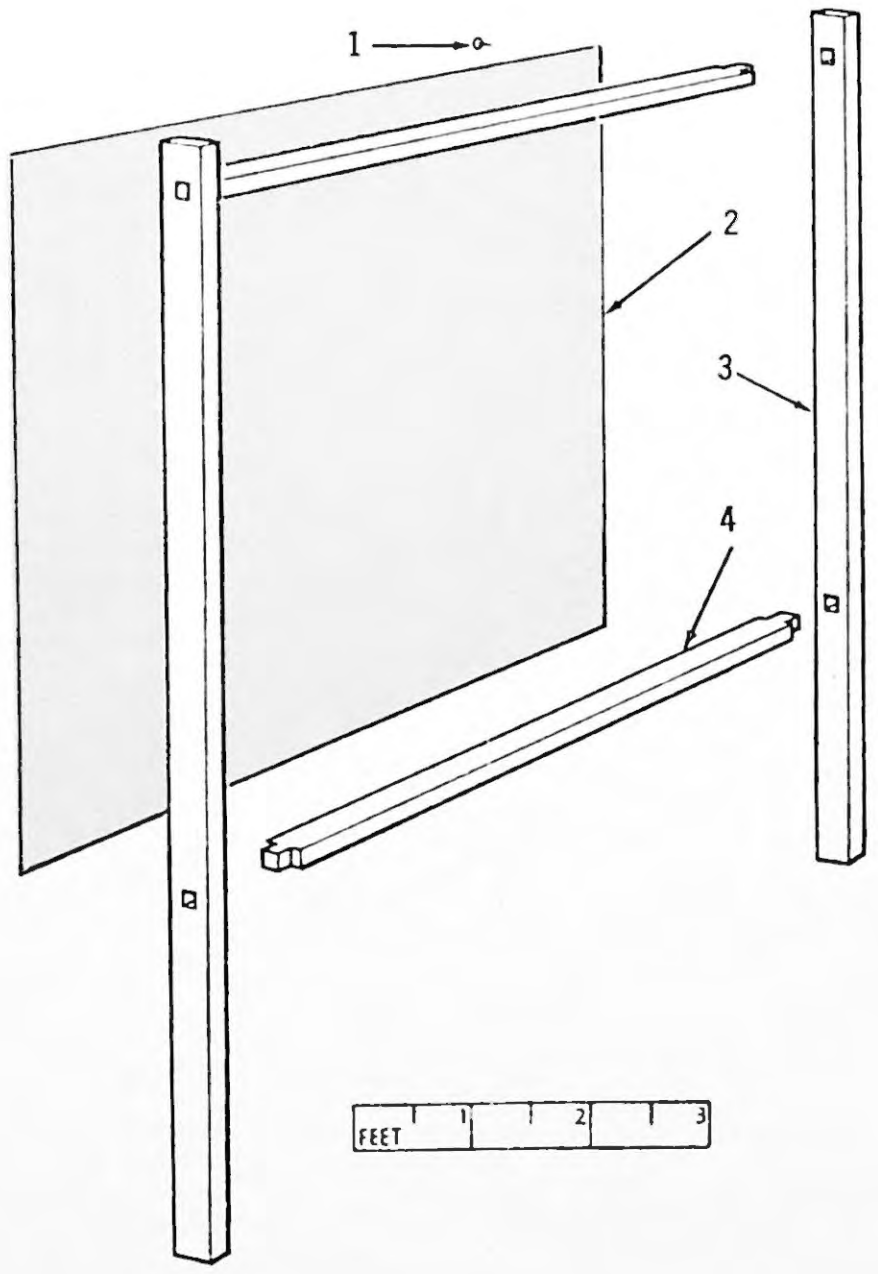


Figure 53. Target Frame Assembly, 6- x 6-feet

Federal stock No.	Repair parts for sliding combination target frames	Unit of issue	Quantity incorporated in unit	Item No.
	TARGET FRAME ASSEMBLY, 6 X 10 FEET			
8305-281-2884	CLOTH, COTTON, OSNABURG: 6.1 min oz, white, unshrunk, 72 w, Fed CCC-C-429 (27-C-38006-72). (For authorized allowance, see this item under target frame assembly 6 x 6 feet.)			1
6920-713-7216	DOWEL, OAK: sliding target frame, ½ dia, 4¼ lg (7137216).	1	8	3
6920-555-9760	RAIL, TARGET: horizontal, wood, 25/32 thk, 1⅝ w, 120 lg (For 6 x 10 ft frame only) (5559760).	1	4	5
6920-713-7214	RAIL, TARGET: vertical, wood, 25/32 thk, 1⅝ w, 74½ lg (For 6 x 10 ft frame only) (7137214).	1	4	4
6920-713-7215	RAIL, TARGET: vertical, wood, 3⅝ w, 1⅝ thk, 105¾ lg (For 6 x 10 ft frame only) (7137215).	1	4	6
5315-161-9839	STAPLE, WIRE CLOTH: S, smooth shank, side point, fl-hd, 0.065 fl stock, 7/32 inside shoulder spread, 7/16 lg (42-6012-250-160). (For authorized allowance, see this item under target frame assembly 6 x 6 feet.)			2

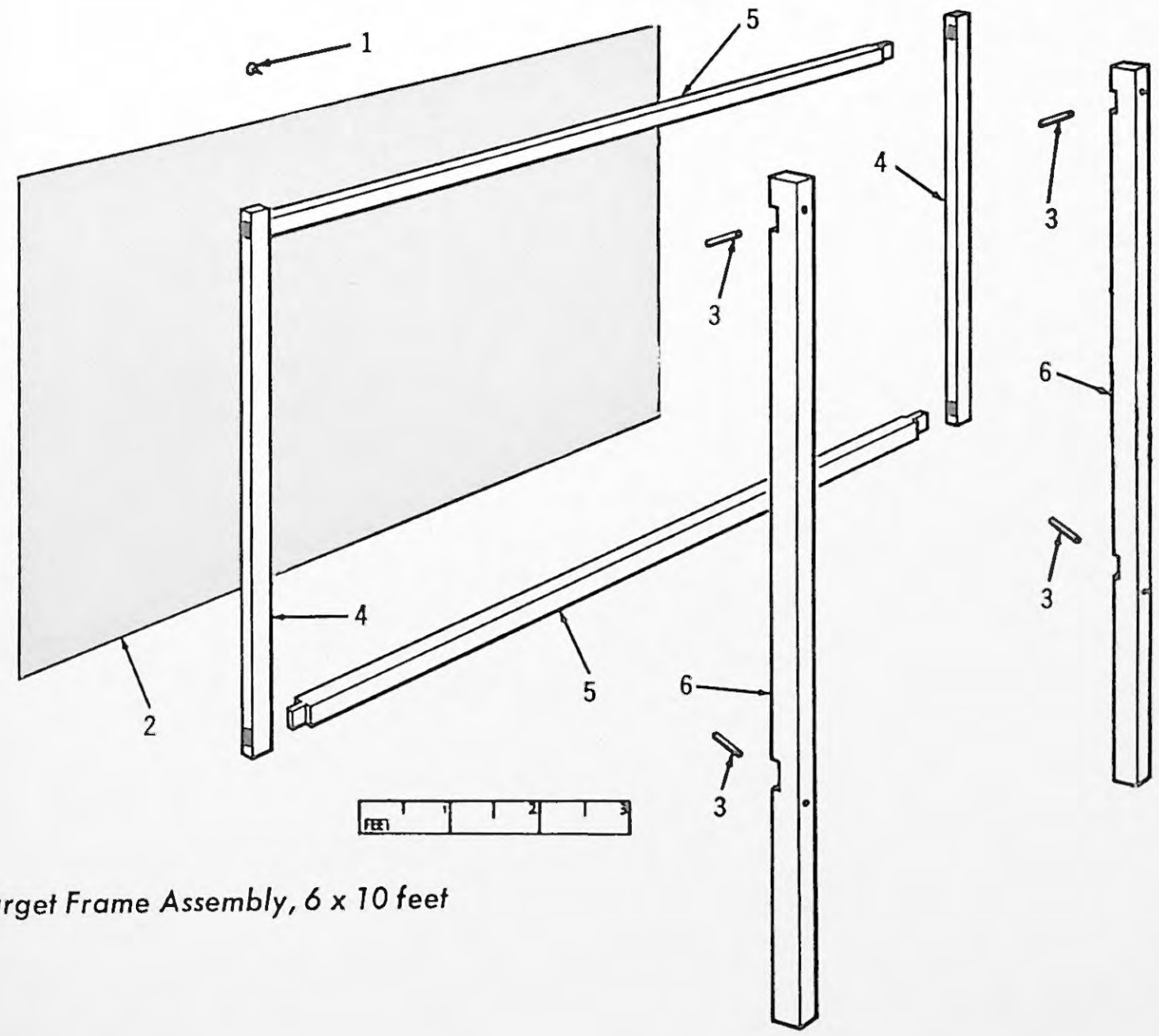


Figure 54. Target Frame Assembly, 6 x 10 feet

Federal stock No.	Repair parts for sliding combination target frames	Unit of issue	Quantity incorporated in unit	Item No.
	TARGET FRAME ASSEMBLY CARRIAGE			
5306-010-9195	BOLT, MACHINE: sq-hd, S, 3/8-16 UNC-2A x 4 1/2 (MS 35354-72). (For authorized allowance, see this item under sliding combination target frame.)			5
5305-010-9827	BOLT, MACHINE: sq-hd, S, 3/8-16 UNC-2A x 6 (MS 35354-75).	1	6	7
6920-713-7218	BRACE, TARGET FRAME CARRIAGE: softwood, 1 5/8 thk, 3 5/8 w, 36 1/2 lg (7137218).	1	8	19
5315-010-4657	NAIL, COMMON: wire, steel, smooth shank, diamond point, fl-hd, 0.113 dia shank, 0.266 dia hd, 6d, 2 lg (104657).	lb	30	18
5315-010-4659	NAIL, COMMON: wire, steel, smooth shank, diamond point, fl-hd, 0.131 dia shank, 0.281 dia hd, 8d, 2 1/2 lg (104659).	lb	8	13
5315-011-8613	NUT, PLAIN, HEXAGON: S, phos-ctd, 1/4-20UNC-2B, 7/16 w, 7/32 o/a h (MS 35690-403).	1	24	1 9
5310-011-8615	NUT, PLAIN, HEXAGON: S, phos-ctd, 3/8-16UNC-2B, 9/16 w, 21/64 o/a h (MS 35690-603). (For authorized allowance, see this item under sliding combination target frame.)			4 15A
6920-555-9790	RAIL, TARGET: horizontal, wood, 1 5/8 thk, 3 5/8 w, 68 3/4 lg (5559790).	1	4	17
6920-713-7219	RAIL, TARGET: vertical, wood, 25/32 thk, 1 5/8 w, 30 1/4 lg (For 6 x 10 ft frame only) (7137219).	1	4	14
6920-713-7217	RAIL, TARGET: vertical, wood, 2 5/8 thk, 3 5/8 w, 35 1/2 lg (7137217).	1	4	16
6920-610-8941	REST, SUPPORT: iron, carriage target frame assy (6108941).	1	4	6
6920-713-7220	ROD ASSEMBLY, TIE: target frame (7137220).	2	2	15
5305-012-1900	SCREW, CAP, HEXAGON HEAD: S, cd- or zn-pltd, 1/4-20UNC-2A x 1 nom lg 121900).	1	16	11
5305-058-3176	SCREW, MACHINE: fl-hd, S, cd- or zn-pltd, 1/4-20UNC-2A x 3 1/2 (583176).	1	8	2
6920-514-1144	SLIDE, TARGET FRAME CARRIAGE: S, 1 1/4 w, 1/4 thk, 12 3/4 o/a lg (5141144).	1	16	12
6920-514-1143	SUPPORT, TARGET FRAME CARRIAGE: U-shape, 1 1/4 w, 1/4 thk, 2 3/8 distance between arms, 8 3/8 o/a lg (5141143).	1	8	3
5310-274-8715	WASHER, LOCK: split, med, S, phos-ctd, 1/4 screw size (MS 35338-63).	1	16	10
5310-655-9549	WASHER, FLAT: S, phos-ctd, 7/16 id, 1 od, 0.083 thk, for 3/8 screw size (MS 15795-115). (For authorized allowance, see this item under sliding combination target frame.)			15B

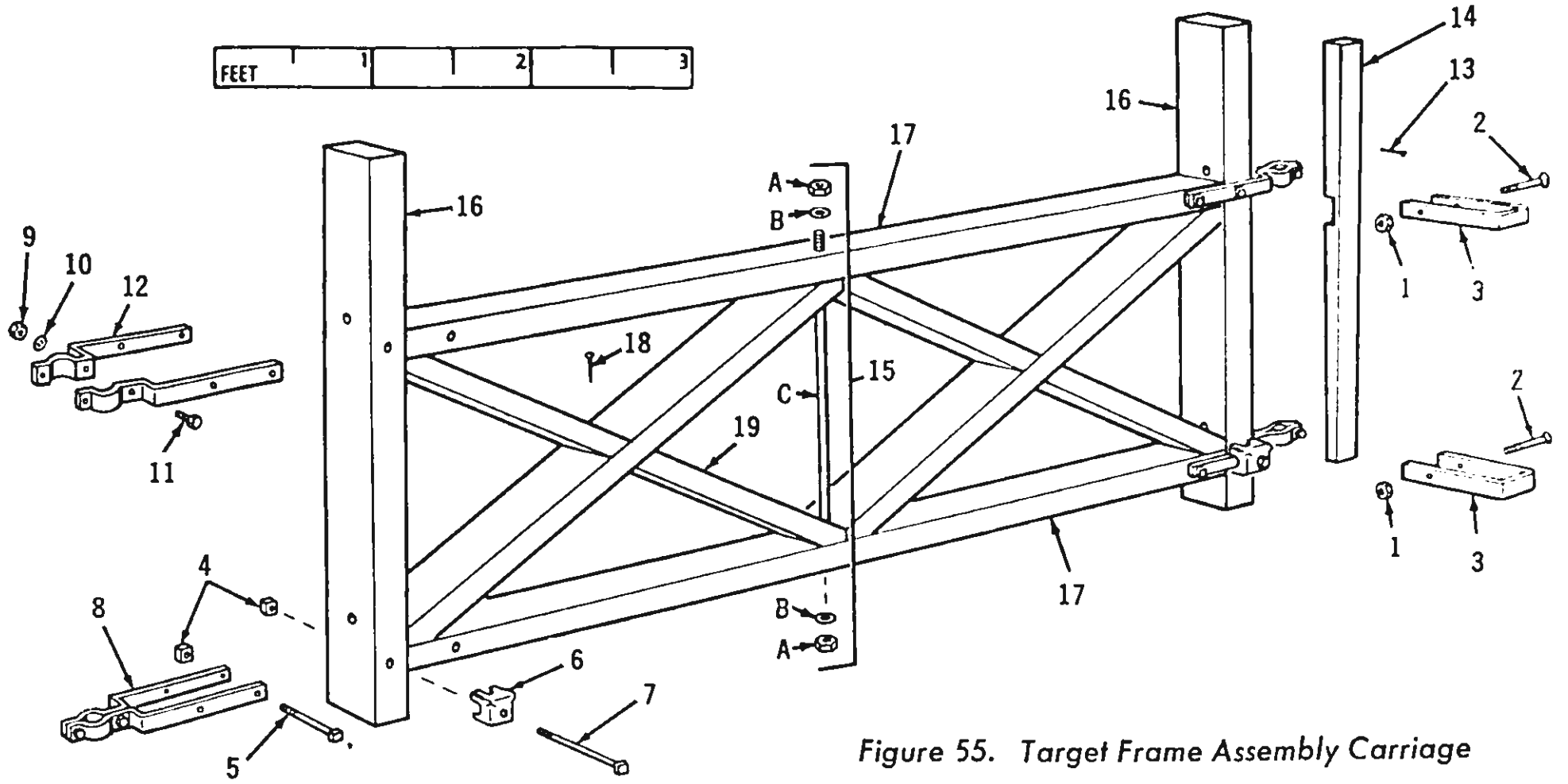


Figure 55. Target Frame Assembly Carriage

Federal stock No.	Repair parts for sliding combination target frames	Unit of issue	Quantity incorporated in unit	Item No.
	TIMBER FRAME ASSEMBLY SUPPORT			
6920-713-7230	BLOCK, FASTENING: sliding target support, softwood, 2⅝ h, 3⅝ w, 8 lg, one hole ½ dia (7137230).	1	1	6
5305-042-7116	BOLT, LAG: sq-hd, cone or gimlet-pt, S, 0.500 nom od, 6 lg (427116).	1	1	3
5305-042-6932	BOLT, MACHINE: sq-hd, S, cd- or zn-pltd, ⅜-16UNC-2A x 4 lg (426932).	1	4	24
5306-010-9195	BOLT, MACHINE: sq-hd, S, ⅜-16 UNC-2A x 4½ (MS 35354-72). (For authorized allowance, see this item under sliding combination target frame.)			11
5305-042-6934	BOLT, MACHINE: sq-hd, S, ⅜-16UNC-2A x 5 (426934).	1	10	22
5305-010-9827	BOLT, MACHINE: sq-hd, S, ⅜-16UNC-2A x 6 (MS 35354-75). (For authorized allowance, see this item under target frame assembly carriage.)			7
6920-713-7227	BRACE, TIMBER FRAME SUPPORT: softwood, 1⅝ thk, 5⅝ w, 84 o/a lg (7137227).	1	2	17
6920-610-8938	BRACKET, PULLEY ASSEMBLY: (6108938).	1	2	20
6920-514-1145	CLAMP, SASH CORD: iron, 1⅝ w, ½ thk, 3⅝ lg, 3 holes (5141145).	1	2	1
6920-713-7229	GUIDE, FRAME: sliding target, wood, 13/16 thk, 2 w, 3 lg, 2 holes ¼ dia (7137229).	1	4	14

Federal stock No.	Repair parts for sliding combination target frames	Unit of issue	Quantity incorporated in unit	Item No.
	TIMBER FRAME ASSEMBLY SUPPORT			
4730-019-0361	LOCKNUT PIPE: M1, 1 pipe size, 11½ NPSL thd, 1.75 w across flats (190361). (For authorized allowance, see this item under sliding combination target frame.)			7
5315-010-4661	NAIL, COMMON: wire, steel, smooth shank, diamond point, fl-hd, 0.148 dia shank, 0.313 dia hd, 10d, 3 lg (104661).	lb	8	5
5310-011-8615	NUT, PLAIN, HEXAGON: S, phos-ctd, ⅜-16UNC-2B, 9/16 w, 21/64 o/a h (MS 35690-603). (For authorized allowance, see this item under sliding combination target frame.)			9 15
6920-514-1140	PLATE, FASTENING: support, 1⅜ w, 3/16 thk, 11¼ o/a lg (5141140).	2	1	4
6920-514-1141	PLATE, PULLEY: support, 1½ w, 7/16 thk, 10¼ lg (5141141).	2	2	18
6920-514-1142	PLATE, SLIDE ROD: support, S, 2½ w, ½ thk, 14¼ lg, 4 holes (5141142). (For authorized allowance, see this item under sliding combination target frame.)			12
6920-514-1147	PULLEY, GROOVED: al, anodized-fin., one U-shaped groove, 0.510 bore dia, 5 11/16 pulley od, 2 7/32 o/a lg (5141147).	1	2	19
6920-713-7228	RAIL, TARGET: horizontal, wood, 1⅝ thk, 5⅝ w, 84 lg (7137228).	1	2	26
6920-713-7225	RAIL, TARGET: horizontal, wood, 3⅝ thk, 5⅝ w, 95 lg, (7137225).	1	1	29
6920-650-7414	RAIL, TARGET: horizontal, wood, 3⅝ thk, 5⅝ w, 95 lg (6507414).	1	2	27
6920-713-7226	RAIL, TARGET: vertical, wood, 3⅝ thk, 5⅝ w, 107⅞ lg (7137226).	1	2	28
6920-610-8939	ROD, SLIDE: S, 1 id, 1.315 od, 1-11½ NPS x 1½ lg both ends, 9 ft o/a lg (6108939).	1	4	8
6920-713-6612	ROD, SLIDE ASSEMBLY: (7136612).	4	4	
6920-713-7223	ROD, STAY, ASSEMBLY: Target frame, timber frame (7137223).	1	2	25
4020-231-2581	ROPE, MANILA: preservative oil treated, 1⅛ nom circ, 24.4 ft per lb, 1350 lbs min breaking strength, 12⅝ lg of 10 turns, Fed Spec T-R-605, Type M, class 2 (21-R-358-10).	ft		2
	ROPE: (12½ ft) Improvised from above item.		2	
5305-010-1958	SCREW, WOOD: fl-ck-hd, S, no. 14 (0.246) nom dia, 2 lg (101958).	1	8	13
5310-655-9549	WASHER, FLAT: S, phos-ctd, 7/16 id, 1 od, 0.083 thk, ⅜ screw size (MS 15795-115). (For authorized allowance, see this item under sliding combination target frame.)			10 16

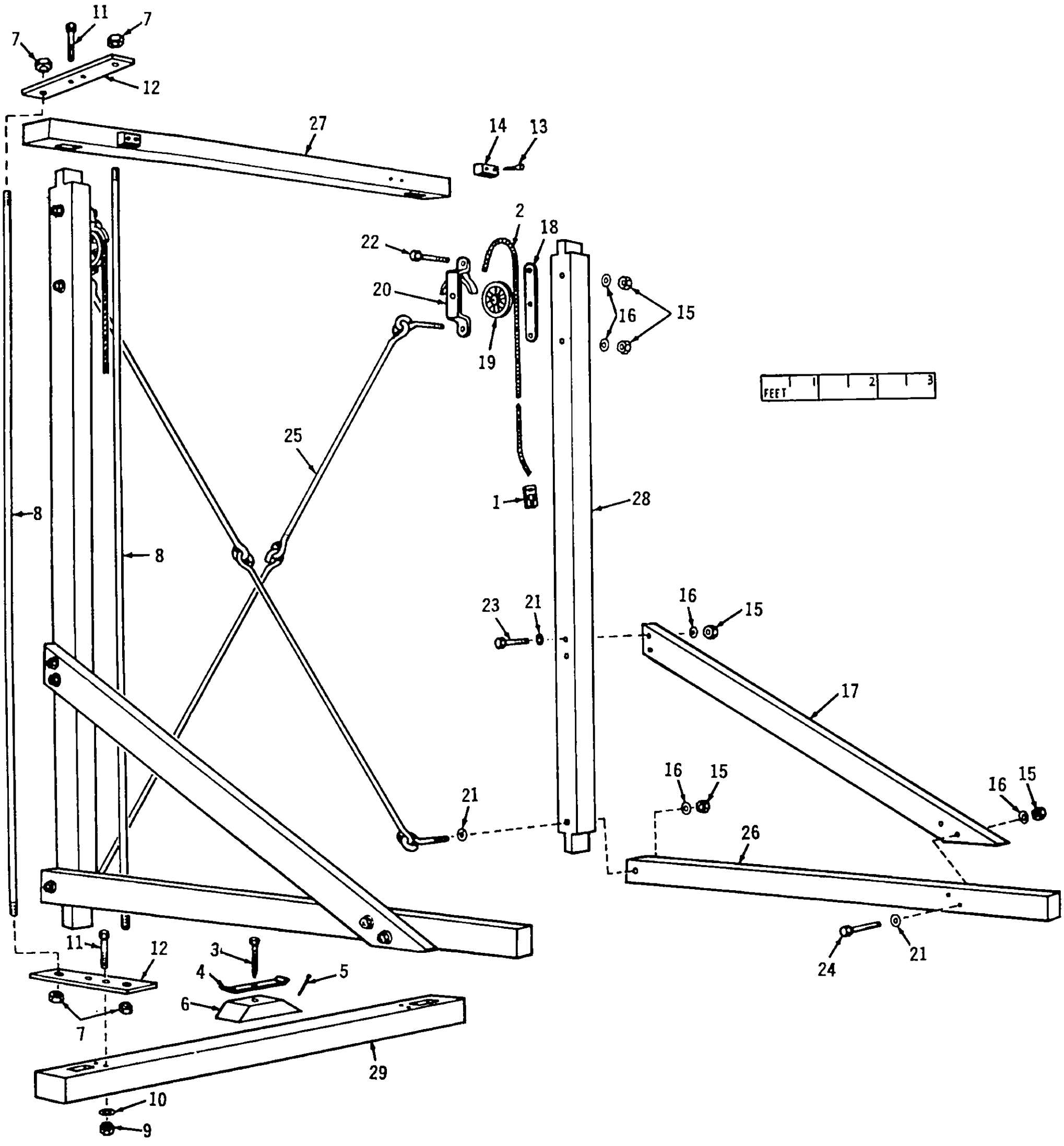


Figure 56. Timber Frame Assembly Support

Federal stock No.	Repair parts for target markers	Unit of issue	Quantity incorporated in unit	Item No.
	PISTOL TARGET MARKER			
5306-012-6291	BOLT, SQUARE NECK: (carriage bolt) button, S, cd- or zn-pltd, no. 10 (0.190)-24NC-2A x 1½ (126291).	1	2	3
6920-610-8889	DISK, TARGET MARKER: S, phos-ctd, 4 dia, (100 per box) (6108889).	box	1	5
5310-014-4233	NUT, PLAIN, WING: S, cd- or zn-pltd, no. 10 (0.190)-24NC-2B, 27/32 wing spread, 13/32 wing h (144233).	1	2	1
6920-500-8783	STAFF, TARGET MARKING: wood, 13/16 in. thk, 1⅝ in. w, 9 ft lg (5008783).	1	1	4
5310-012-0385	WASHER, FLAT: S, cd, or zn-pltd, ¼ id, 9/16 od, 0.049 nom thk (120385).	1	2	2
	SHORT RANGE TARGET MARKER			
5306-012-6291	BOLT, SQUARE NECK: (carriage bolt) button, S, cd- or zn-pltd, no. 10 (0.190)-24NC-2A x 1½ (126291).	1	4	3
6920-610-8868	DISK, TARGET MARKER: left, steel, phos-ctd, 10 dia (40 per box) (6108868).	box	1	5
6920-610-8869	DISK, TARGET MARKER: right, steel, phos-ctd, 10 dia (40 per box) (6108869).	box	1	6
5310-014-4233	NUT, PLAIN, WING: S, cd- or zn-pltd, no. 10 (0.190)-24NC-2B, 27/32 wing spread, 13/32 wing h (144233).	1	4	1
6920-255-9018	STAFF, TARGET MARKING: wood, 13/16 thk, 1⅝ w, 108 lg (5008782).	1	1	4
5310-012-0385	WASHER, FLAT: S, cd, or zn-pltd, ¼ id, 9/16 od, 0.049 nom thk (120385).	1	6	2
	MID-RANGE TARGET MARKER			
5306-012-6291	BOLT, SQUARE NECK: (carriage bolt) button, S, cd- or zn-pltd, no. 10 (0.190)-24NC-2A x 1½ (126291).	1	6	3
6920-610-8866	DISK, TARGET MARKER: S, phos-ctd, 20 dia, 40 per box (6108866).	box	1	5
6920-600-6899	DISK, TARGET MARKER: S, phos-ctd, 20 dia, 40 per box (6006899).	box	1	6
5310-014-4233	NUT, PLAIN, WING: S, cd- or zn-pltd, no. 10 (0.190)-24NC-2B, 27/32 wing spread, 13/32 wing h (144233).	1	6	1
6920-600-6901	STAFF, TARGET MARKING: wood, 108 lg, 1⅝ w, 13/16 thk (6006901).	1	1	4
5310-012-0385	WASHER, FLAT: S, cd, or zn-pltd, ¼ id, 9/16 od, 0.049 nom thk (120385).	1	6	2

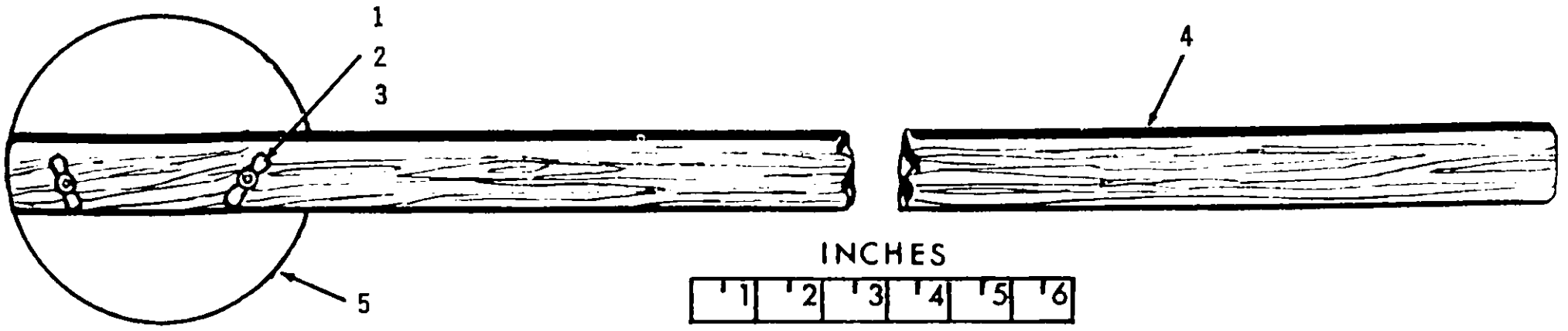


Figure 57. Pistol Target Marker

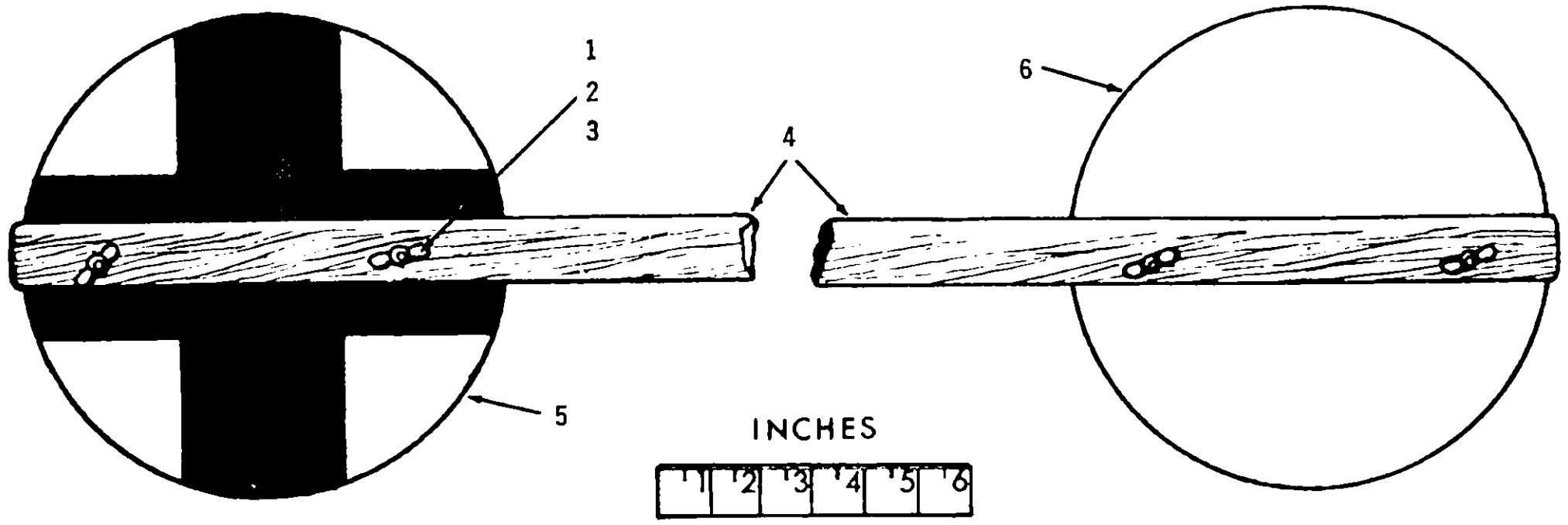


Figure 58. Short Range Target Marker

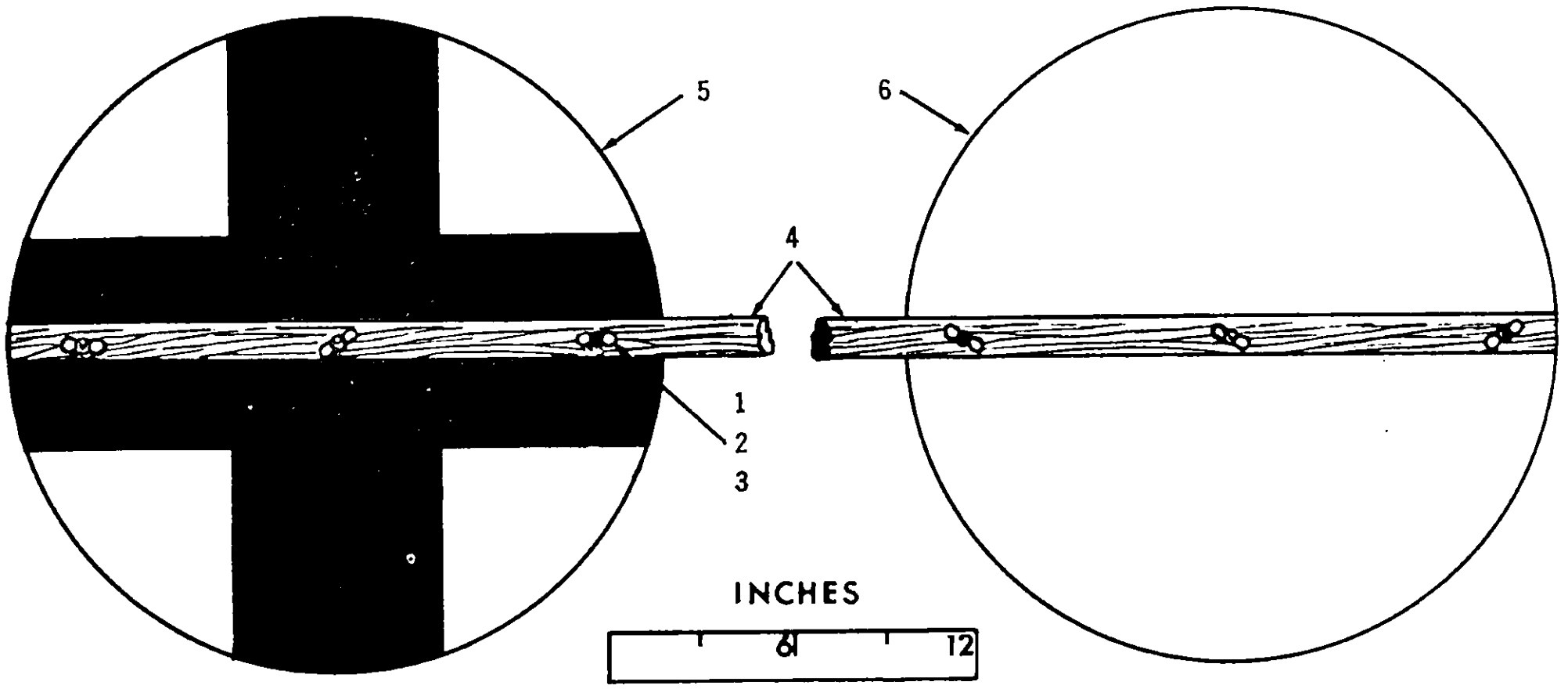


Figure 59. Mid-range Target Marker

Federal stock No.	Repair parts for target markers	Unit of issue	Quantity incorporated in unit	Item No.
	LONG RANGE TARGET MARKER			
5306-012-6291	BOLT, SQUARE NECK: (carriage bolt) button, S, cd- or zn-pltd, no. 10 (0.190)-24NC-2A x 1½ (126291).	1	5	3
6920-610-8874	DISK, TARGET MARKER: S, phos-ctd, 30 dia, 20 per box (6108874).	box	1	5
6920-600-6898	DISK, TARGET MARKER: S, phos-ctd, 30 dia, 20 per box (6006898).	box	1	6
5310-014-4233	NUT, PLAIN, WING: S, cd- or zn-pltd, no. 10 (0.190)-24NC-2B, 27/32 wing spread, 13/32 wing h (144233).	1	6	1
6920-600-6902	STAFF, TARGET MARKING: wood, 120 lg, 1⅝ w x 13/16 thk (6006902).	1	1	4
5310-012-0385	WASHER, FLAT: S, cd- or zn-pltd, ¼ id, 5/16 od, 0.049 nom thk (120385).	1	1	2

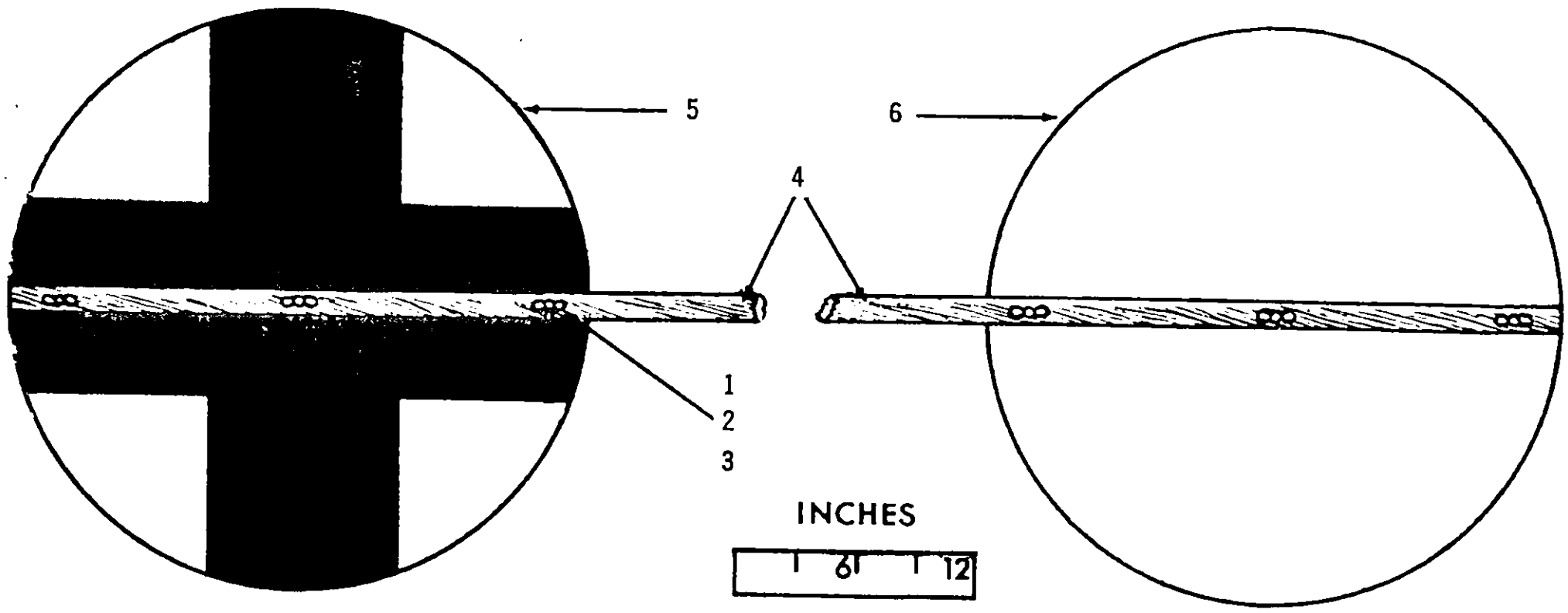
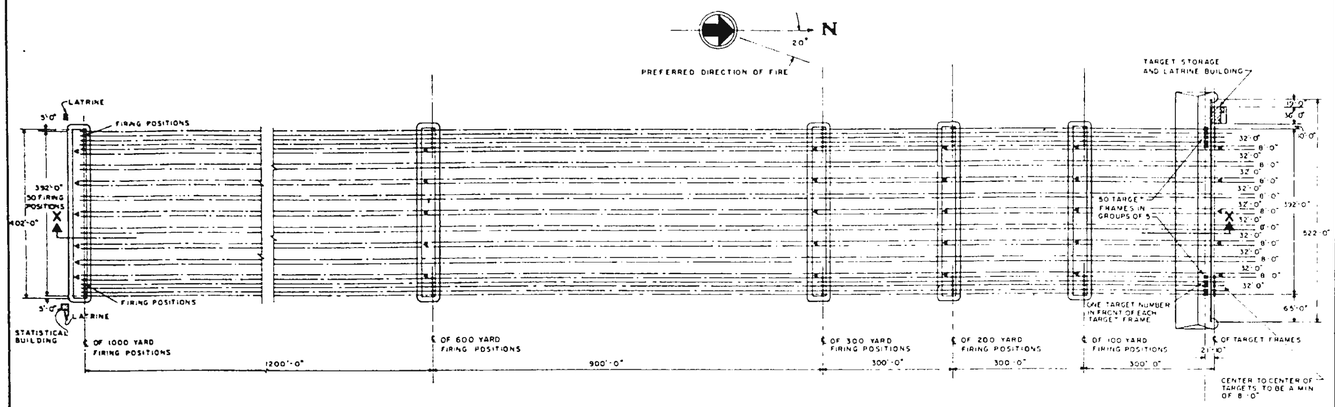
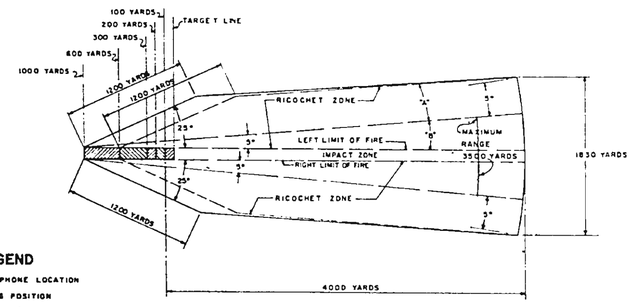


Figure 60. Long Range Target Marker



PLAN - FIFTY POSITION RANGE
1"=100'-0"

SECTION X - X
1"=100'



LEGEND

- TELEPHONE LOCATION
- FIRING POSITION
- TARGET FRAME
- TARGET NUMBER
- STRUCTURES

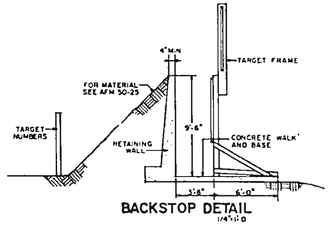
DANGER AREA PLOT PLAN

NO SCALE

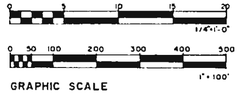
BASED ON CALIBER .30 SERVICE AMMUNITION, RICOCHET ZONE AS SHOWN IS CONSIDERED ADEQUATE FOR SUBSTANTIALLY LEVEL OPEN DANGER ZONES

AMMUNITION	DIMENSIONS IN YARDS		
	MAXIMUM RANGE	SAFETY FACTOR	LIMIT OF DANGER AREA
CALIBER .30 CARBINE	2200	300	2500
CALIBER 5.56 MM	2833	500	3333
CALIBER 7.62 MM	3500	500	4000
CALIBER 30 .06	3500	500	4000

1. LIMIT OF SIDE RICOCHET AREA "A" IS DETERMINED BY MEASURING OUTWARD FROM A POINT AT THE END OF THE FIRING LINE AT AN ANGLE 25° BEYOND THE LIMIT-OF-FIRE LINE FOR A DISTANCE OF 1200 YARDS, AND BY MEASURING OUTWARD 5° BEYOND THE LIMIT-OF-FIRE AT THE OUTER LIMIT OF THE DANGER AREA.
2. MINIMUM SIDE RICOCHET AREA "B" IS DETERMINED BY MEASURING OUTWARD FROM A POINT AT THE END OF THE FIRING LINE AT AN ANGLE OF 5° TO THE OUTER LIMIT OF DANGER AREA



BACKSTOP DETAIL
1/4"=1'-0"



GRAPHIC SCALE

PROGRAMMING AND PLANNING GUIDES

1. THE BASE CIVIL ENGINEER HAVING SUPPORT RESPONSIBILITY WILL INSURE COMPLIANCE WITH THE PROVISIONS OF AFM 50-25, SEC A, PARA 1-3, AND SEC B, PARA. 1-8 OF AFM 85-1. SEE AFM 86-1, PARA. 86 FOR JUSTIFICATION OF NUMBER OF FIRING POSITIONS AND RANGE SUPPORT REQUIREMENTS.
2. GOVERNMENT FURNISHED AND INSTALLED PUBLIC ADDRESS SYSTEM WILL BE ADEQUATE TO VERBALLY CONTROL FIRING.
3. RANGE SUPPORT BUILDINGS TO BE OF WOOD FRAME, MINIMUM CONSTRUCTION.
4. RANGES WITH 3 TO 25 POSITIONS REQUIRE ONE LATRINE AT FIRING POSITION END. RANGES WITH MORE THAN 25 POSITIONS REQUIRE TWO LATRINES AT FIRING POSITION END. OTHER STRUCTURES REQUIRED AS SHOWN REGARDLESS OF NUMBER OF POSITIONS.
5. DIMENSIONS A, B, C, D, E AND F, WILL VARY WITH SITE CONDITIONS, BUT MUST BE PLANNED TO MINIMIZE GRADING.
6. WHEN 1,000 AND 600 YARD FIRING POSITIONS ARE NOT FEASIBLE, DUE TO UNSUITABLE TERRAIN, 500 YARD POSITIONS MAY BE SUBSTITUTED.
7. THE NUMBER OF FIRING POSITIONS ON THE 1,000 YARD LINE MAY BE REDUCED, AND IT MAY BE DESIRABLE TO MAKE SUCH A REDUCTION TO A FIGURE BELOW THE NUMBER OF FIRING POSITIONS BUILT ON THE OTHER FIRING LINES.
8. 100 YARD POSITIONS WILL NOT BE BUILT UNLESS THE PLANNED USE OF THIS RANGE WILL ALSO INCLUDE FIRING THE CARBINE.
9. FOR CONSTRUCTION DETAILS OF TARGET BUTTS, REFER TO DAT TECHNICAL ORDER NO. TO 29-10-28, FIG. 38.
10. NO BAFFLES OR WALKS TO BE CONSTRUCTED ON THIS RANGE.

UTILITY REQUIREMENTS

ELECTRICITY	NONE
WATER	NONE
SEWAGE	LATRINE
GAS	NONE
STEAM	NONE
TELEPHONE	SEE AFM 50-25

HEATING REQUIREMENT

OIL	OIL FIRED WARM AIR HEATER IN STATISTICAL BUILDING

AREA FOR PROGRAMMING

GROSS AREA

STATISTICAL BUILDING	400 S.F.
TARGET STORAGE HOUSE	500 S.F.
LATRINES (240 x 2)	720 S.F.

AREAS SHOWN ABOVE, IF REQUIRED, WILL BE INCLUDED AS SUPPORT ITEMS.

THIS DRAWING SUPERSEDES DEFINITIVE DRAWING NO AD 84-08-04 & AD 84-01-08

CAT. CODE NO. 179-472

SYMBOL	REVISIONS — DESCRIPTION	DATE	APPROVAL

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS UNITED STATES AIR FORCE

ALBERT GOENNER & ASSOCIATES
ARCHITECTS ENGINEERS WASHINGTON, D. C.

RANGE, HIGH-POWER RIFLE
OUTDOOR
(50 POSITION, OUTDOOR)

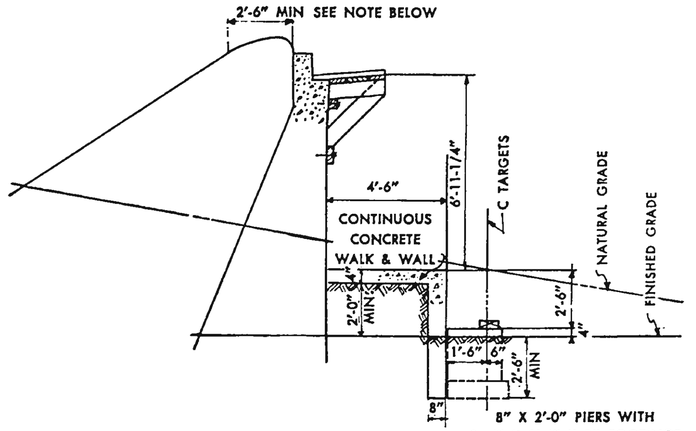
APPROVED
FOR CHIEF OF STAFF, USAF

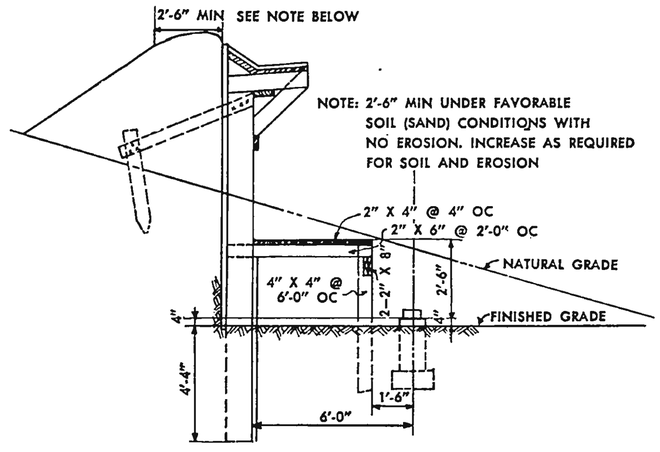
AD 84-01-08 R1

SCALE AS SHOWN

DATE 28 MAY 64

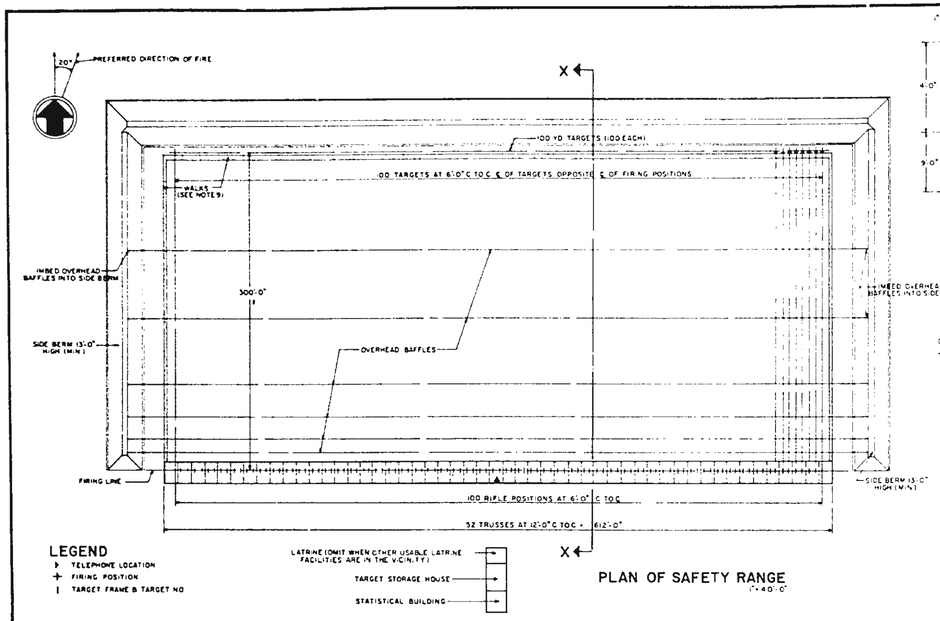
SHEET 1 OF 1





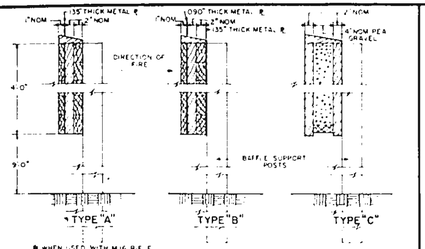
RIFLE RANGE TARGET BUTTS

HIGH-POWER RIFLE RANGE DEFINITIVE DRAWING



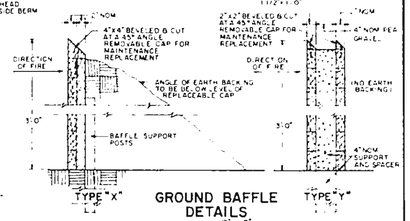
PLAN OF SAFETY RANGE
1" = 40'-0"

PERSPECTIVE

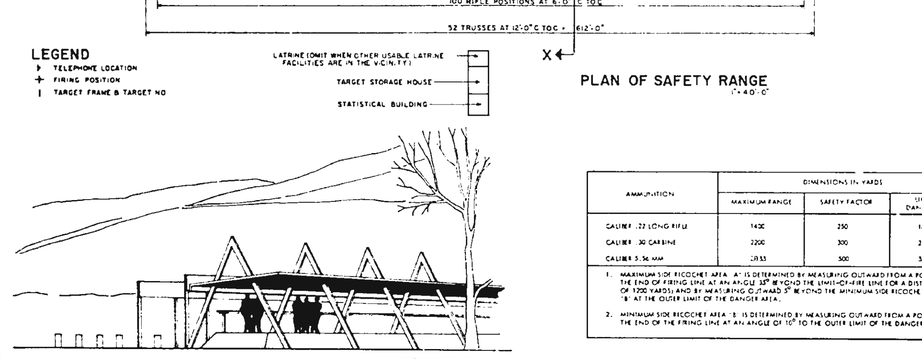


* WHEN USED WITH M16 RIFLE A CLEAR AREA OF 300 YARDS IS REQUIRED BEYOND BACKSTOP

OVERHEAD BAFFLE DETAILS
1" = 2'-0"



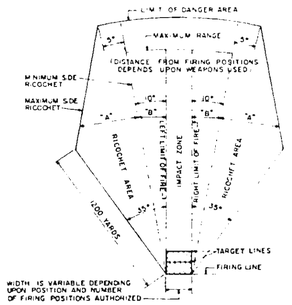
GROUND BAFFLE DETAILS
1" = 2'-0"



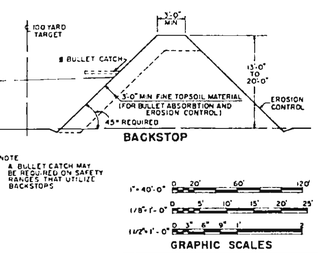
SECTION "X-X"
1/8" = 1'-0"

AMMUNITION	DIMENSIONS IN YARDS		
	MAXIMUM RANGE	SAFETY FACTOR	LIMIT OF DANGER AREA
CALIBER .22 LONG RIFLE	1400	250	1650
CALIBER .30 CARBINE	2200	300	2500
CALIBER 5.56 MM	2833	500	3333

1. MAXIMUM SIDE RICOCHET AREA "A" IS DETERMINED BY MEASURING OUTWARD FROM A POINT AT THE END OF FIRING LINE AT AN ANGLE 35° BEYOND THE LIMIT-OF-FIRE LINE FOR A DISTANCE OF 1700 YARDS AND BY MEASURING OUTWARD 5° BEYOND THE MINIMUM SIDE RICOCHET AREA "B" AT THE OUTER LIMIT OF THE DANGER AREA.
2. MINIMUM SIDE RICOCHET AREA "B" IS DETERMINED BY MEASURING OUTWARD FROM A POINT AT THE END OF THE FIRING LINE AT AN ANGLE OF 10° TO THE OUTER LIMIT OF THE DANGER AREA.



IMPACT RANGE
DANGER AREA PLOT PLAN
NO SCALE
(WITHOUT BERMS, BACKSTOP & BAFFLES)



* NOTE
A BULLET CATCH MAY BE REQUIRED ON SAFETY RANGES THAT UTILIZE BACKSTOPS

GRAPHIC SCALES
1" = 40'-0" 0 20' 60' 120'
1/8" = 1'-0" 0 5' 10' 15' 20' 25'
1/2" = 1'-0" 0 2' 6' 8' 4'

PROGRAMMING AND PLANNING GUIDES

1. THE BASE CIVIL ENGINEER HAVING SUPPORT RESPONSIBILITY WILL INSURE COMPLIANCE WITH THE PROVISIONS OF AFM 50-25, SEC A, PARA 1-3, AND SEC B, PARA 1-18 OF AFM 85-1. SEE AFM 86-4, PARA. 86 FOR JUSTIFICATION OF NUMBER OF FIRING POSITIONS AND RANGE SUPPORT REQUIREMENTS.
2. GOVERNMENT FURNISHED AND INSTALLED PUBLIC ADDRESS SYSTEM WILL BE ADEQUATE TO VERBALLY CONTROL FIRING.
3. RANGE SUPPORT BUILDINGS TO BE OF WOOD FRAME, MINIMUM CONSTRUCTION.
4. ROOF AND SIDE BAFFLES FORWARD OF THE FIRING LINE TO BE CONSTRUCTED THE SAME AS OVERHEAD BAFFLES. THAT PORTION OF THE ROOF BACK OF THE FIRING LINE MAY BE NORMAL ROOF CONSTRUCTION.
5. DANGER AREA IS NOT REQUIRED BEYOND THE LIMITS OF THE BACK STOP, SIDE BERMS AND BAFFLES OF A SAFETY RANGE.
6. LIMITED USE OF THE DANGER AREA OF AN IMPACT RANGE MAY BE AUTHORIZED. UNINHABITED STRUCTURES, PROPERLY SANDBAGGED OR OTHERWISE PROTECTED, MAY BE UTILIZED ON A CONTROLLED ACCESS BASIS.
7. TARGET TURNING DEVICES WILL BE PROVIDED AND INSTALLED BY THE AIR FORCE (SEE AFM 50-25 ATCH. 9).
8. MATERIAL FOR FIRING SIDE OF ALL BAFFLES WILL BE MIDDLE GRADE LUMBER; SPAR USE OR PONDEROSA IS ACCEPTABLE. EXCEPTIONALLY HARD OR KNOTTY WOOD IS NOT PERMITTED. MATERIAL ON BACK SIDE OF BAFFLES MAY BE OF LOWER GRADE AND OR HIGHER DENSITY.
9. TURFED WALKS, WITH BASE CONSISTING OF NON-RICOCHET MATERIALS SUCH AS SAND OR MIXTURE OF SAND, CINDERS AND TOP SOIL ONLY, WILL BE PERMITTED.
10. VARIOUS TYPES OF RANGES WILL BE SUPERIMPOSED ONLY WITH WRITTEN PERMISSION FROM HQ USAF (PTPTC) AND IN ACCORDANCE WITH DETAILED INSTRUCTIONS IN AFM 50-25.

UTILITY REQUIREMENTS

ELECTRICITY	FOR POWERED TARGET TURNING MECHANISMS ONLY
WATER	NONE
SEWAGE	LATRINE
GAS	NONE
STEAM	NONE
TELEPHONE	SEE AFM 50-25

HEATING REQUIREMENT

OIL	OIL FIRED WARM AIR HEATER IN STATISTICAL BUILDING

AREA FOR PROGRAMMING

GROSS AREA

STATISTICAL BUILDING	400 S.F.
TARGET STORAGE HOUSE	500 S.F.
LATRINE	240 S.F.
FIRING LINE SHELTER (FOR EACH 5 POSITIONS)	600 S.F.

THIS DRAWING SUPERSEDES DEFINITIVE DRAWING NO. AD 84-01-07

CAT. CODE NO. 179 - 47

SYMBOL	REVISIONS — DESCRIPTION	DATE	APPROVAL

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE

ALBERT GOENNER & ASSOCIATES
ARCHITECTS - ENGINEERS WASHINGTON, D. C.

RANGE, SMALL-BORE RIFLE / CARBINE
OUTDOOR

(100 POSITION, OUTDOOR)

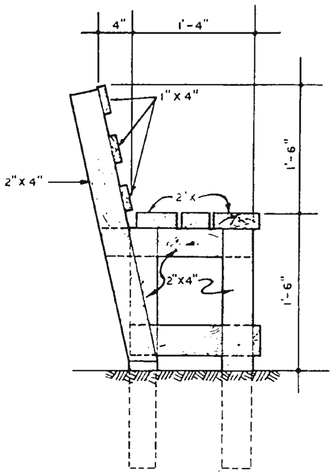
APPROVED: Robert F. Goenner Colonel, USAF
FOR CHIEF OF STAFF, USAF

AD 84-01-07 R1

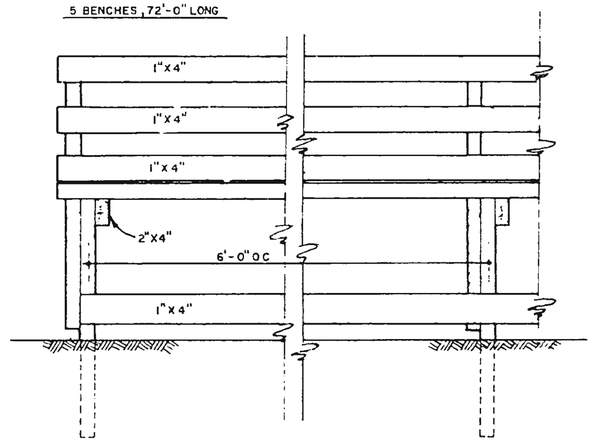
SCALE AS NOTED

DATE 28 MAY 64

SHEET 1 OF 1

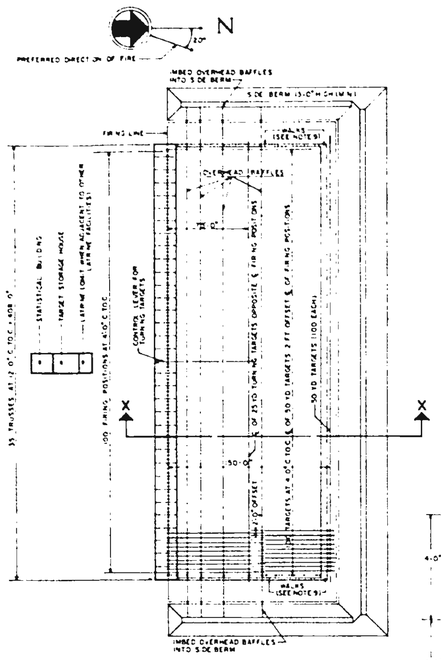


5 BENCHES, 72'-0" LONG



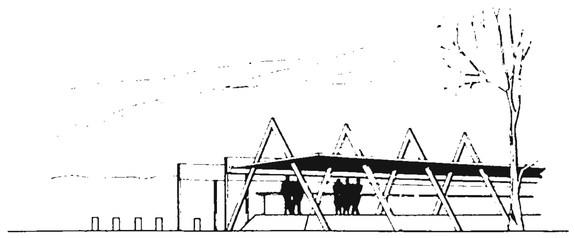
BENCH DETAIL

SMALL-BORE RIFLE-CARBINE RANGE DEFINITIVE DRAWING



PLAN OF SAFETY RANGE

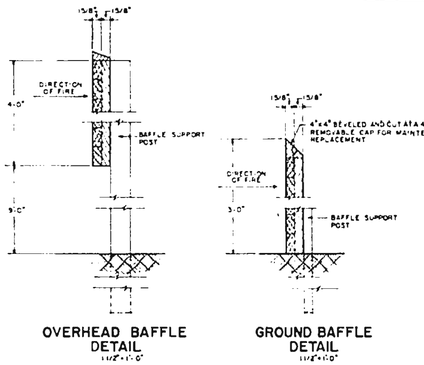
LEGEND
- TELEPHONE LOCATION
- FIRING POSITION
- TARGET FRAME & TARGET NO



PERSPECTIVE

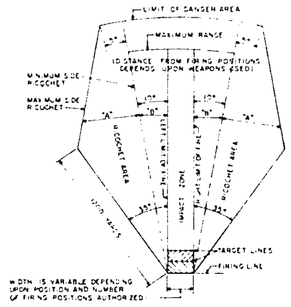
AMMUNITION	DIMENSIONS IN YARDS		
	MAXIMUM RANGE	SAFETY FACTOR	LIMIT OF DANGER AREA
CALIBER .22 LONG RIFLE	1400	250	1650
CENTER FIRE PISTOL	1640	190	1830
CALIBER .45 PISTOL	1840	190	1830

1. MAXIMUM SIDE RICOCHET AREA "A" IS DETERMINED BY MEASURING OUTWARD FROM A POINT AT THE END OF FIRING LINE AT AN ANGLE 30° BEYOND THE LIMIT-OF-FIRE LINE FOR A DISTANCE OF 1200 YARDS, AND BY MEASURING OUTWARD 30° BEYOND THE MINIMUM SIDE RICOCHET AREA "B" AT THE OUTER LIMIT OF THE DANGER AREA.
2. MINIMUM SIDE RICOCHET AREA "B" IS DETERMINED BY MEASURING OUTWARD FROM A POINT AT THE END OF THE FIRING LINE AT AN ANGLE OF 12° TO THE OUTER LIMIT OF THE DANGER AREA.

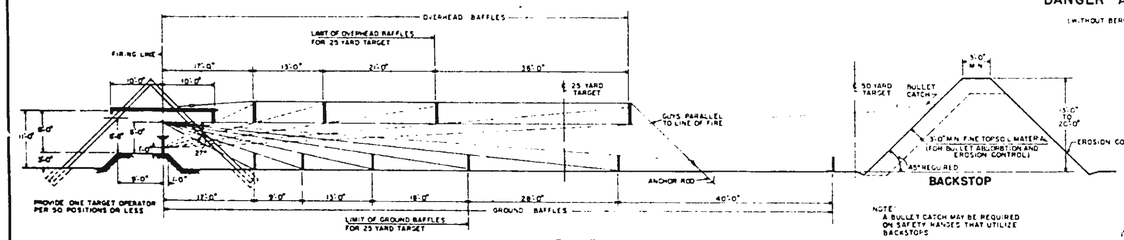


OVERHEAD BAFFLE DETAIL

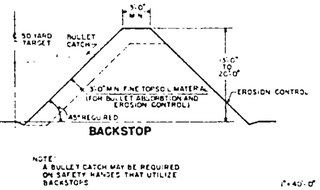
GROUND BAFFLE DETAIL



IMPACT RANGE
DANGER AREA PLOT PLAN
NO SCALE
(WITHOUT BERMS, BACKSTOP & BAFFLES)



SECTION "X-X"



BACKSTOP

NOTE
A BULLET CATCH MAY BE REQUIRED ON SAFETY RANGES THAT UTILIZE BACKSTOPS

GRAPHIC SCALES

PROGRAMMING AND PLANNING GUIDES

1. THE RANGE ENGINEER HAS ALL DIRECT RESPONSIBILITY AND WILL BE THOROUGHLY FAMILIAR WITH THE CRITERIA SET FORTH IN AFM 50-25, CHAP 4, SECS 1 AND 2, SEC III, PARA 3-08, PARA 3-10, AND PARA 3-11. HE ALSO HAS FULL RESPONSIBILITY FOR THE NUMBER OF FIRING POSITIONS AND RANGE DIRECTIONS.
2. ELECTRONIC TARGET EQUIPMENT AND INSTALLED PUBLIC ADDRESS SYSTEM WILL BE ADEQUATE FOR ALL RANGES OF MORE THAN 5 FIRING POSITIONS.
3. RANGES WILL BE WELL LIGHTED IF THEY ARE TO BE USED AT NIGHT. (MINIMUM OF 1 FOOT-CANDLE).
4. SIDE AND OVERHEAD BAFFLES REQUIRED FOR THE FIRING LINE WILL BE CONSTRUCTED OF TRANSITE OR TIMBER BAFFLES. (TIMBER BAFFLES ON THE SIDE BERMS OF THE FIRING LINE MAY BE REMOVABLE FOR TARGET PULLING).
5. DANGER AREAS WILL NOT BE LOCATED OUTSIDE THE LIMITS OF THE RANGE SITE, SIDE BERMS AND BAFFLES OF A SAFETY PANEL.
6. LIMITED USE OF THE DANGER AREA BEYOND THE RANGE MAY BE AUTHORIZED ONLY WHEN THE CONCURRENCE OF ALL INTERESTED AGENCIES OF GOVERNMENT PROPERTIES MAY BE OBTAINED AND A SAFETY LOCATION EXISTS.
7. TARGET OPERATING STATIONS WILL BE PROVIDED AND INSTALLED BY THE AIR FORCE (SEE AFM 50-25, PAR 4-11).
8. MATERIALS FOR FIRING LINE OF ALL BAFFLES WILL BE MIDDLE GRADE LUMBER. SMALL KNOTS OR KNOT HOLES ACCEPTABLE. EXTENSIVELY USED OR PARTLY ROTTED LUMBER IS NOT PERMITTED. MATERIAL ON BACK SIDE OF BAFFLES MAY BE OF LOWER GRADE AND OF HIGHER STRENGTH.
9. PLASTIC BULLETS WITH SINGLE CONSTRUCTION OF NON-CORROSIVE MATERIALS SUCH AS ALUMINUM OR MAGNESIUM AND COMPOSITE TYPES WITH CORE OF LEAD AND JACKET OF COPPER ALLOY WILL BE PERMITTED.
10. VARIOUS TYPES OF HANGERS WILL BE EXPERIMENTED ONLY WITH WRITTEN PERMISSION FROM HQ USAF (AFPRTRC) AND IN ACCORDANCE WITH DETAILED INSTRUCTIONS IN AFM 50-25.

UTILITY REQUIREMENTS

ELECTRICITY	FOR POWERED TARGET TURNING MECHANISM ONLY
WATER	NONE
SEWAGE	LATRINE
GAS	NONE
STEAM	NONE
TELEPHONE	SEE AFM 50-25

HEATING REQUIREMENT

OIL	OIL FIRED WARM AIR HEATER IN STATISTICAL BUILDING

AREA FOR PROGRAMMING

GROSS AREA

STATISTICAL BUILDING	400 S.F.
TARGET STORAGE HOUSE	400 S.F.
LATRINE	240 S.F.
FIRING LINE SHELTER (FOR EACH 5 POSITIONS)	600 S.F.

AREAS SHOWN ABOVE, IF REQUIRED, WILL BE INCLUDED AS SUPPORT ITEMS

THIS DRAWING SUPERSEDES DEFINITIVE DRAWING NO. AD 84-01-06

CAT. CODE NO. 179-473

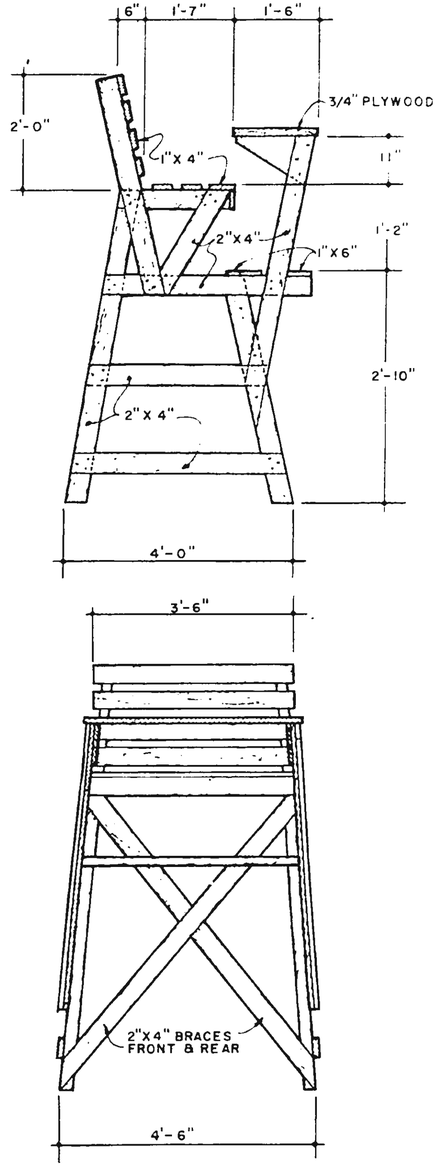
SYMBOL	REVISIONS — DESCRIPTION	DATE	APPROVAL

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
ALBERT GOENNER & ASSOCIATES
ARCHITECTS - ENGINEERS WASHINGTON, D. C.

RANGE, PISTOL
OUTDOOR
(100 POSITION, OUTDOOR)

APPROVED: Cecil A. Turner Col USAFCE
FOR CHIEF OF STAFF, USAF

AD 84-06-06 R1
SCALE AS NOTED
DATE 28 MAY 64
SHEET 1 OF 1



DETAIL OF OPERATOR'S CHAIR

OUTDOOR PISTOL RANGE DEFINITIVE DRAWING AND NRA DESIGNS

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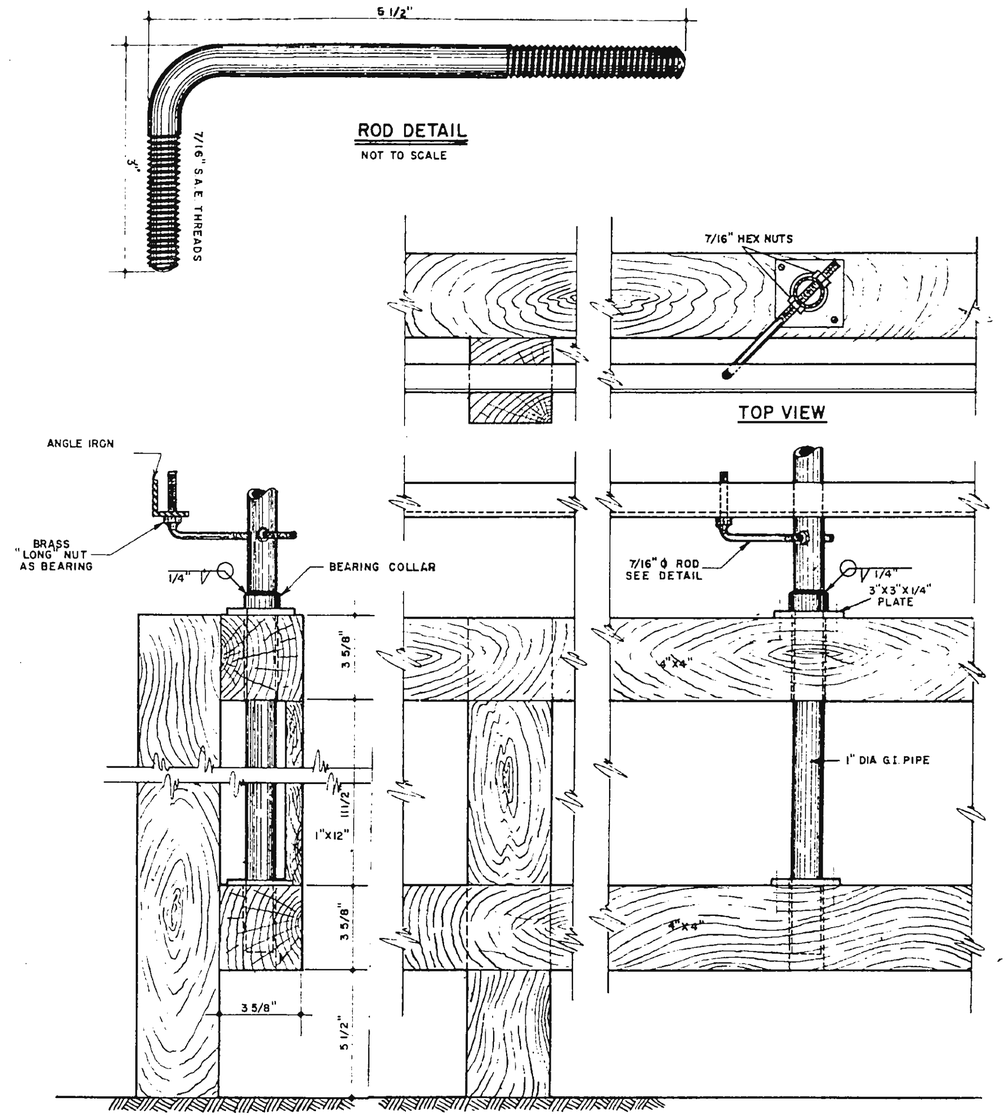
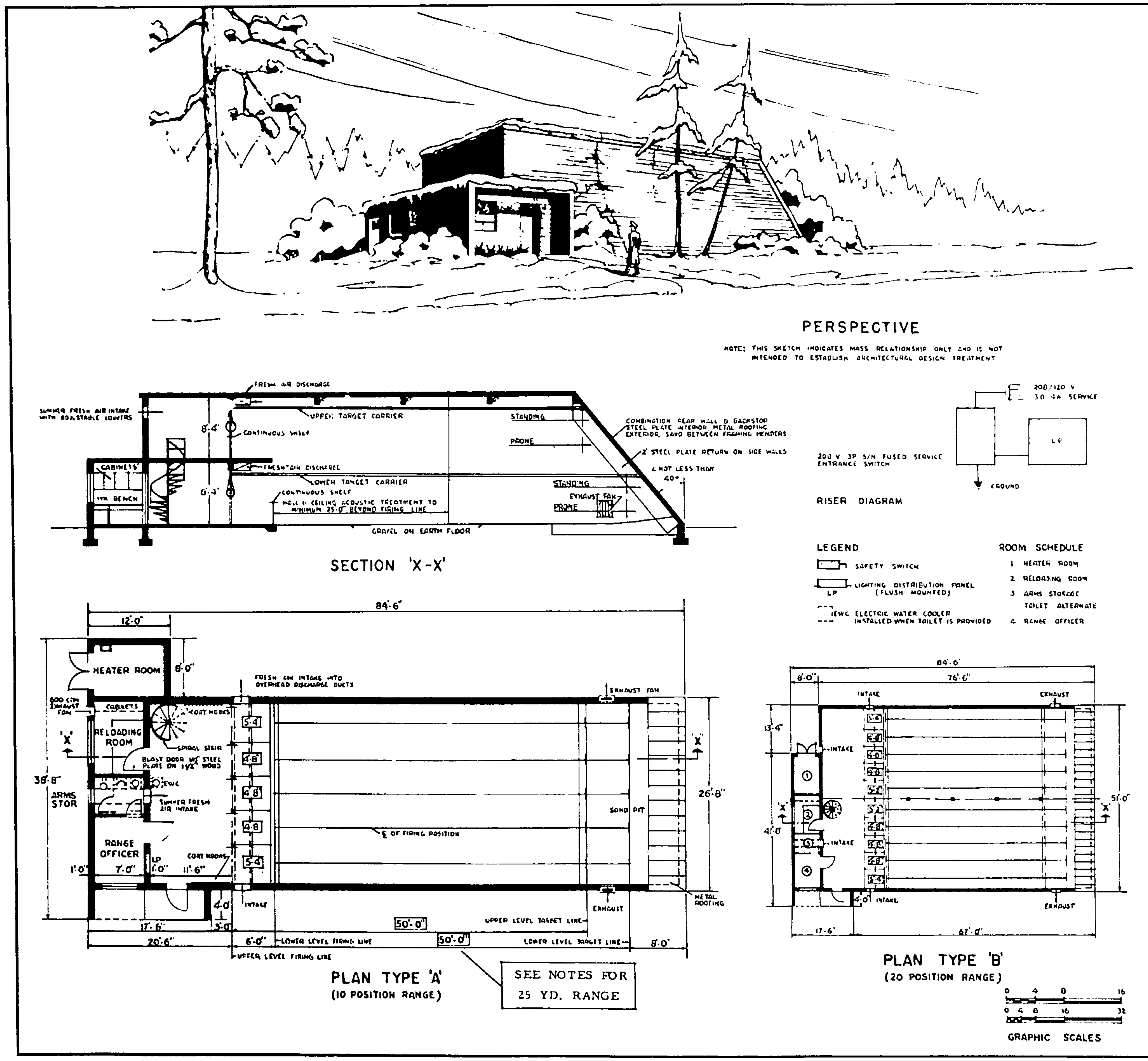


REVISED TARGET TURNING MECHANISM

OUTDOOR PISTOL RANGE DEFINITIVE DRAWING AND NRA DESIGNS

Attachment 9 continued



REFERENCE MATERIAL

THE FOLLOWING DOCUMENTS HAVE BEEN UTILIZED IN THE DEVELOPMENT OF THIS DEFINITIVE

1. USAF INSTALLATIONS FACILITY REQUIREMENTS MANUAL
2. STANDARD OUTLINE SPECS FOR A.F. FACILITIES, AFM 88-15
3. TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAYOUTS, TO 28-[illegible]
4. CORPS OF ENGINEERS SAFETY REQUIREMENTS MANUAL

DESIGN GUIDES

ARCHITECTURAL

1. DIMENSIONS SHOWN [illegible] ARE CRITICAL AND MUST BE HELD
2. ALL WALLS OF RANGE AREA WILL BE CONCRETE MASONRY, MINIMUM 12" THICKNESS. ROOF OF RANGE AND SECOND LEVEL DECK WILL BE OF CONCRETE MATERIAL [illegible] MINIMUM THICKNESS
3. BULLET BACKSTOP TO BE DESIGNED FOR .38 AND .45 CAL AMMUNITION [illegible] ARMOR PLATE OR STRUCTURAL STEEL EQUIVALENT OF [illegible] ABRASIVE RESISTANCE. THE FIRING OF HIGH VELOCITY OR MAGNUM AMMUNITION WILL NOT BE PERMITTED
4. MANUAL TARGET CARRIERS WILL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. TARGET TURNER AND TIMER WILL BE INSTALLED AT THE [illegible] FOOT OR 25 YARD TARGET LINE. THIS ITEM IS GOVERNMENT FURNISHED. SEE [illegible]
5. UNDERSIDE OF ROOF DECK AND SECOND LEVEL DECK WILL BE PROTECTED WITH MINIMUM [illegible] T & G WOOD SURFACE TO A DISTANCE APPROX. 25 FEET DOWN RANGE FROM REAR RANGE WALL. PROJECTING SURFACES IN FRONT OF FIRING LINE WILL BE PROTECTED WITH A MINIMUM [illegible] WOOD FACING TO PREVENT RICOCHETS.
6. ARMS STORAGE ROOM TO HAVE METAL CLAD DOOR AND LOCK. WINDOW TO BE PROVIDED ONLY WHEN TOILET IS JUSTIFIED. WHERE ALL SMALL ARMS ASSIGNED TO THE SMALL ARMS TRAINING SECTION ARE TO BE STORED AND MAINTAINED IN THIS FACILITY, THE ARMS STORAGE ROOM WILL BE ENLARGED TO MEET LOCAL REQUIREMENTS
7. [illegible] FOOT RANGES MAY BE CONSTRUCTED ONLY WHEN REHABILITATING OLD BUILDINGS AND IT IS UNFEASIBLE TO CONSTRUCT A 25 YARD RANGE. ALL NEW CONSTRUCTION WILL CONTAIN A 25 YARD MINIMUM RANGE

STRUCTURAL

DIMENSIONS MAY BE ADJUSTED FOR STRUCTURAL ADAPTATION. DESIGN LOADS WILL BE IN ACCORDANCE WITH AMERICAN STANDARDS ASSOCIATION'S MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES. THIS FACILITY MAY BE CONSTRUCTED AS A SINGLE STORY UNIT AS SHOWN IN PLAN 'B'

MECHANICAL

PROVIDE MECHANICAL EXHAUST AT BACKSTOP WITH [illegible] FPM AIR VELOCITY ACROSS TARGET AREA. SUMMER FRESH AIR INTAKES AT REAR OF RANGE, UPPER AND LOWER LEVELS, TO BE PROVIDED WITH ADJUSTABLE LOUVERS. EXHAUST OPENINGS TO BE PROVIDED WITH BULLET DEFLECTING LOUVERS. HEATING BY RADIANT COILS IN FLOOR AND SECOND LEVEL DECK FOR OUTSIDE TEMP. [illegible] UNIT HEATERS TO BE USED ABOVE [illegible] OUTSIDE TEMPERATURES

ELECTRICAL

LIGHTING AT FIRING LINE AREA WILL BE INDIRECT, APPROXIMATE INTENSITY OF [illegible] FOOT CANDLES. LIGHTING IN RANGE AREA SHOULD BE DIRECT, SHIELDED FROM STRAY BULLETS, APPROXIMATE INTENSITY [illegible] FOOT CANDLES. TARGET LIGHTING BY FLOODLIGHTS PROVIDING [illegible] FOOT CANDLES ON TARGET AREA

PROGRAMMING AND MASTER PLANNING GUIDES

THE FOLLOWING INFORMATION IS FOR GUIDANCE IN PROGRAMMING AND MASTER PLANNING. PROGRAM TYPE 'A' FOR 10-POSITION RANGE. TYPE 'B' FOR 20 POSITION RANGE. TOILET TO BE PROVIDED WHEN TOILET FACILITIES ARE NOT READILY AVAILABLE IN ADJACENT BUILDINGS

SPECIFICATION - TYPE 'N' CONSTRUCTION

FOR ACCEPTABLE MATERIALS SEE AFM 88-15 AND APPLICABLE ITEMS

UTILITY REQUIREMENTS

ELECTRICITY (KW)	LIGHTING	HEATER	TOTAL
TYPE 'A' CONNECTED LOAD	7	4	[illegible]
TYPE 'A' ESTIMATED DEMAND	[illegible]	4	
TYPE 'B' CONNECTED LOAD	14	4	[illegible]
TYPE 'B' ESTIMATED DEMAND	12	4	[illegible]

WATER (GPD) NONE * GAS (THERMS DAY) NONE (EXCLUDING HEAT)
SEWAGE (GPD) NONE * STEAM (LBS HR) NONE (EXCLUDING HEAT)
OIL (GPH) NONE (EXCLUDING HEAT)
* WHEN TOILET IS PROVIDED, WATER 270 GPD, SEWAGE 270 GPD.

HEATING REQUIREMENTS

HEATING REQUIRED [illegible] MBTU HR FOR 0° F OUTSIDE DESIGN TEMPERATURE

AREA ANALYSIS (SF)

AREA ANALYSIS (SF)	TYPE 'A'	TYPE 'B'
NET PRIMARY FUNCTION (RANGE AREA)	[illegible]	[illegible]
NET RELOADING ROOM	[illegible]	[illegible]
NET RANGE OFFICE	[illegible]	[illegible]
NET ARMS STORAGE	[illegible]	[illegible]
NET HEATER ROOM	[illegible]	[illegible]
TOTAL NET AREA	[illegible]	[illegible]

AREA FOR PROGRAMMING

GROSS AREA TYPE 'A' 2,875 SQ. FT.

GROSS AREA TYPE 'B' 5,180 SQ. FT.

NOTE

1. GROSS AREAS INCLUDE COVERED ENTRANCE COMPUTED AT [illegible] AREA [illegible] SF
2. DEDUCT [illegible] SF FROM GROSS AREA WHEN HEATER ROOM IS NOT REQUIRED

AF CONTROL NO. [illegible]

SYMBOL	REVISIONS - DESCRIPTION	DATE	APPROVAL

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS UNITED STATES AIR FORCE

H. D. NOTTINGHAM & ASSOCIATES
ENGINEERS ARCHITECTS ARLINGTON, VIRGINIA

RANGE, SMALL ARMS, INDOOR
(10 AND 20 POSITIONS)

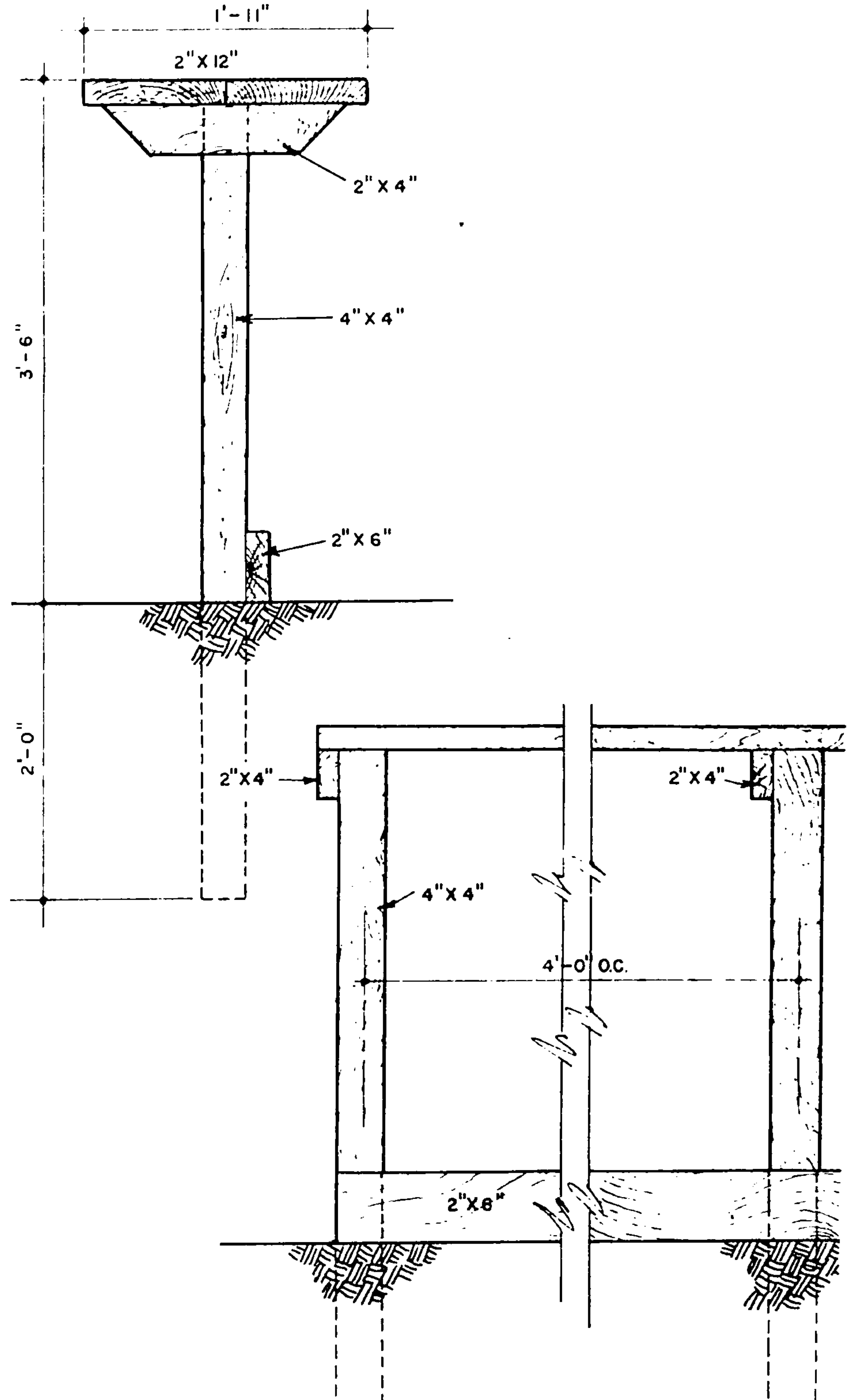
APPROVED

FOR CHIEF OF STAFF, USAF

AD 84-06-05

SCALE

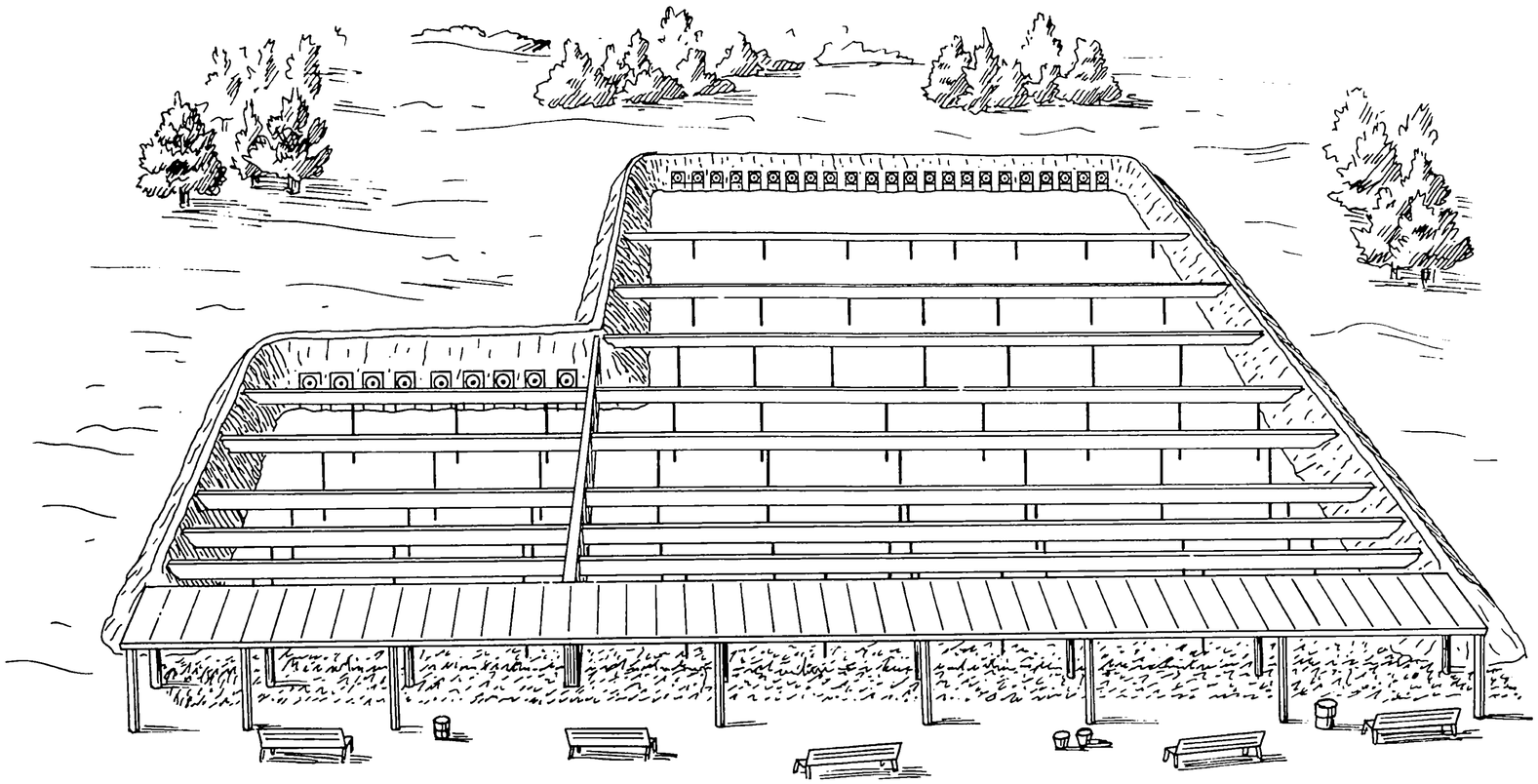
DATE 17 DECEMBER 1957 SHEET 1 OF 1



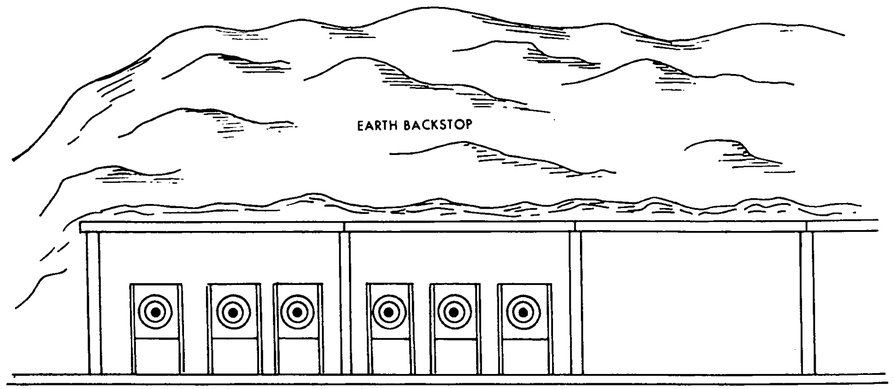
PISTOL TABLE DETAIL

(5 TABLES 72'-0" LONG)
(3'-0" PASSAGE AT WALKWAYS)

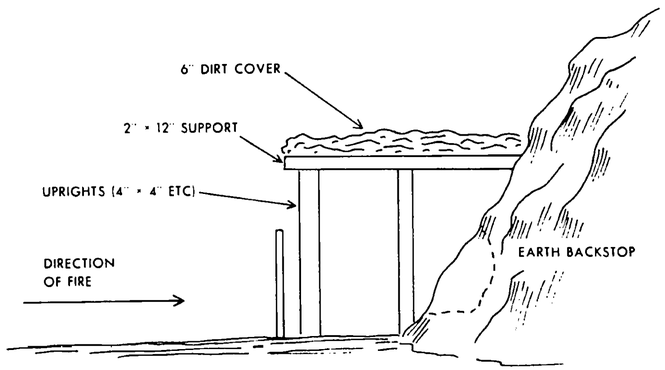
INDOOR PISTOL RANGE DEFINITIVE DRAWING



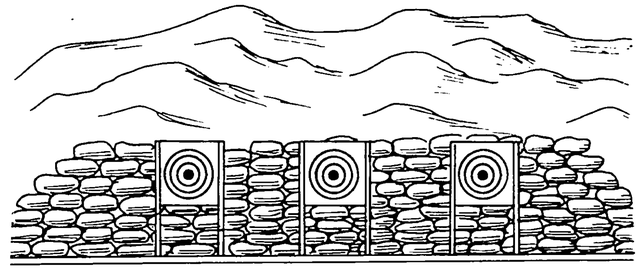
MULTI-PURPOSE RANGE



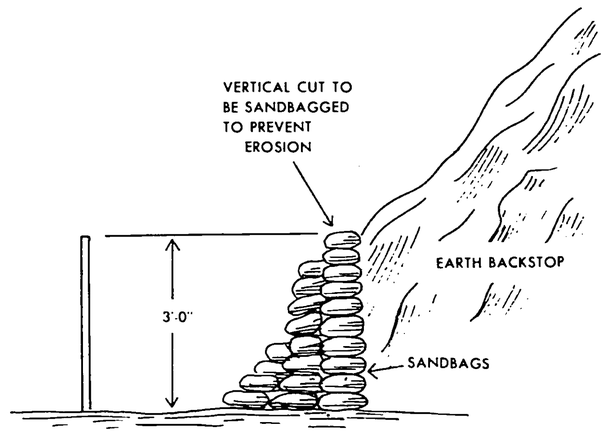
FRONT VIEW



SIDE VIEW



FRONT VIEW



SIDE VIEW

MULTIPURPOSE RANGE AND BACKSTOPS

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UNIVERSAL OUTDOOR SMALLBORE RIFLE TARGET FRAME

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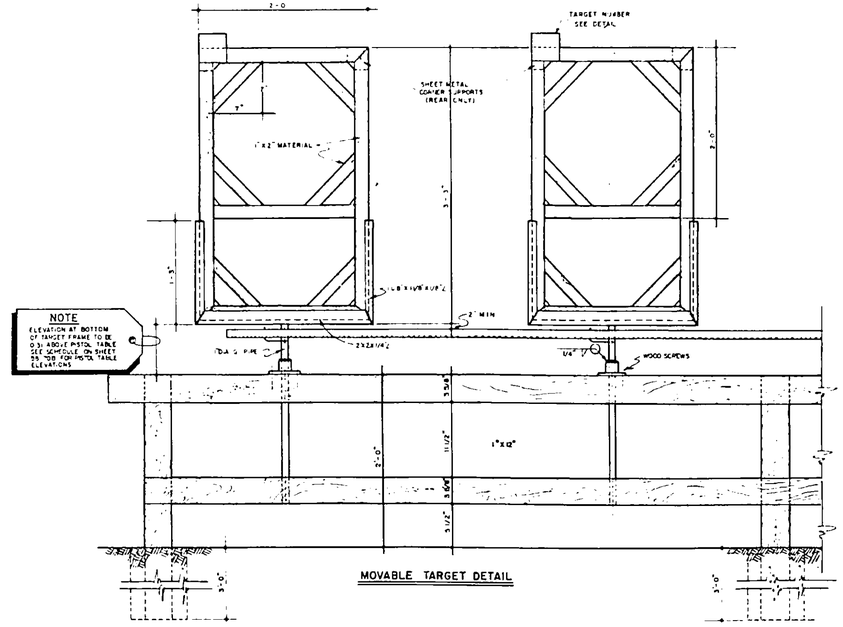
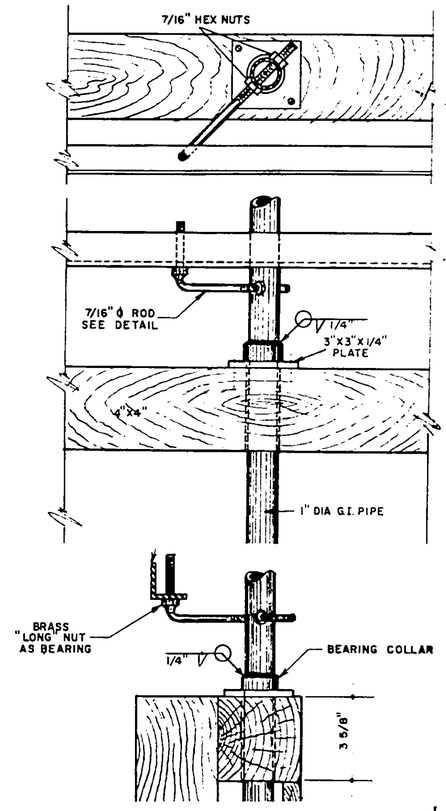
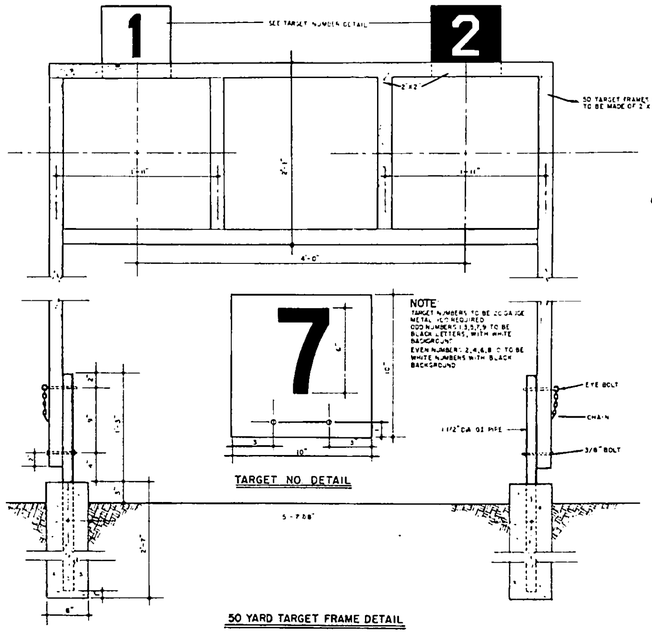


MOVABLE TARGET DETAIL

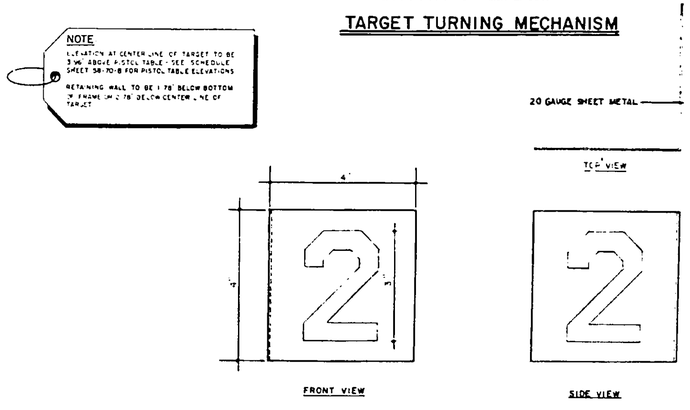


TARGET TURNING MECHANISM



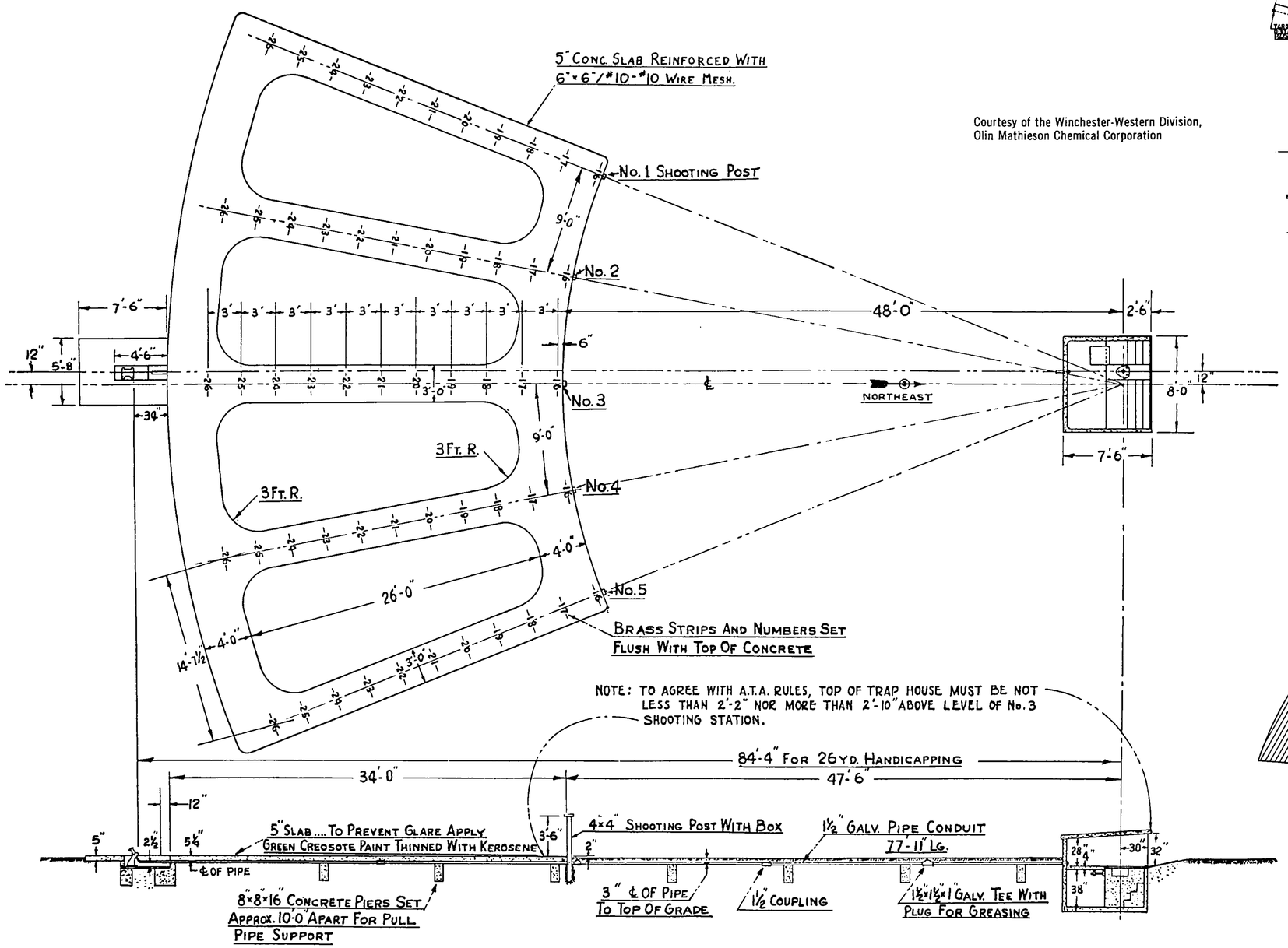
TARGET NO. DETAIL

50 YARD TARGET FRAME DETAIL



TARGET NUMBER DETAIL

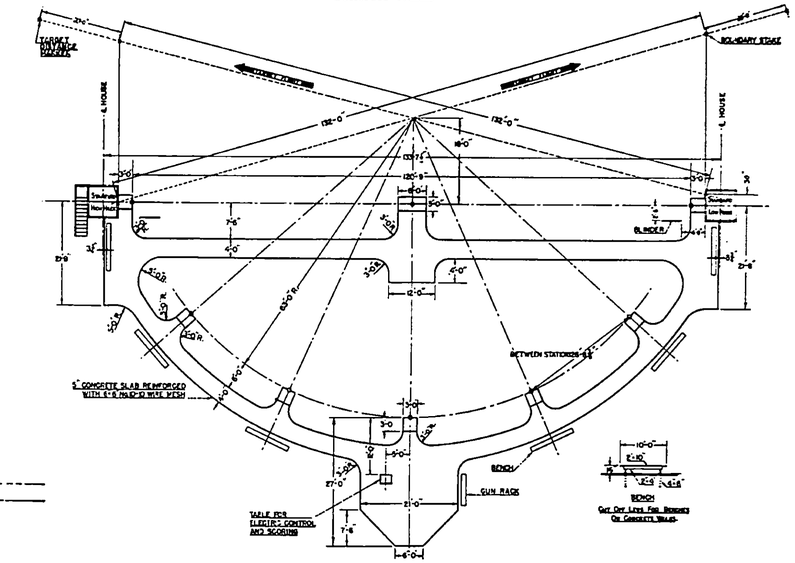
TARGET FRAME DETAILS

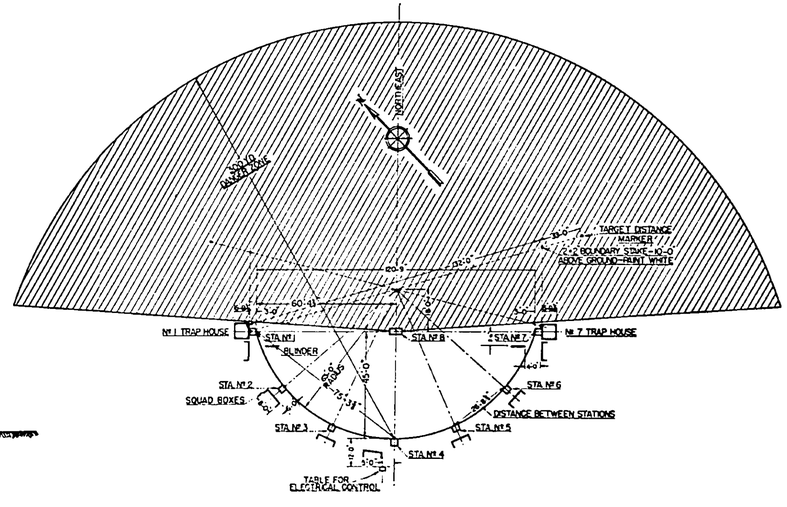


Courtesy of the Winchester-Western Division, Olin Mathieson Chemical Corporation

26-YARD FIELD LAYOUT WITH CONCRETE SHOOTING PLATFORM

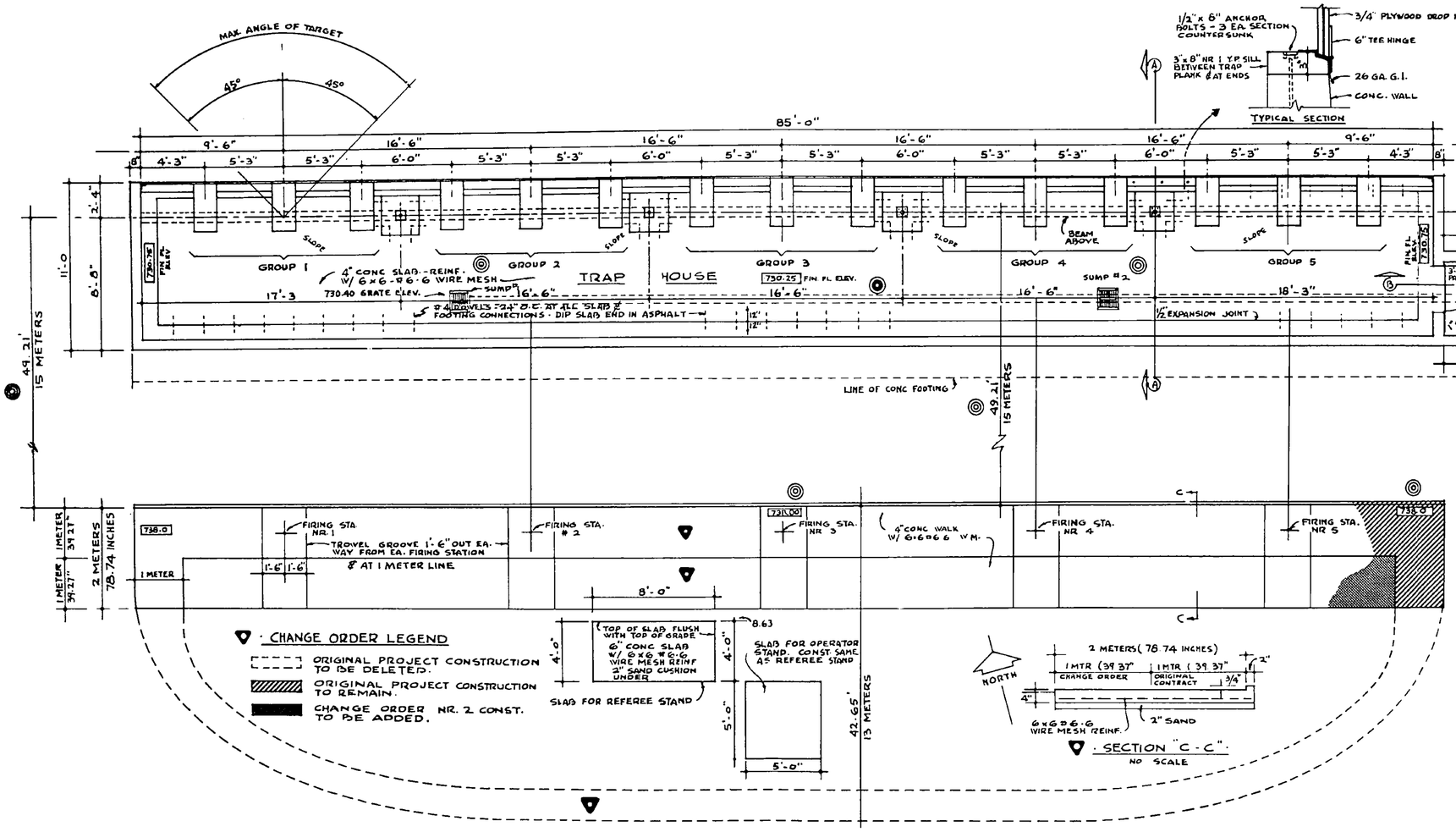
Concrete Walks

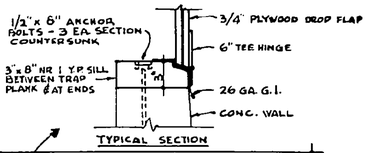


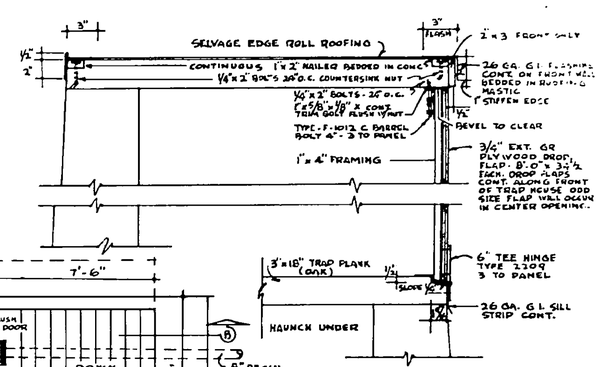


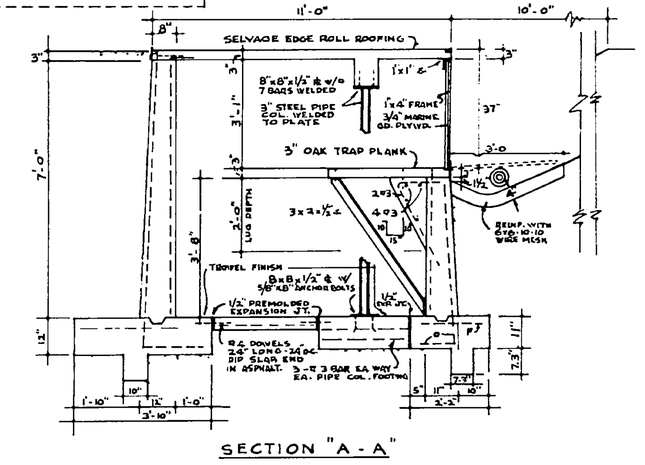
Skeet Field Layout

TRAP AND SKEET RANGE LAYOUTS

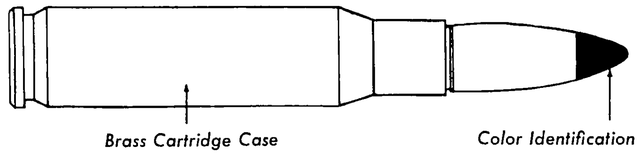




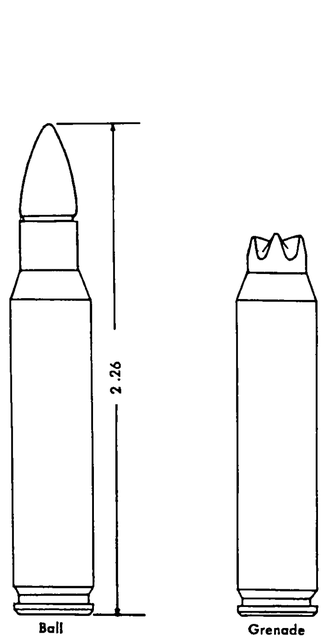




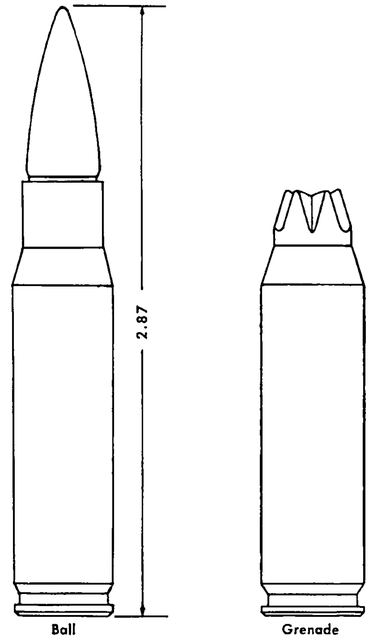
INTERNATIONAL TRAP RANGE PLAN



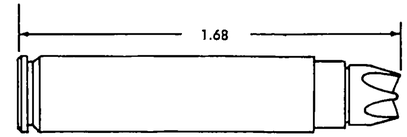
Color of tip of bullet	Type of cartridge
No color	Ball.
Black	Armor-piercing.
Aluminum color	Armor-piercing-incendiary.
Blue	Incendiary.
Red	Tracer.
Orange	Tracer.
Red w/aluminum color rear annulus	Armor-piercing-incendiary-tracer.
Green w/white rear annulus	Frangible.



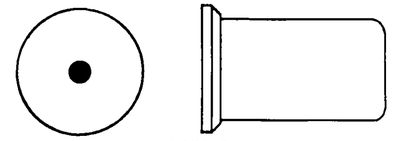
CALIBER 5.56mm. CARTRIDGES



CALIBER 7.62 mm. CARTRIDGES (NATO)



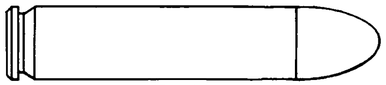
CARTRIDGE, GRENADE, CARBINE, CAL. .30, M6



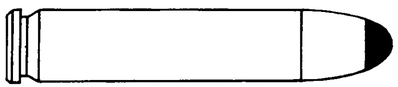
CARTRIDGE, GRENADE,

GRENADE CARTRIDGES

CARTRIDGE, RIFLE GRENADE, CAL. 30, M3

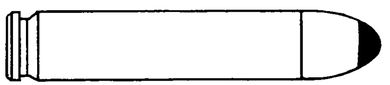


CARTRIDGE, BALL, CARBINE, CAL. .30, M1



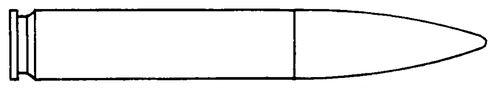
CARTRIDGE, TRACER, CARBINE, CAL. .30, M16

CARTRIDGE, DUMMY, CARBINE, CAL. .30, M13

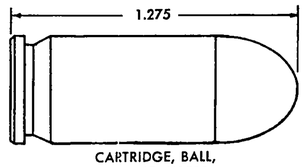


CARTRIDGE, TRACER, CARBINE, CAL. .30, M27 (T43)

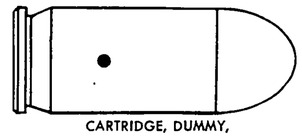
CALIBER .30 CARBINE CARTRIDGES



CARTRIDGE, TEST, HIGH-PRESSURE, CARBINE, CAL. .30, M18

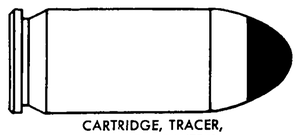


CARTRIDGE, BALL, CAL. .45, M1911

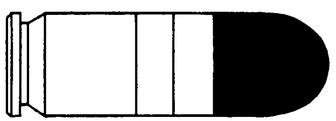


CARTRIDGE, DUMMY, CAL. .45, M1921

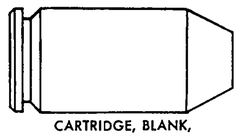
CALIBER .45 CARTRIDGES



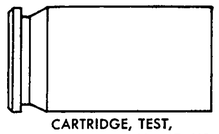
CARTRIDGE, TRACER, CAL. .45, M26 (T30)



CARTRIDGE, SHOT, CAL. .45, M12



CARTRIDGE, BLANK, CAL. .45, M9



CARTRIDGE, TEST, HIGH-PRESSURE, CAL. .45, M1

CARTRIDGE, SHOT, CAL. .45, M15

IDENTIFICATION OF SMALL ARMS AMMUNITION