JOHN P. BERARD

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TM 9-855

WAR DEPARTMENT TECHNICAL MANUAL

Rifle Section

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

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WAR DEPARTMENT • *17 AUGUST 1944*

WAR DEPARTMENT TECHNICAL MANUAL

TM 9-855

This Technical Manual supersedes TM 9-855, dated 19 June 1941, and Changes No. 1, dated 5 August 1942; and TB 9-855-1, dated 21 March 1944.

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



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WAR DEPARTMENT
Washington 25, D. C., 17 August 1944

Material, and Training Course Lay-outs,
ın and guidance of all concerned.

OF WAR:

G. C. MARSHALL,
Chief of Staff.

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R 1, 3, 8, 10 (3); R 2, 4-7, 17, 18
1-7, 9, 11, 17, 19 and 44 (2); 18 (5);
19 and 44 (3); Chief of Tech Svs
Sv Bd (2); Post, Camp, Sta (1);
ı and Sp Sv Sch (10); Ord Decen
(Ord O) (5); H and R Points (5);
Ord Dist Br O (3); Ord Reg O (3);
; Ord Tnk Dep (3); Repl Trng

ymbols, see FM 21-6.)

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Section I

INTRODUCTION

1. SCOPE.

a. This Technical Manual is published for the information and guidance of the Army of the United States, its components and auxiliaries, and the several agencies functioning under the supervision of the War Department. It contains descriptions, general and technical information, and instructions for the construction or erection, care, handling, and use of targets, target materials, and training aids.

b. These instructions are intended to cover the major requirements for the planning and construction of training aids designed to provide facilities prescribed in the various Field Manuals. Good engineering practice will be followed in regard to special conditions and special problems and to items not covered specifically by these instructions.

c. The targets and target materials described are required or authorized for the conduct of bayonet training, various marksmanship courses, technique of fire, tactical training, including field firing (combat) exercises and gunnery practices authorized and described in Basic Field Manuals and other War Department instructions.

d. The procedure for selection of training areas and construction of training aids, a brief description of training facilities, and a table showing number of ranges and targets authorized under War Department Memorandum No. W210-8-42 and changes are shown in Appendix.

e. Publications to be used in conjunction with this manual are listed in section VI.

2. TYPES OF TRAINING AIDS.

a. Training aids include ranges, courses, and courts as follows and as separately described below or shown in the accompanying figures:

(1) RANGES.
(a) Rifle range at 100, 200, 300, and 500 yards.
(b) Pistol range.
(c) Landscape target range.
(d) Submachine gun and machine gun, 1,000-inch ranges.
(e) Antiaircraft range, miniature.
(f) Moving vehicle ranges.
(g) Field target (combat) ranges.

Figure 1 →

LEGEND			
KEY NO.	TYPE OF RANGE	FOR CONSTRUCTION DETAILS SEE PLAN NO.	
1	LANDSCAPE	1600 - 110	
2	ANTITANK (1000" MINIATURE)	1600 - 175	
3	PISTOL	1600 - 110	
4	MACHINE GUN (1000")	1600 - 125	
5	RIFLE (100, 200, & 300 YDS.)	1600 - 115	
6	SUBMACHINE GUN	1600 - 125	
7	ANTIAIRCRAFT MINIATURE	1600 - 130	

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Figure 2 — General Lay-out of Small Arms Ranges Without Field Target Ranges

(h) Antiaircraft towed target ranges.
(i) 1,000-inch antitank range, miniature.
(j) Moving target ranges.
(k) Artillery ranges.
(l) Harbor defense.

(2) COURSES AND COURTS.
(a) Obstacle course.
(b) Bayonet assault course.
(c) Grenade courts.
(d) "Combat in cities" course.
(e) Infiltration course.
(f) Close combat course.
(g) Transition firing course.

Section II

SELECTION OF SITES FOR RANGES AND OTHER TRAINING AIDS

3. GENERAL.

a. Training aid requirements will normally be furnished by the Commanding General of the post or station involved or by the Commanding General of the Service Command concerned, to the representative of the Chief of Engineers to prepare detailed plans and estimates (par. 7). Training aids requirements at AAF installations will normally be furnished by the commanding officer of the station involved, or by the Commanding General of the Air Forces Command concerned to the representative of the Chief of Engineers to prepare detailed plans and estimates.

b. The Corps of Engineers is charged with the duty of constructing the various types of ranges for use of the different arms and services. This work includes the necessary clearing, excavating and grading, construction of target butts, target pits, drainage facilities, storeroom or range house, and firing points. For regulations pertaining to the construction and maintenance of ranges see AR 100-80.

c. The Ordnance Department is charged with the duty of providing the necessary targets, target material, and target accessories for all small arm ranges. For information pertaining to nomenclature, procurement, and allowances of target equipment, targets, and target accessories, see AR 760-40; and Standard Nomenclature List No. L-1.

d. The Signal Corps is charged with the installation, supervision, and maintenance of target range communications (AR 105-5 and 105-20).

Figure 2 →

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

4. SAFETY LIMITS AND DANGER AREAS.

a. The following safety factors should be considered in the selection of sites for training aids:

(1) In selecting a range site, AR 750-10 must be consulted and strictly complied with. This regulation prescribes the safety limits, danger areas, and safety precautions required for firing all types of weapons and ammunition. The Field Manuals pertaining to weapons supplement these Army Regulations in so far as training in the particular weapon is concerned.

(2) For safety to the public, the range should be so located that the line of fire with its corresponding danger area will not include any habitable building, traveled highways, navigable waterways, railroads, airports, or recreation resorts.

(3) For safety of aircraft in flight, regulations of the Interdepartmental Air Traffic Control Board must be followed and clearance of this Board obtained in the location of artillery and small arms ranges or other similar activities which introduce a hazard to aircraft in flight. Accurate definitions of such ranges, both as to firing points and impact areas, must be shown in site selection investigation reports in order to obtain the necessary clearance.

5. LOCATION AND ARRANGEMENT OF TRAINING AIDS.

a. Location and arrangement of ranges, courts, and courses should be such as to facilitate their use by troops, provide economy of construction, avoid the isolation of useful maneuver areas, and require minimum danger area space. Rarely is the topography such that ranges can be located to use escarpments or hills for back-up so as to obviate the need of danger areas. Accordingly, the location of ranges to permit the overlapping of danger areas is desirable for economy in over-all acreage required for this purpose. Under average terrain conditions, the most compact and economical arrangement is accomplished if the ranges can be located along a segment of a comparatively large circle, as indicated in figures 1 and 2. Figure 2 covers arrangement of ranges and courts receiving greatest usage and which should be located within not more than 30 minutes' marching time from the cantonment area. Figure 1 includes moving vehicle and combat ranges which require a wide angle of fire and large danger areas due to a reduction in the element of disciplinary control over the firing which is inherent in these types of range firing. Since moving vehicle and combat ranges need not be located within 30 minutes' marching time from the cantonment area, terrain unsuitable for other purposes may be utilized for these danger areas with use of an arrangement similar to that shown in figure 1 for the small arms ranges located near the cantonment. Where an arrangement similar to that

IAL, AND TRAINING COURSE LAY-OUTS

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SELECTION OF SITES FOR RANGES AND OTHER TRAINING AIDS

shown in figure 1 is found desirable, total danger area may be sufficient to permit adding a moving target range for the 37-mm. Safety angles are typical only and should be modified as required for local terrain. The purpose of the 30-degree safety angle shown is to provide protection against ricochets and to provide sufficient spacing of ranges and firing points to allow for independent and simultaneous use. Where restricted range facilities demand, a 20-degree safety angle may be used in construction of new ranges, except that, in the independent marking of targets on 1,000-inch and other short ranges, provisions for a full 30-degree safety angle should be made when a weapon not provided with a fixed mount is used. Following are special notes on ranges shown on:

(1) FIGURE 1.

(a) Range No. 1. The angles shown include the angle of fire plus the required safety angle.

(b) Ranges Nos. 2 and 10. The angles shown include the angle of fire plus a safety angle of 30 degrees as requested by the Commanding General, Army Ground Forces, for construction for Ground Force troops.

(c) Ranges Nos. 3 to 8 Inclusive. The angles shown include the angle of fire plus the required safety angle, plus an arbitrary angle requested by the Commanding General, Army Ground Forces, in order to make each range independent. This angle should be used when berms between ranges are not being constructed.

(d) Ranges Nos. 5, 7, 8, and 9. The length of these ranges is based on the use of cal. .30 M2 ammunition for both rifle and machine gun firing.

(e) Range No. 9. The angles shown on this range include the normal safety angle plus the angle of fire. The Commanding General, Army Ground Forces, requests that all combat ranges have an over-all angle of 80 degrees if possible.

(f) Range No. 11. Range and safety angles must comply with existing Army Regulations at time of construction. Provisions for additional firing points, permitting firing at greater ranges, should be made wherever possible. A depth of firing points of approximately one-half mile is desirable.

(2) FIGURE 2.

(a) Ranges Nos. 1 to 5 Inclusive. The angles shown include the angle of fire plus the required safety angle, plus an arbitrary angle requested by the Commanding General, Army Ground Forces, in order to make each range independent. This angle should be used when constructing for Army Ground Force units when berms between ranges are not being constructed.

(b) Ranges Nos. 4 and 5. The length of these ranges is based on the use of cal. .30 M2 ammunition for both rifle and machine gun firing.

(c) Range No. 6. The angles shown on this range include the normal safety angle plus the angle of fire.

(d) Range No. 7. The angles shown include the angles of fire plus the required safety angle.

6. SELECTION OF SITES FOR ECONOMY AND EFFICIENCY.

a. In the construction of small arms ranges other than field firing or combat ranges, the site should be so selected that the line of fire will be as nearly horizontal as is practicable and will not be below horizontal. Maximum gradient of line of fire will be plus 2 percent, except for 100-yard carbine fire, where gradient of line of fire will not exceed plus 4 percent. For economy in danger areas, it should be noted that the selection of comparatively open areas, free of ledge rock or boulders and providing sufficient substantially level ground for butts and firing points, with rising ground along flanks and rear of danger areas, will require minimum danger areas. Wooded areas or areas in which ledge rock or boulders are prevalent with continuous ground slope away from targets will require abnormally large ricochet danger areas. Where practicable, the impact area of the small arms ranges may be made to coincide with the impact area of the artillery range, provided no serious interference with observation stations for the latter results. Where an area sufficient in size only for specific ranges is to be acquired at established posts, airfields, or other troop installation, availability and probable cost of suitable area for possible expansion of facilities or increase in range should be considered. In such cases, the preliminary lay-out (par. 7) should be sufficiently advanced, prior to submission of recommendation for land acquisition, to insure economical construction, proper relationship to adjacent ranges or training aids and to troop housing area, and to total required danger area. Favorable terrain which will permit material reduction in the size of danger area may offset higher land values if other requirements are met.

b. In order to permit maximum efficient use, small arms ranges, bayonet and grenade courts, obstacle courses, and gas chambers should be located within 30 minutes' marching distance from cantonment areas. Locations requiring the use of transportation should be avoided. Proper coordination will avoid locations of aids which would bar access to other areas or prevent the use of existing roads as a part of the training area road net.

TERIAL, AND TRAINING COURSE LAY-OUTS

and 5. The length of these ranges is based
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SELECTION OF SITES FOR RANGES AND OTHER TRAINING AIDS

c. The following factors should be considered regarding firing direction and control:

(1) GENERAL. Efficiency in use of the ranges is best assured if they are so located that firing is toward or slightly to the east of north. This gives good light on the face of the target during the greatest possible part of the day. However, security, suitable grounds, and proper and efficient relationship to troop housing areas and other adjacent ranges are more important than the direction of firing, except that known-distance ranges should preferably not require firing into the rising or setting sun. Where no firing is entailed, as on bayonet courts, practice grenade courts, and obstacle courses which require comparatively small areas, efficiency of use is best assured by the selection of sites in available areas in close proximity to units of using troops. With this in view, all courts of a given type need not be grouped in one location but may be separated as warranted.

(2) TERRAIN.

(a) On rough terrain, the range should be located so that the line of fire is at right angles, or nearly so, to and into high ground, with attention being given to the drainage of the target pits.

(b) On flat terrain, the range should, if practicable, be located so that the target pits and firing points may be drained easily and at a minimum cost and so that the intervening space between the former and latter is free of knolls, ridges, large trees, etc., which obstruct the visibility of the targets.

(c) In the selection of available areas for the known-distance ranges, the requirement that the line of fire should be as nearly horizontal as practicable and never below horizontal is of greatest importance. Ranges may, for economy, be selected so that the firing point is below the target, provided the gradient between the firing point and target does not exceed 2 percent. For this reason and to avoid grading to satisfy this requirement, choice of site for these ranges should take precedence over all others.

(d) In the selection of available areas for 1,000-inch ranges, except antiaircraft ranges, it is desirable, where practicable, to use areas where the soil shows the smallest deflection of ricochets under firing tests. An earth mound back of these targets is desirable, if the cost of construction is nominal, for the salvage of lead and for the reduction of ricochets.

Section III

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

7. APPROVAL OF PROPOSED CONSTRUCTION, PRELIMINARY PLANS, AND ESTIMATES.

a. The Office of the Chief of Engineers has prepared typical plans for training aids in cooperating with the Commanding General, Army Ground Forces, the Commanding General, Army Air Forces, and the Chief of Ordnance. These plans will provide required training facilities with maximum economy and minimum use of critical materials. Division and District representatives of the Office of the Chief of Engineers will furnish the Service Command or Air Force Command concerned with such assistance in the selection of sites and arrangement of training aids as may be requested. After the location of aids has been established and information has been furnished by the Service Command or Air Force Command as to the total number and type of aids to be provided, the District Engineer will prepare and submit preliminary lay-outs, detailed plans, and specifications for approval. The preliminary plan will show *in skeleton form only* the various ranges, courts, and courses with relationship to the troop housing area, road net, artillery range, maneuver areas, etc. Preliminary lay-outs should be made on United States Geological Survey maps, where available, supplemented with aerial maps of data from other sources (field reconnaissance) to establish wooded areas, favorable terrain to permit reduction in size of danger area, and location of firing points. Several studies, supplemented by field investigations, should develop the most favorable lay-out for submission to Service Command or Air Force Command for approval prior to preparation of detailed plans. Preparation of profiles or 2-foot interval contour surveys of the known-distance range area may be required to verify suitability. The Office of the Chief of Engineers will review plans and specifications in accordance with current instructions contained in chapter VII, Orders and Regulations. The expenses for the construction, maintenance, repair, extension, and improvement of training aids will be charged to funds allocated to the Chief of Engineers and will be authorized in accordance with procedures outlined in War Department Memorandum No. W 210-8-42 (Appendix A).

8. CONSTRUCTION MATERIALS AND REQUIREMENTS.

a. The type of training aids construction to be used at a given post or station will be consistent with the proposed life of the post or station of which the aids form a part; i.e., design, life, and standards of construction shall be predicated upon the anticipated life of the

ERIAL, AND TRAINING COURSE LAY-OUTS

Section III

TARGET RANGES AND LAY-OUT THER RANGES AND COURSES

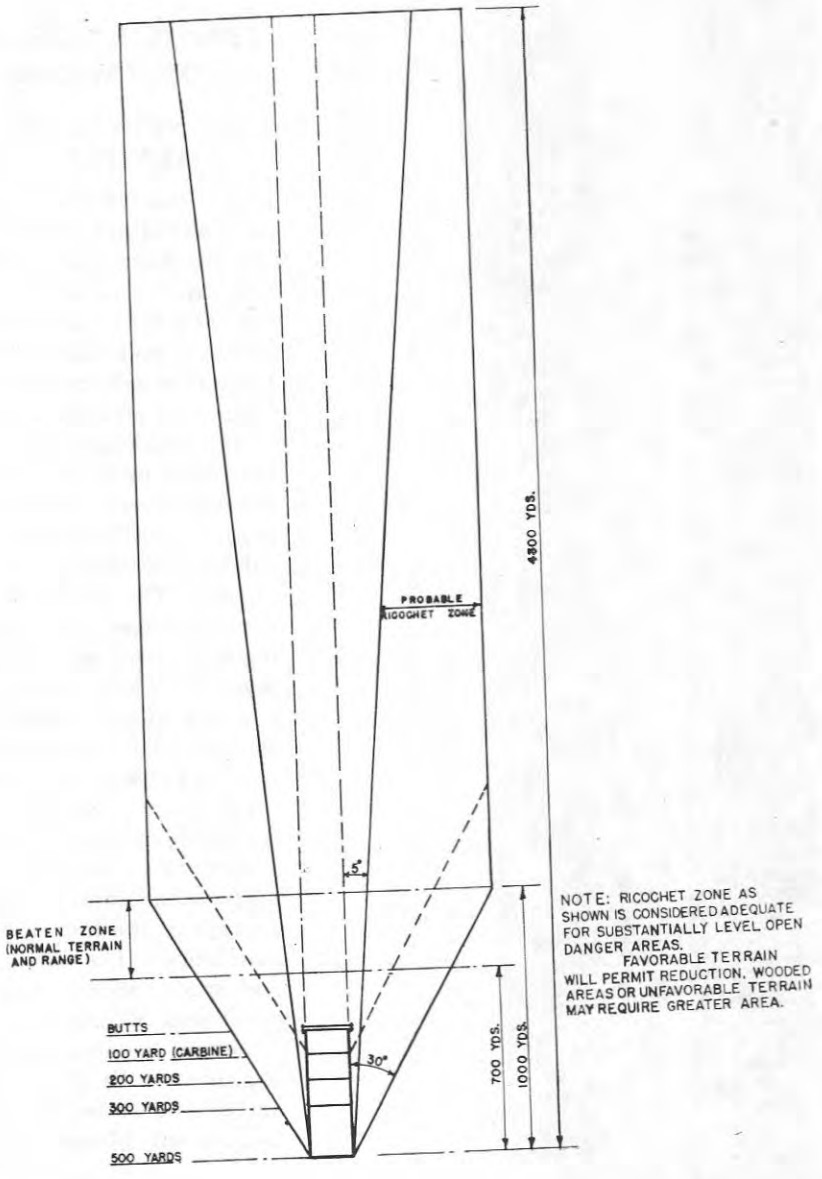
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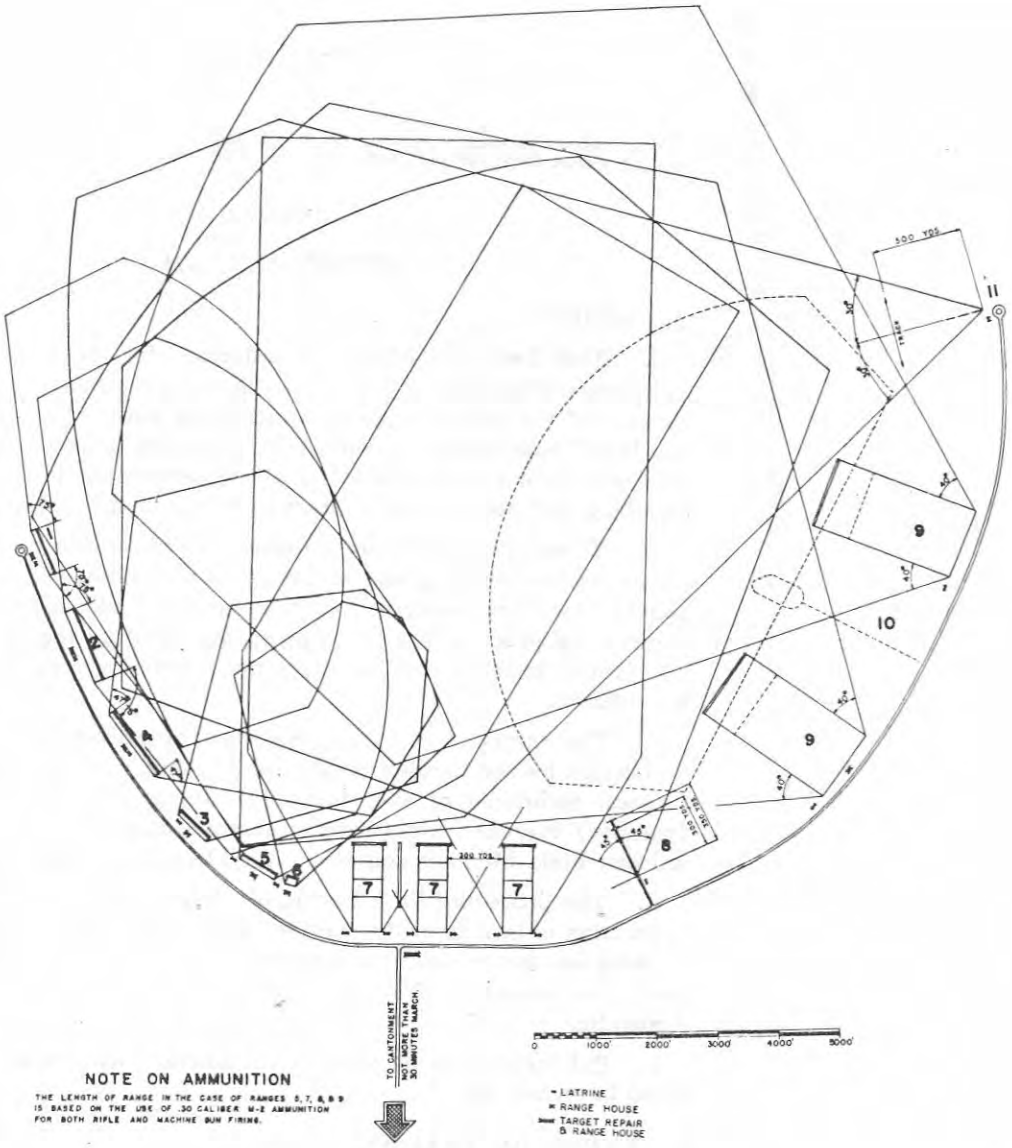
CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



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Figure 3 — Rifle Range



LEGEND			
KEY NO	TYPE OF RANGE	FOR CONSTRUCTION DETAILS SEE PLAN NO.	
1	ANTIAIRCRAFT MINIATURE	1600-130	
2	SUBMACHINE GUN	1600-125	
3	LANDSCAPE	1600-110	
4	ANTITANK (1000" MINIATURE)	1600-175	
5	MACHINE GUN (1000")	1600-125	
6	PISTOL	1600-110	
7	RIFLE (100, 200, & 300 YDS.)	1600-115	
8	MOVING VEHICLE (CAL. .30 MACHINE GUN)	1600-135	
9	FIELD TARGET	1600-140	
10	MOVING VEHICLE (SUBMACHINE GUN)	1600-135	
11	MOVING TARGET (37 MM)	1600-165	

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Figure 1 — General Lay-out of Small Arms Ranges Including Field Target Ranges

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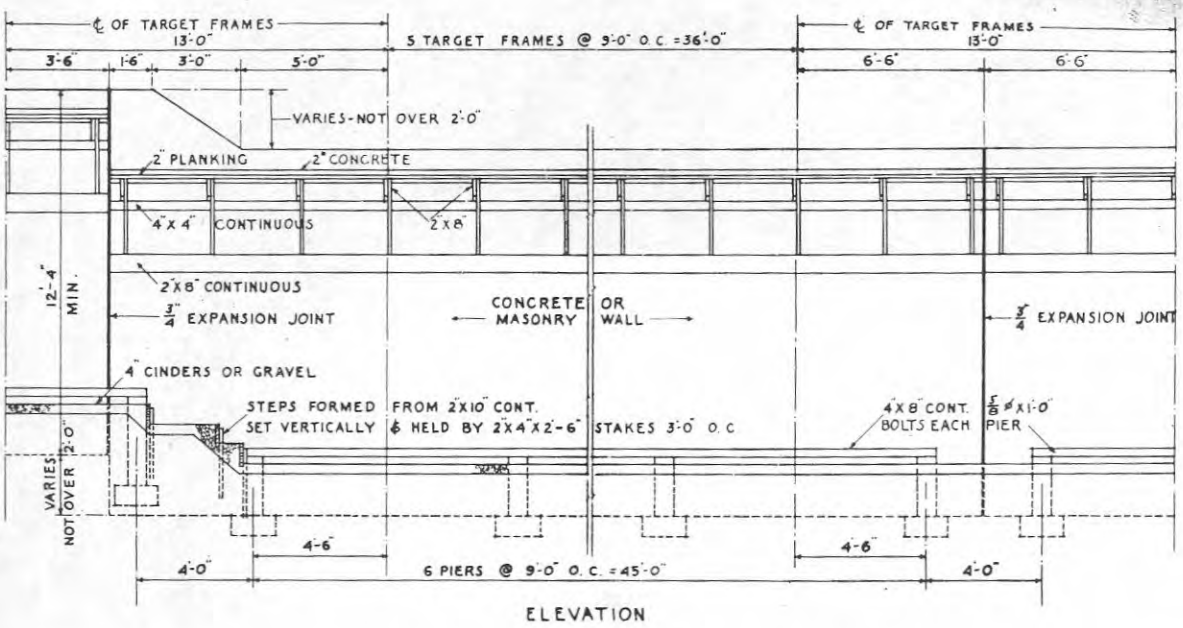
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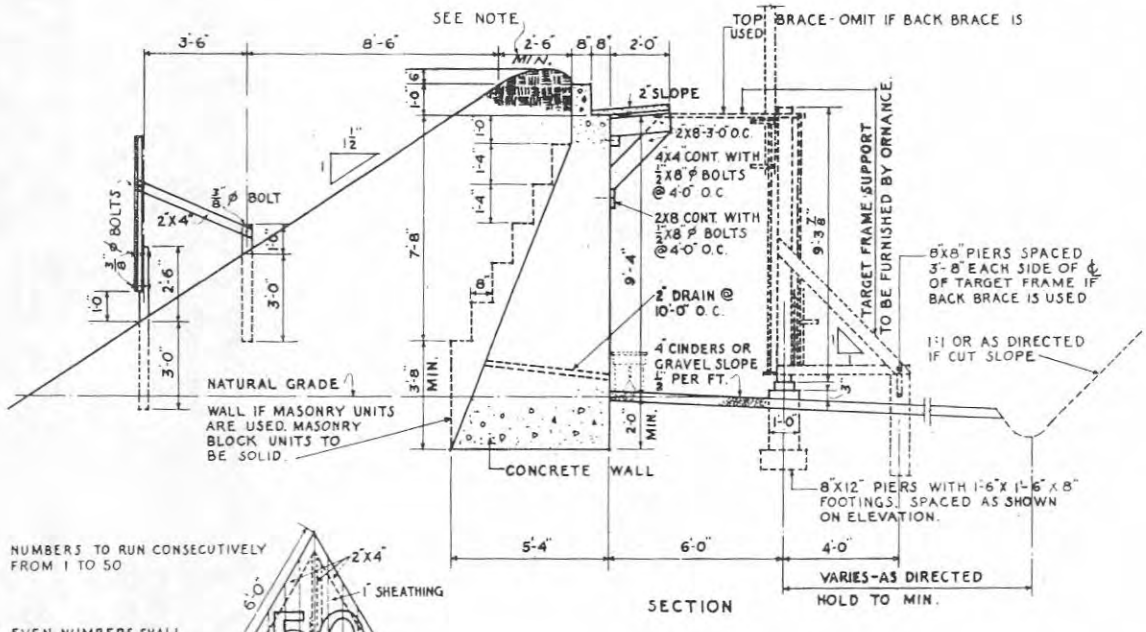
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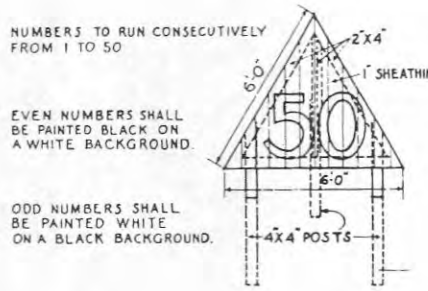
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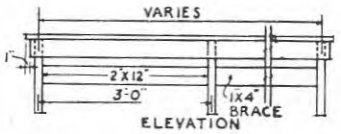
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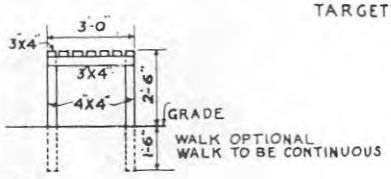
SECTION



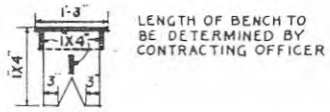
TARGET NUMBER



ELEVATION



SECTION THRU WALK



SECTION
DETAIL OF BENCH

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

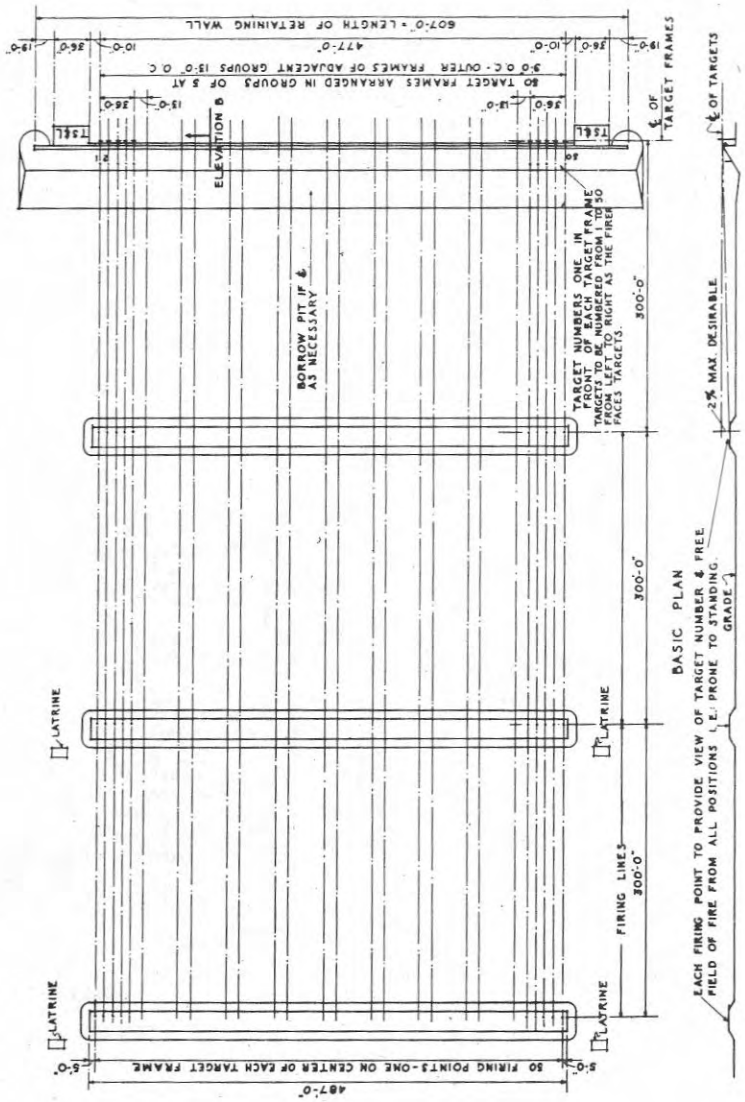
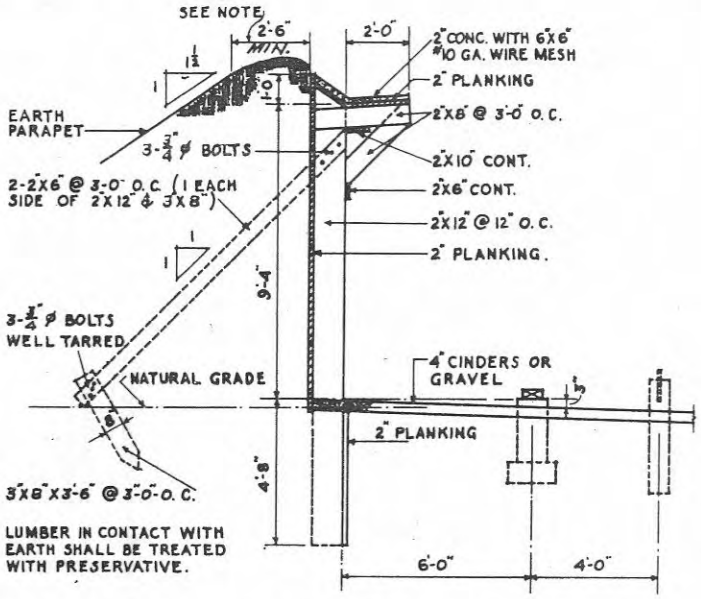


Figure 4 — Rifle Range — Detail Lay-out

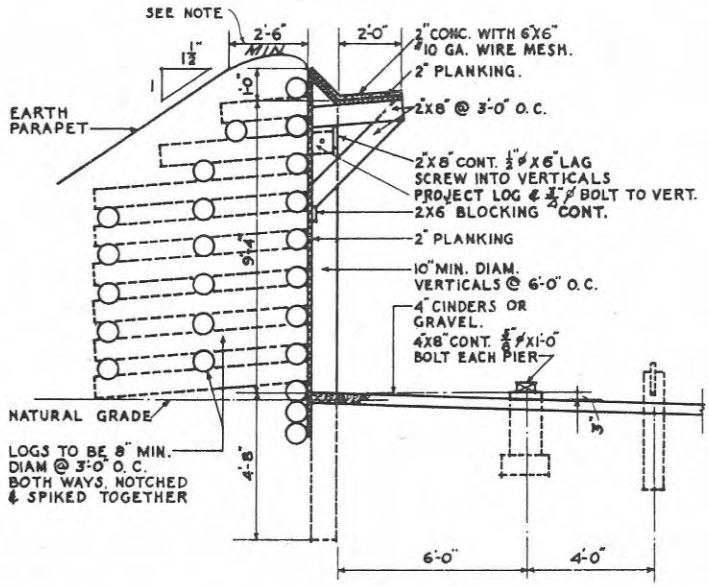
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TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



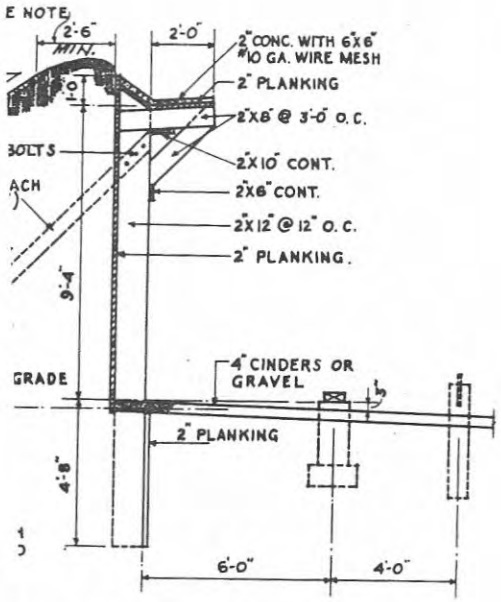
SECTION THRU BUTTS ALTERNATE NO. 1



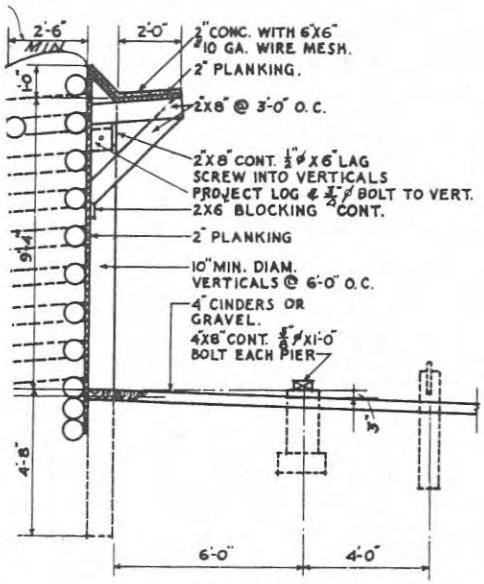
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Figure 6 — Rifle Range — Alternate Target Butts

MATERIAL, AND TRAINING COURSE LAY-OUTS



RU BUTTS ALTERNATE NO. 1

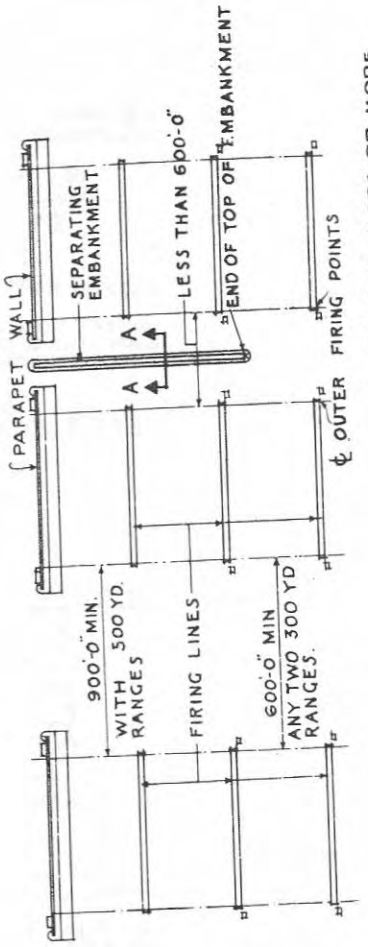


RA PD 60934

e Range — Alternate Target Butts

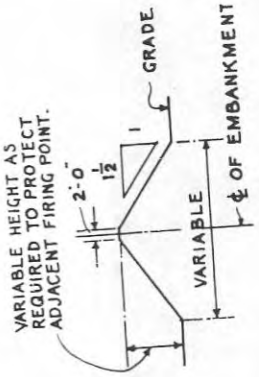
CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

RA PD 60932



RANGES 300 YARDS OR MORE APART DO NOT REQUIRE EMBANKMENT - WHERE LOCAL CONDITIONS REQUIRE LOCATION OF RANGES TO BE LESS THAN 300 YARDS APART, A SEPARATING EMBANKMENT WILL BE REQUIRED. LENGTH OF EMBANKMENT WILL DEPEND UPON THE SAFETY ANGLES NECESSARY TO GIVE PROTECTION ON ADJACENT RANGES.

MINIMUM REQUIREMENTS FOR CONDUITS ETC. TO CARE FOR SIGNAL SYSTEM (TO BE INSTALLED BY OTHERS) WILL BE ESTABLISHED IN CO-OPERATION WITH THE SIGNAL CORPS.



SECTION "A-A"

OCE 1600-115

Figure 7 — Multiple Rifle Ranges

post (Mobilization or Theater-of-Operations Type—five years' occupancy and use). The use of critical materials will be governed by current instructions of the Office of the Chief of Engineers. Clearing and grading will be limited to that necessary to provide serviceable training aids with essential protection from ricochets. Grading quantities will be held to a minimum through care in the selection and location of training aid areas. Requirements for compaction of embankment, for drainage, and for general clean-up, will conform to minimum standards. Seeding, sodding, or other erosion control measures will be undertaken only where essential. Seeding or spot sodding of firing points on known-distance ranges will be permitted as needed.

9. CONSTRUCTION DETAILS FOR RANGES.

a. Standard drawings cover typical, approved construction details. Comparable construction, established as satisfactory through prior usage, requiring no greater use of critical materials than shown on the typical plans, and requiring no increase in cost, may be substituted by contracting officers. All construction must provide required training facilities, utilizing standard targets and materials supplied by the Ordnance Department. In preparing construction details for ranges and estimates, the following points are to be noted:

(1) KNOWN-DISTANCE RANGE (figs. 3 to 8 incl.). The known-distance range receives greater usage and entails larger expenditure for construction than any of the other training aids. Survey of available areas and careful design offer opportunities for marked economies. The crib-type parapet (fig. 6) may be used, where logs are available for clearing, in areas reasonably free of termites and where rainfall is not excessive. Alternate No. 1 parapet (fig. 6) is suitable for construction under substantially all conditions; the type and extent of treatment (i.e., creosote, various salts, or pentochlorphenol applied as pressure treatment, dip treatment, or paint coat) should be predicated on local experience. Concrete parapets on temporary-type projects will be provided only under very adverse conditions. The following points should be noted in the design of known-distance ranges:

(a) Height of parapet is predicated on the present standard target frames as furnished by the Ordnance Department. Height of parapet necessary for protection of personnel is 7.5 to 8.0 feet. Accordingly, where definite information is available on the type of target frames to be furnished the individual project, an inspection of these frames in cooperation with the camp Ordnance officer is recommended in order to establish whether they are susceptible to ready modification to reduce frame height which will permit reduction in parapet height.

(b) Thickness of embankment shown at top of parapet is minimum and will be increased as required, based on type of soil and

IATERIAL, AND TRAINING COURSE LAY-OUTS

Theater-of-Operations Type—five years' occu-
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the Office of the Chief of Engineers. Clearing
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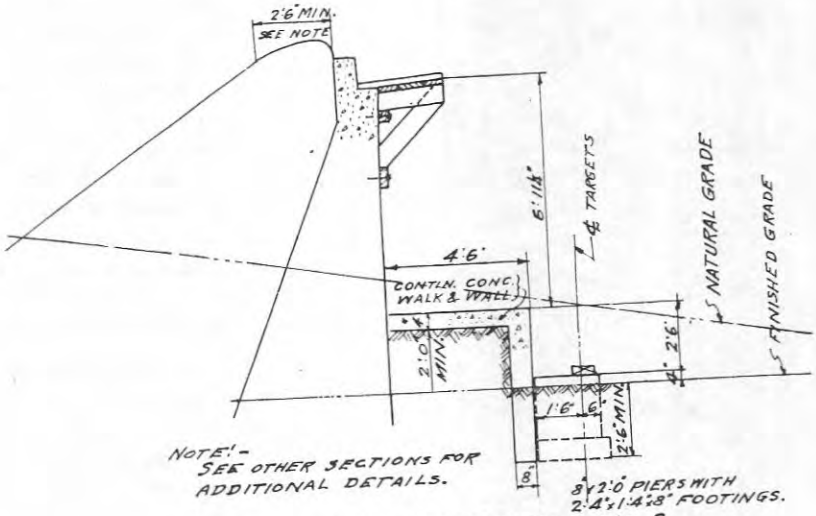
DETAILS FOR RANGES.

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All construction must provide required train-
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In preparing construction details for ranges
wing points are to be noted:

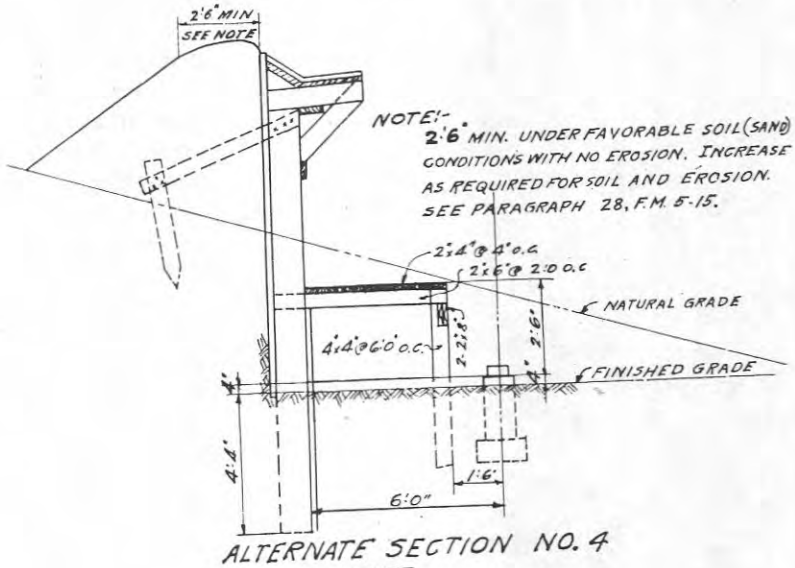
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CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



ALTERNATE SECTION NO. 3



ALTERNATE SECTION NO. 4

RA PD 60935

OCE 1600-115

Figure 8 — Rifle Range — Alternate Target Butts

probable erosion. Appendix II in FM 5-15 includes table on page 17.

(c) The type and spacing of pedestals for target frames will be revised as required for target frames furnished.

(d) Where butts are to be located along a transverse slope, attention is directed to savings which may be accomplished by stepping elevation of parapet at intervals of not less than 5 targets. Study should be made to establish comparative cost of constructing groups of 25 targets with a 200-yard interval (300-yd adjacent to 500-yd range) between adjacent groups with cost of providing a protective embankment between adjacent groups for the portion not clear of the danger zone. Height of protective embankment must be sufficient to protect adjacent firing points from all firing positions. A wood bench may be provided to assist marking and posting of targets.

(e) Where local conditions will require excessive expenditure to place combined storage house and latrine facilities (figs. 9, 10, 11, and 12) adjacent to parapet extended, target storage house may be placed back of target frames. Latrines must be placed adjacent to parapets extended for protection of personnel, and target storage house *will not be entered or occupied while firing is in progress.*

(2) PISTOL RANGE (figs. 13, 14, and 15). Requirements for this range are such as to permit of extremely economical construction. Salvage embankment, designed to permit salvage of material in bullets as well as to reduce ricochets, may be provided along the rear of the targets when terrain conditions are particularly favorable; otherwise, value of material that can be recovered will not justify expenditure.

(3) LANDSCAPE TARGET RANGE (figs. 16 and 20). The necessity of providing safety space between adjacent targets to permit independent operation of each target will extend this range over a considerable lateral distance. Adjustment in distance between adjacent targets to take full advantage of topography will be reflected by savings in construction costs.

(4) MACHINE GUN 1,000-INCH RANGE (fig. 21). Total usage of this range is second only to the known-distance range. A location along cut slope or hillside will simplify construction of salvage wall (fig. 17).

(5) SUBMACHINE GUN RANGE (figs. 18, 19, and 22). Alternate methods shown for actuating targets fired upon from point "B" may be predicated upon local terrain or the desires of Range Officer. Effective use of this range is predicated on proper instructions and proper policing to control time and direction of fire.

(6) ANTIAIRCRAFT RANGE, MINIATURE (figs. 23 to 29 incl.). The wide angle of fire and limited range of cal. .22 weapons justify

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

THICKNESS REQUIRED FOR PROTECTION AGAINST SINGLE SHOTS BY DIRECT-FIRE WEAPONS

Materials	Small-arms and MG (7.92-mm) Fire at 100 yards[1]	AT rifle (7.92-mm) Fire at 100 yards[1]	20-mm AT fire at 200 yards	37-mm AT fire at 400 yards	Remarks
Solid walls:[2]	Feet	Feet	Feet	Feet	
Brick masonry	1½	2	2½	5	Ordinary concrete walls.
Concrete (not reinforced)[3]	1	1½	2	3½	Structurally reinforced.
Concrete (reinforced)[3]	½	1	1½	3	
Stone masonry	1	1½	2½	3½	These figures can be taken as guide only.
Wood	2	3	4	—	
Timber	3	5	—	—	
Walls of loose materials packed between boards:[2]					
Brick rubble	1	2	2½	5	Add 100 percent if wet.
Clay (dry)	3	4	—	—	Add 50 percent if wet.
Loam (dry)	2	3	4	—	
Gravel, small stones	1	2	2½	5	Add 100 percent if wet.
Sand (dry)	1	2	2½	5	
Sandbags filled with:[4]	Inches	Inches	Inches	Inches	
Brick rubble	20	30	30	60	Add 100 percent if wet.
Clay (dry)	40	60	—	—	Add 50 percent if wet.
Loam (dry)	30	50	60	—	
Gravel, small stones	20	30	30	60	Add 100 percent if wet.
Sand (dry)	20	30	30	60	
Loose parapets of:[2]	Feet	Feet	Feet	Feet	
Clay	3½	5	—	—	Add 100 percent if wet.
Loam	3	4	5	—	Add 50 percent if wet.
Sand	2	3	4	—	Add 100 percent if wet.

[1]One burst of five shots.
[2]Thickness given to the nearest half foot.
[3]For 3,000 pounds per square inch concrete.
[4]Thickness for walls made of sandbags given in multiples of filled bag widths (10 in.).

NOTE: Protective thickness given is for a single shot only. Where direct-fire weapons are able to get five or six hits in the same area, the required protective thickness is approximately twice that indicated.

IAL, AND TRAINING COURSE LAY-OUTS

x II in FM 5-15 includes table on page 17.

ing of pedestals for target frames will be et frames furnished.

be located along a transverse slope, atten- which may be accomplished by stepping ervals of not less than 5 targets. Study comparative cost of constructing groups ard interval (300-yd adjacent to 500-yd oups with cost of providing a protective ent groups for the portion not clear of f protective embankment must be suffi- ring points from all firing positions. A d to assist marking and posting of targets.

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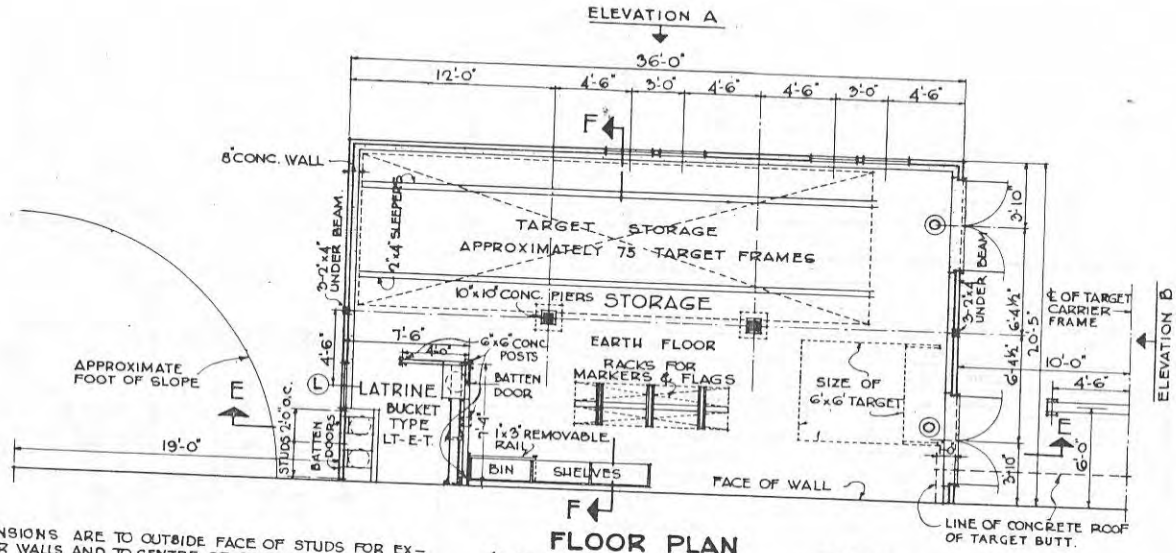
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FLOOR PLAN
(1 AS SHOWN – 1 OPPOSITE HAND)

DIMENSIONS ARE TO OUTSIDE FACE OF STUDS FOR EXTERIOR WALLS AND TO CENTRE OF STUDS FOR PARTITIONS.

LUMBER SIZES GIVEN ARE NOMINAL SIZES.

PROVIDE ONE 12'-0" LADDER TO HANG ON BRACKETS ON EXTERIOR WALL (ALTERNATE PLAN).

CINDER OR GRAFEL FILL MAY BE USED IN LIEU OF EARTH FOR FLOOR.

BOTTOM OF CONCRETE WALLS SHOULD NOT BE CARRIED BELOW THE FROST LINE, WHERE SUFFICIENT BEARING CAN BE OBTAINED AT A HIGHER ELEVATION, EXCEPT WHERE CONSIDERABLE HEAVING MAY BE EXPECTED. SOIL BEARING VALUE SHALL BE AT LEAST 3000# PER SQ. FT. IF SOIL BEARING VALUE IS LESS THAN 3000# PER SQ. FT. FOOTINGS SHALL BE RE-DESIGNED BY THE DISTRICT ENGINEER.

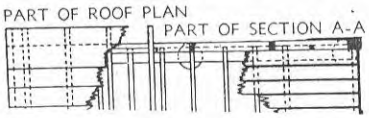
PROVIDE V-GROOVE IN CONCRETE WALLS AS DETAILED.

EITHER BUCKET TYPE OR EARTH PIT LATRINE MAY BE USED DEPENDING UPON LOCAL SOIL CONDITION.

OCE 1600-116

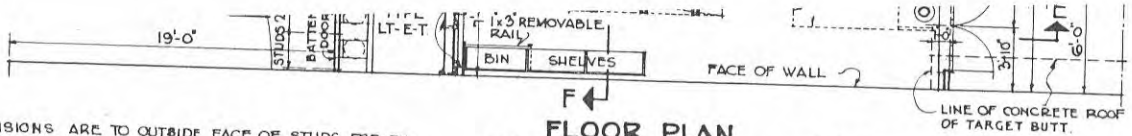
RA PD 60936

Figure 9 — Target Storage House and Latrine — Floor Plan



MATERIALS	
6 — 10" X 48" POSTS	1-ROLL, 2-PLY COMPOSITION ROOFING
3 — 2" X 8" X 12' SIDE & END SILLS.	1-2'-8" X 7'-0" X 1-3/8" STOCK DOOR.
2 — 2" X 6" X 12' JOIST PLATES	1-10" X 16"-3 LIGHT STOCK SASH.
9 — 2" X 6" X 6" FLOOR JOISTS	4-3/8" X 1-1/2" X 12" W.I. STRAPS.
6 — 2" X 4" X 12' PLATES	20-60d SPIKES.
4 — 4" X 4" X 8' CORNER POSTS	20 LBS. 20d SPIKES
8 — 2" X 4" X 8' STUDS	10 LBS. 8d NAILS.
	10 LBS. 6d NAILS

CONSTRUCT
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FLOOR PLAN

(1 AS SHOWN – 1 OPPOSITE HAND)

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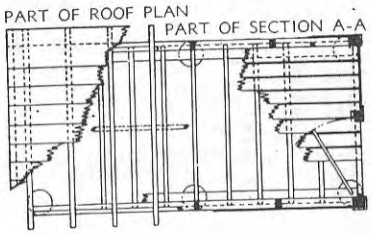
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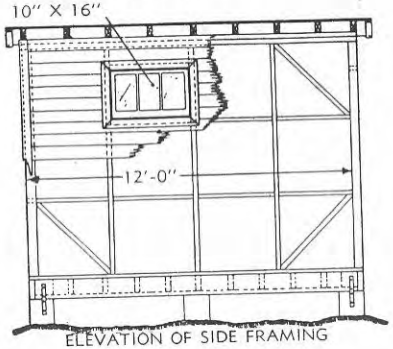
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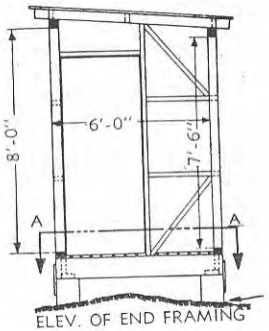
Figure 9 — Target Storage House and Latrine — Floor Plan



ORD 9942-A
Q.M.C. 416-119

MATERIALS	
6 — 10" X 48" POSTS	1-ROLL, 2-PLY COMPOSITION ROOFING
3 — 2" X 8" X 12' SIDE & END SILLS.	1-2'-8" X 7'-0" X 1-3/8" STOCK DOOR.
2 — 2" X 6" X 12' JOIST PLATES	1-10" X 16"-3 LIGHT STOCK SASH.
9 — 2" X 6" X 6" FLOOR JOISTS	4-3/8" X 1-1/2" X 12" W.I. STRAPS.
6 — 2" X 4" X 12' PLATES	20-60d SPIKES.
4 — 4" X 4" X 8' CORNER POSTS	20 LBS. 20d SPIKES
8 — 2" X 4" X 8' STUDS	10 LBS. 8d NAILS.
9 — 2" X 4" X 7' RAFTERS	10 LBS. 6d NAILS
13 — 2" X 4" X 12' HEADERS, BRACES, ETC.	2 PAIRS 1" X 2" BUTTS
2 — 1" X 3" X 8' CLEATS	1 PAIR 1" X 3" BUTTS
140 LIN. FT. 1" X 4" TRIM.	1-MORTISE LOCK
72 SQ. FT. 1" X 6" ROUGH FLOORING	2-1/2 GAL. PAINT, COLOR AS SPECIFIED.
315 SQ. FT. 1" X 6" SIDING.	
100 SQ. FT. 1" X 6" ROOF SHEATHING.	





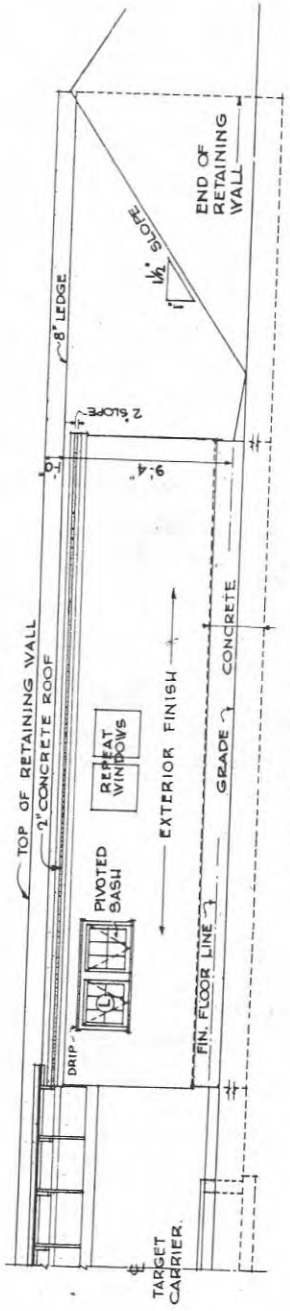
NOTES
IF CORR. GALV. IRON IS USED ON ROOF, SPIKE
2" X 4" NAILING STRIPS BETWEEN RAFTERS
PROVIDE TIGHT WOOD SHUTTER OVER
WINDOW, HINGED ON BOTTOM AND FASTENED
AT TOP WITH HOOK & EYE
IF BUILDING MAY BECOME SUBJECT TO
REMOVAL, LAY FLOORING DIAGONALLY.

GRADE TO DRAIN FROM BLDG.

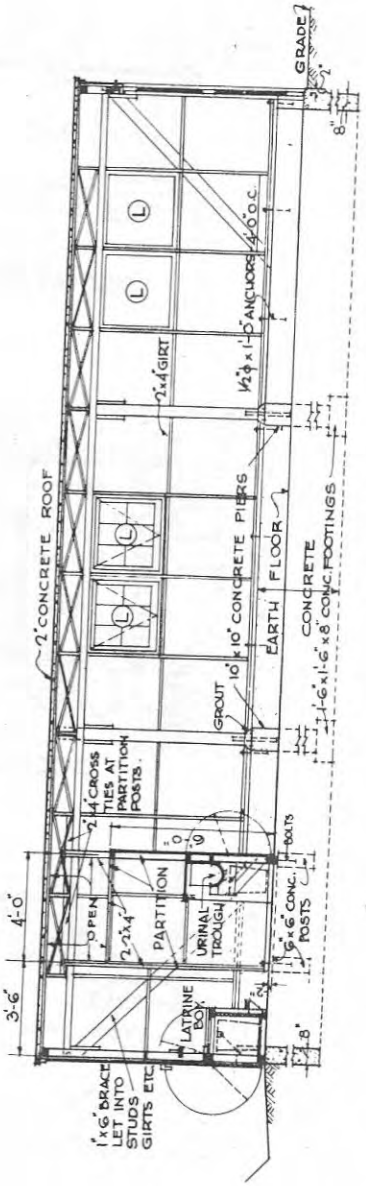
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Figure 10 — Rifle Range Storehouse — Details



ELEVATION A

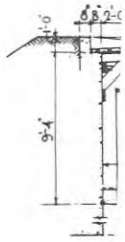


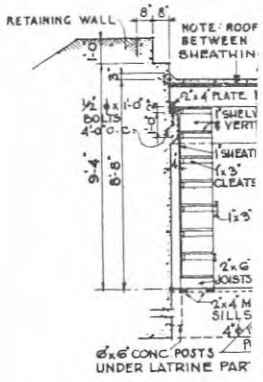
SECTION E-E

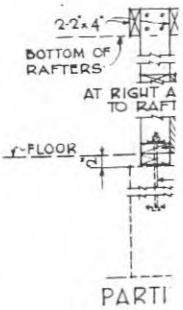
Figure 11 — Target Storage House and Latrine — Elevation and Section

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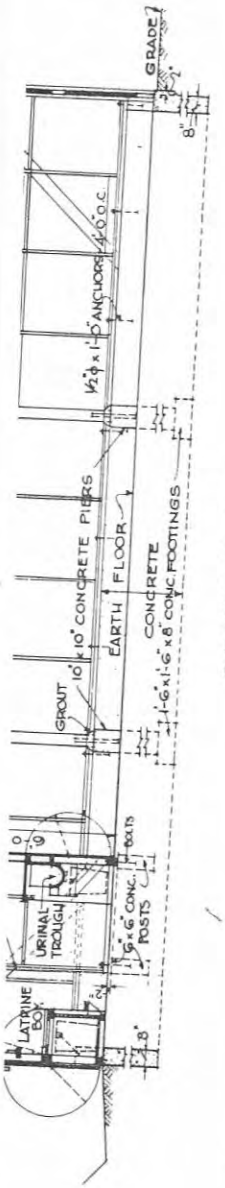






OCE 1600-116

Figure 12 — Target



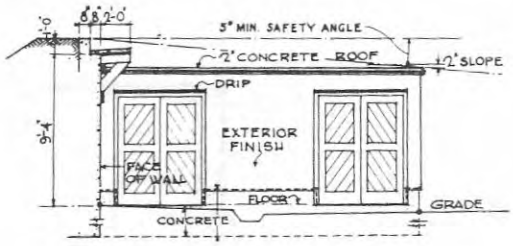
SECTION E-E

Figure 11 — Target Storage House and Latrine — Elevation and Section

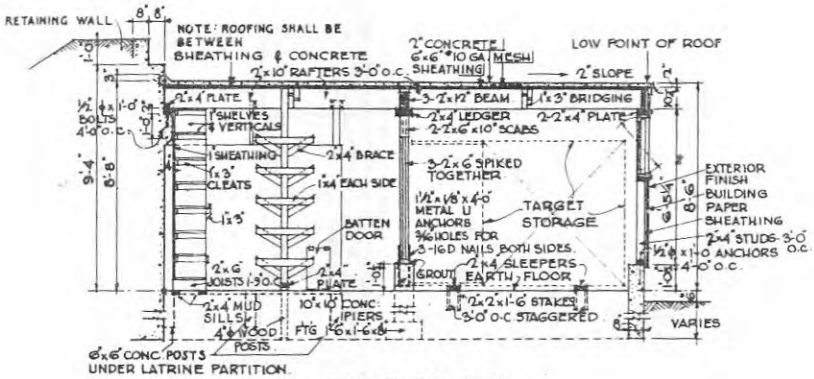
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OCE 1600-116

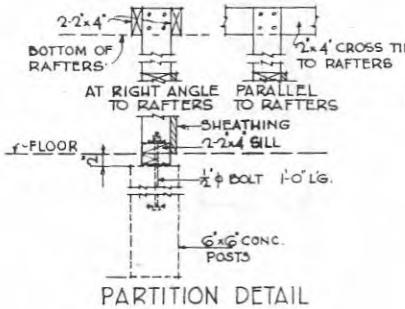
CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



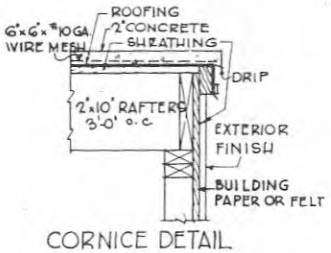
ELEVATION B



SECTION F-F



PARTITION DETAIL



CORNICE DETAIL

OCE 1600-116

RA PD 60938

Figure 12 — Target Storage House and Latrine — Miscellaneous Details

locating this range away from the area assigned to other ranges in cases where desirable and where an alternate location utilizing adverse terrain for danger area is available.

(7) MOVING VEHICLE RANGES (figs. 30 and 31). Moving vehicle range for submachine gun (fig. 31) is typical only. This range should be located along a ridge or on topography which will permit wide angle of vision. The arrangement of the road is subject to modification as required to meet local terrain and to reduce danger area. Each of the three target groupings and the portion of the road from which firing occurs for each should be located on a tangent. Road construction will be held to a minimum, consisting primarily of clearing and sufficient work with a blade machine to provide for satisfactory passage of vehicles. The cal. .30 machine gun moving vehicle range (fig. 30) may be located adjacent to or within the limits of the submachine gun moving vehicle range where the size of the danger area can be materially reduced by such a location. Log-type obstacles are desirable to permit ready removal other than at locations where habitual use by tank traffic is contemplated.

(8) FIELD TARGET OR COMBAT RANGE (figs. 32 to 36; 38, 39). The field target range is designed to provide training simulating actual combat. Assistance of the Range Officer or the Training Aid Section of the Service Command in details of lay-out of this type range is desirable. Full advantage of local topography and controlled direction of fire is essential to avoid excessive danger area. These ranges require largest danger area of the small arms group, and accordingly careful design, even at some increases in construction cost, is warranted where danger area can be materially reduced. The following notes apply to figures 32 to 36 and 38, 39:

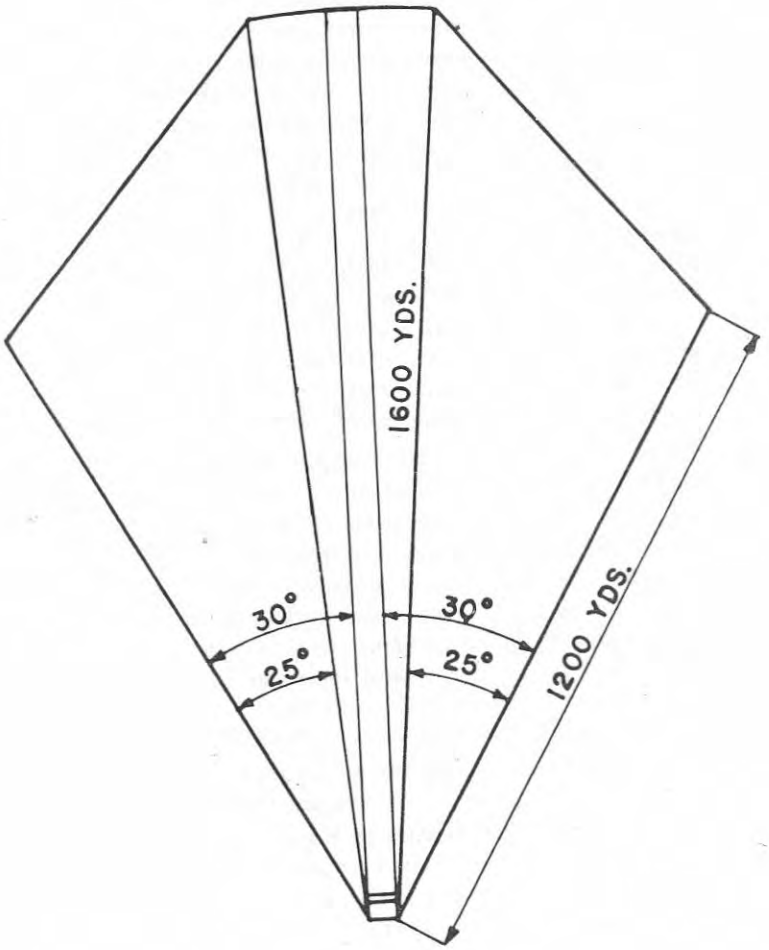
(a) The number, location on target bar, and type (prone kneeling, or standing) of target may be varied to meet individual problems.

(b) The "Typical Combat Range" shown is only one condition. The location of the various component parts of the range should be determined by the plans and training officer after the range area is selected and danger areas established.

(c) The method of dropping the targets shown is by use of extension springs. Should springs not be available, the targets may be dropped by use of a counter weight.

(d) When practicable, target units should be placed on reverse slopes and approximately 1 foot below the crown of a rise. Where units are placed on level or on the forward slope of the rise, each unit should be recessed into the ground approximately 1 foot below plane of fire. The wire leading from the unit for a distance of approximately 15 feet should be placed in a trench 6 inches wide and 1 foot to 0 inch deep with one or more sand bags placed to prevent

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



OCE 1600-101

RA PD 60939

Figure 13 — Pistol Range

TRAINING COURSE LAY-OUTS

ea assigned to other ranges in
rnate location utilizing adverse

(figs. 30 and 31). Moving
g. 31) is typical only. This
or on topography which will
igement of the road is subject
l terrain and to reduce danger
gs and the portion of the road
uld be located on a tangent.
imum, consisting primarily of
lade machine to provide for
cal. .30 machine gun moving
d adjacent to or within the
vehicle range where the size
iced by such a location. Log-
ready removal other than at
ffic is contemplated.

GE (figs. 32 to 36; 38, 39). The
le training simulating actual
or the Training Aid Section
lay-out of this type range is
graphy and controlled direc-
danger area. These ranges
arms group, and accordingly
in construction cost, is war-
ally reduced. The following
9:

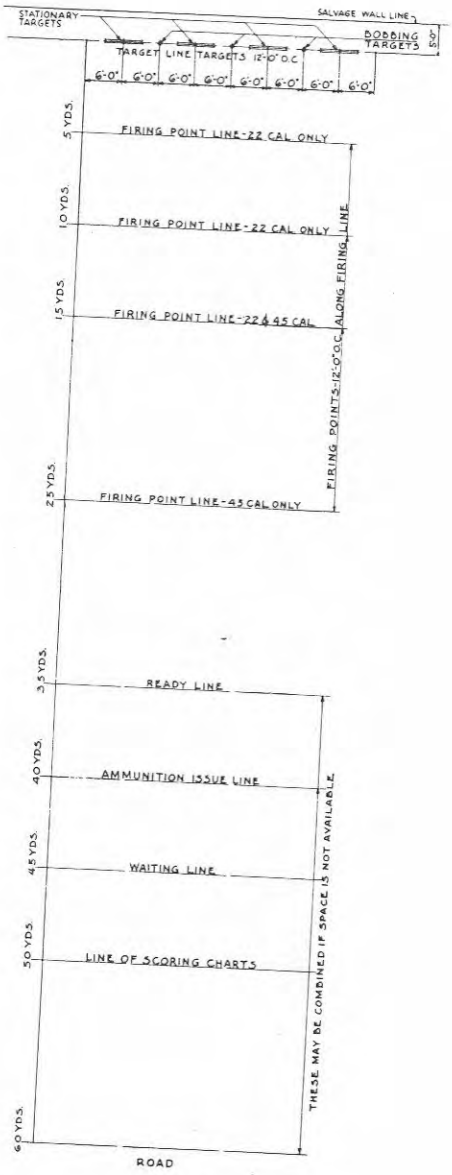
ar, and type (prone kneeling,
ieet individual problems.

hown is only one condition.
arts of the range should be
icer after the range area is

ts shown is by use of exten-
ilable, the targets may be

ould be placed on reverse
ie crown of a rise. Where
ard slope of the rise, each
pproximately 1 foot below
unit for a distance of ap-
trench 6 inches wide and
nd bags placed to prevent

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

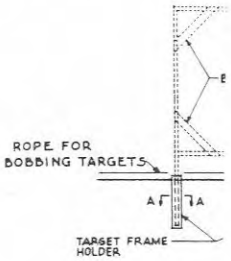


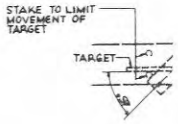
OCE 1600-110

RA PD 60940

Figure 14 — Pistol Range — Detail Lay-out

CONSTRUCTION
OF VARIOU





P

DE

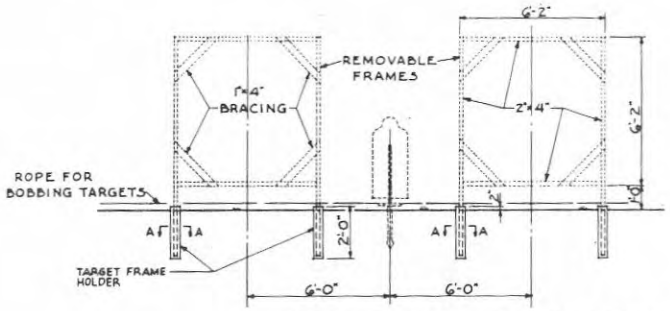
2"x10"x10"
1"x6"x4'
2"x2"x4'-6"

TYPICAL ST
(ONE AT EACH

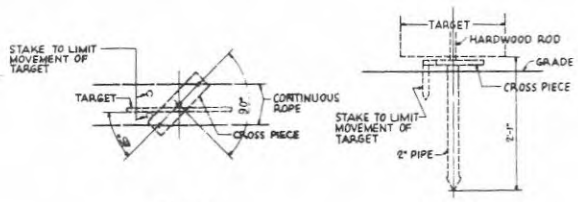
OCE 1600-110

Figure 15 ·

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

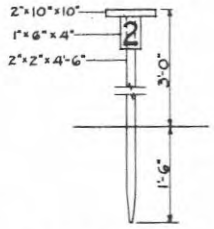


TYPICAL TARGET FRAMES

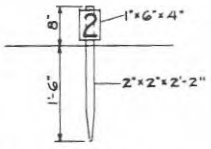


DETAILS FOR BOBBING TARGET

NOTE
FIELD MANUAL REFERENCE 23-35
DOTTED EQUALS ORDNANCE ISSUE MATERIAL



TYPICAL STAKE TABLE
(ONE AT EACH FIRING POINT)



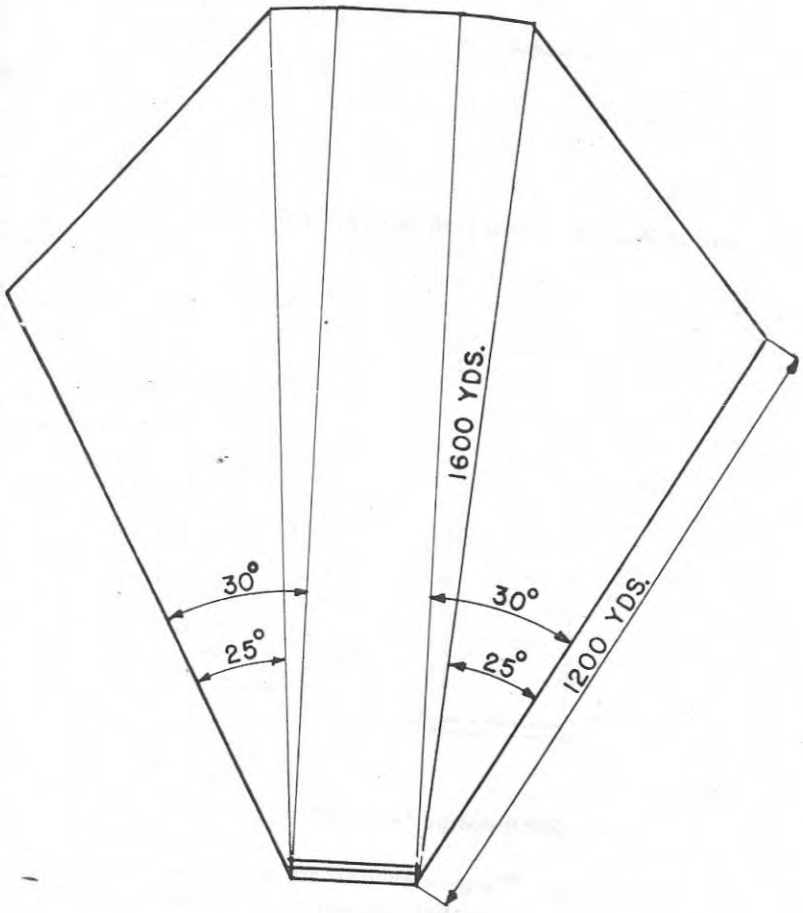
TYPICAL TARGET MARKER
(ONE AT EACH TARGET)

OCE 1600-110

RA PD 60941

Figure 15 — Pistol Range — Miscellaneous Details

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

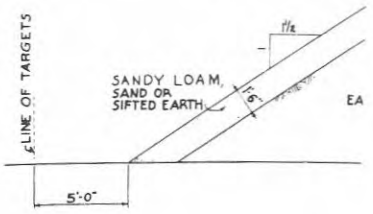


OCE 1600-100

RA PD 60942

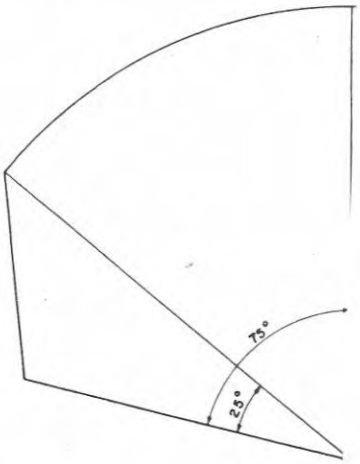
Figure 16 — Landscape Range

CONSTRUCTION OF TA
OF VARIOUS OTHE



OCE 1600-125

Figure 17 — Salvage Wall f



OCE 1600-101

Figure 18 —

enfilade fire into wire trenc
in a down position. Locatio
or camouflaged as practicab

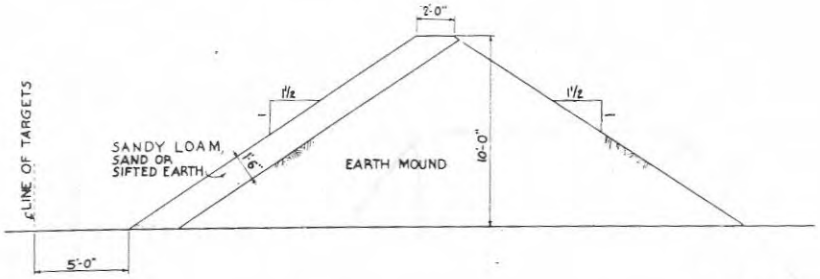
(e) Wires leading off th
so that the wire will not b
yards. This can be accomp

1. Keeping wire on the
ridge or unevenness of the

2. Placing all supports f
and providing a small trenc
of the recessed supports.

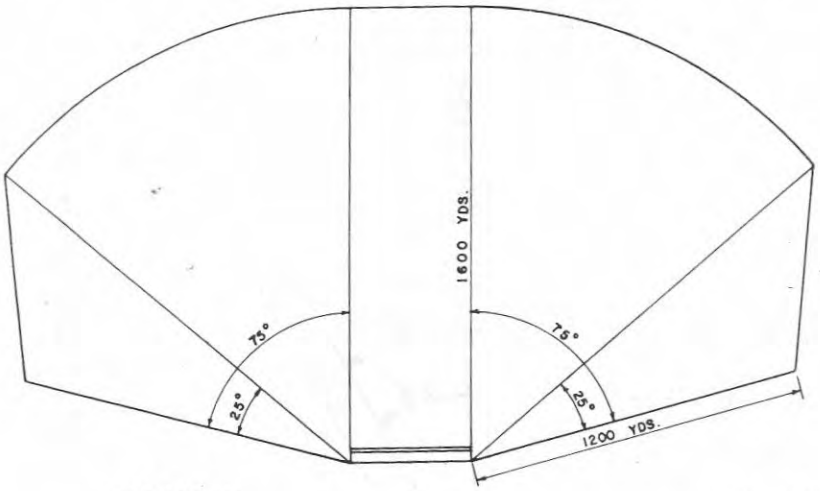
COURSE LAY-OUTS

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



OCE 1600-125 RA PD 60945

Figure 17 — Salvage Wall for 1,000-inch Ranges When Required



OCE 1600-101 RA PD 60946

Figure 18 — Submachine Gun Range



RA PD 60942

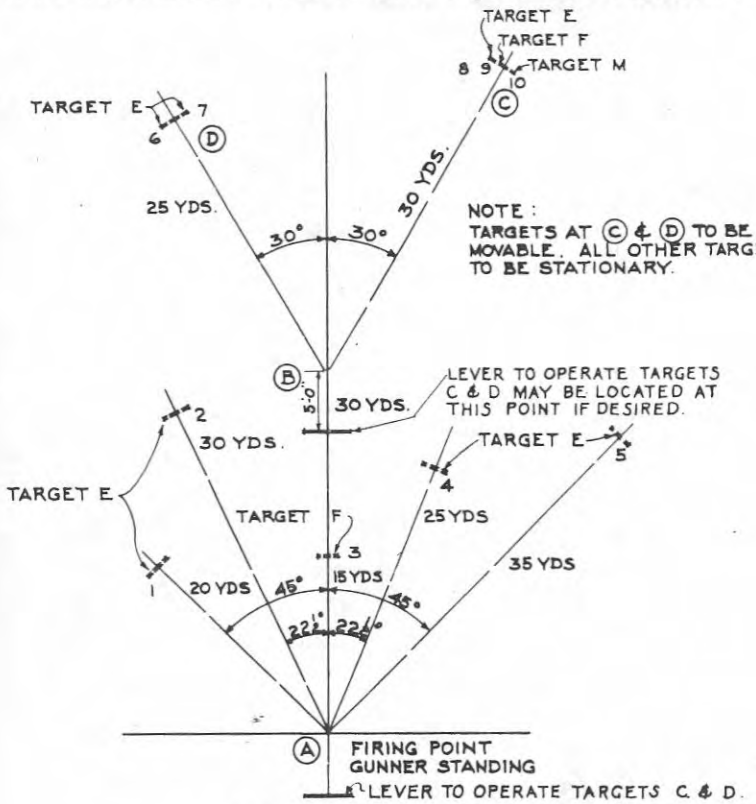
enfilade fire into wire trench. Targets should not be visible when in a down position. Location of trenches and wires should be hidden or camouflaged as practicable.

(e) Wires leading off the main line to the unit should be placed so that the wire will not be noticed at a distance greater than 100 yards. This can be accomplished by:

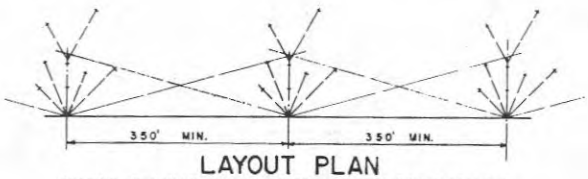
1. Keeping wire on the ground and on the reverse side of any ridge or unevenness of the ground.

2. Placing all supports flush or just below the level of the ground and providing a small trench for the wire about 10 feet on each side of the recessed supports.

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

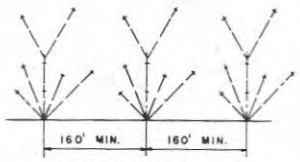


DISMOUNTED COURSE



LAYOUT PLAN

SPACING OF RANGES WHEN INDEPENDENT OPERATION IS POSSIBLE



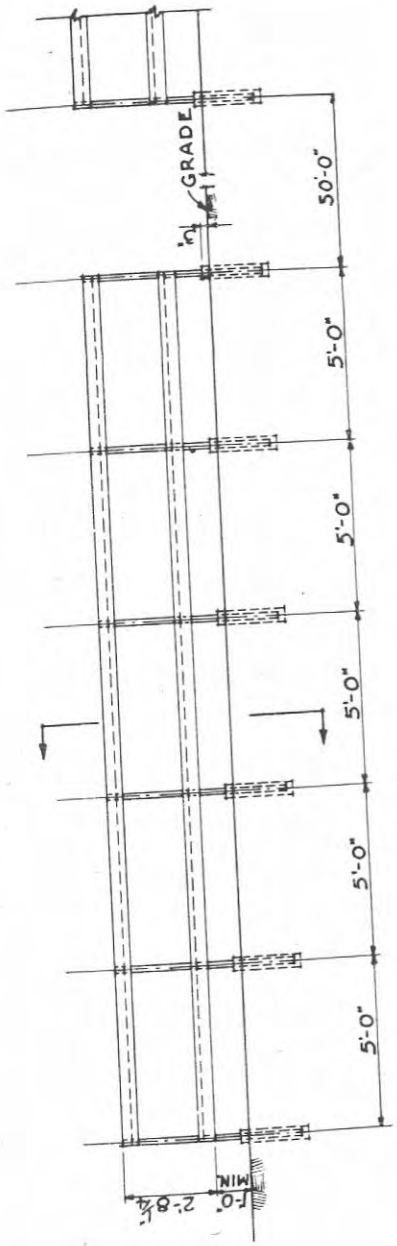
LAYOUT PLAN

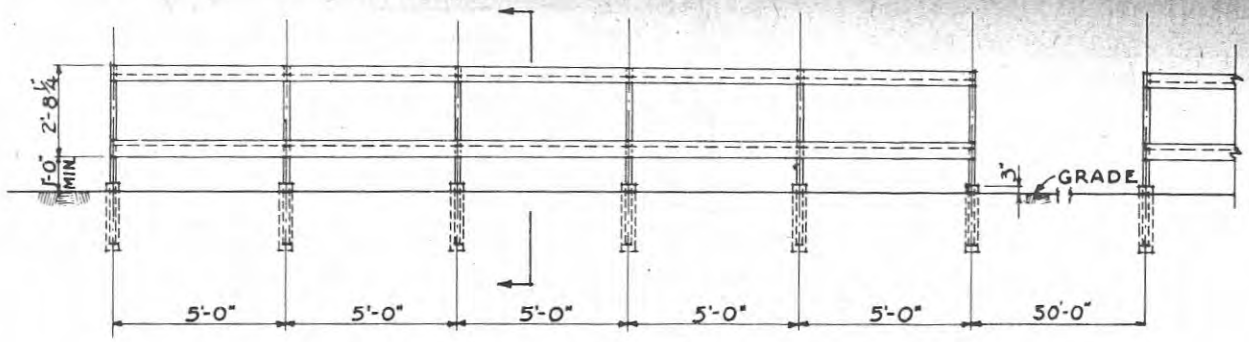
SPACING OF RANGES WHERE LOCAL CONDITIONS WILL NOT PERMIT INDEPENDENT OPERATION OF RANGES.

OCE 1600-125

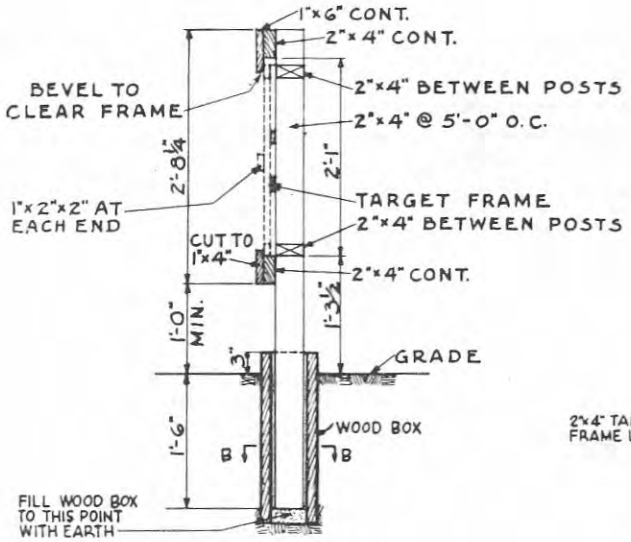
RA PD 60947

Figure 19 — Submachine Gun Range — Detail Lay-out and Spacing for Multiple Ranges

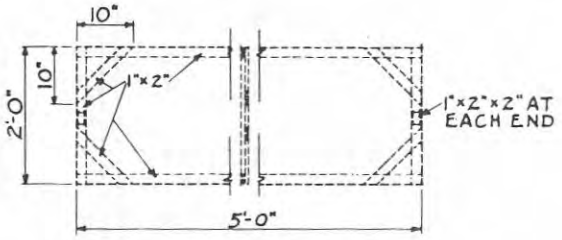




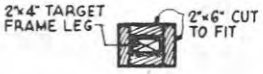
ELEVATION



SECTION



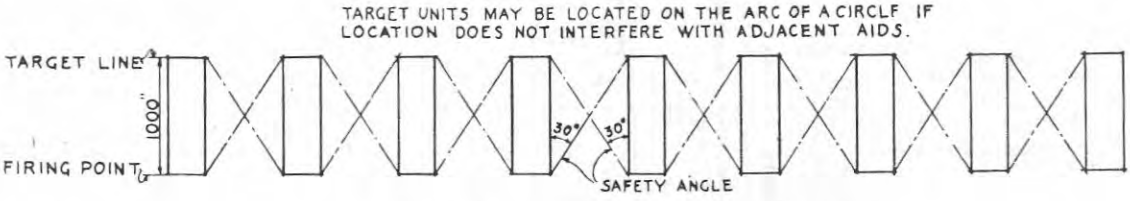
TARGET FRAME DETAILS



PLAN "B-B"

LANDSCAPE TARGET DETAILS

FIELD MANUAL REFERENCE
23 – 5 AND 23 – 10.
DOTTED EQUALS ORDNANCE ISSUE MATERIAL.



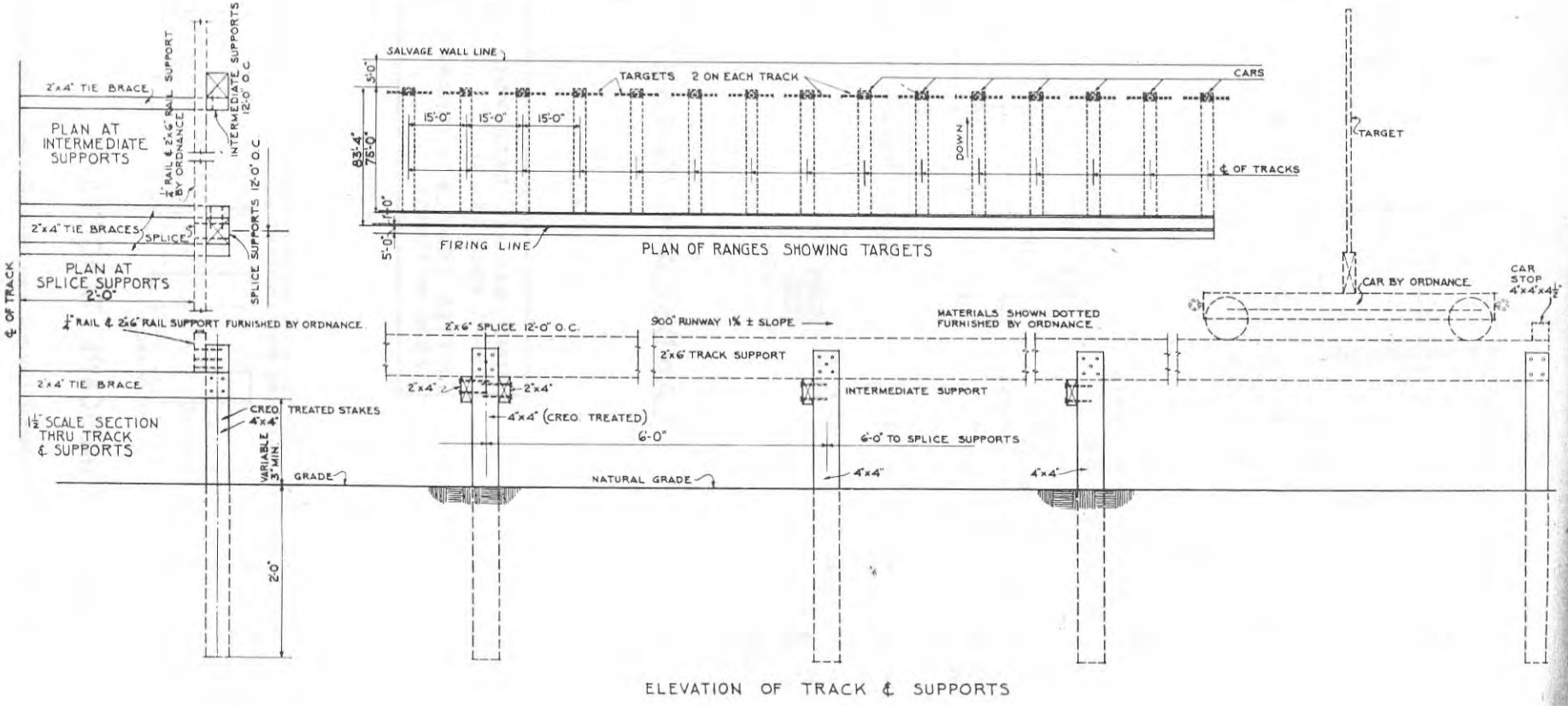
OCE 1600-110

PLAN – LANDSCAPE TARGETS

RA PD 60943

Figure 20 — Landscape Range — Detail Lay-out and Miscellaneous Details

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

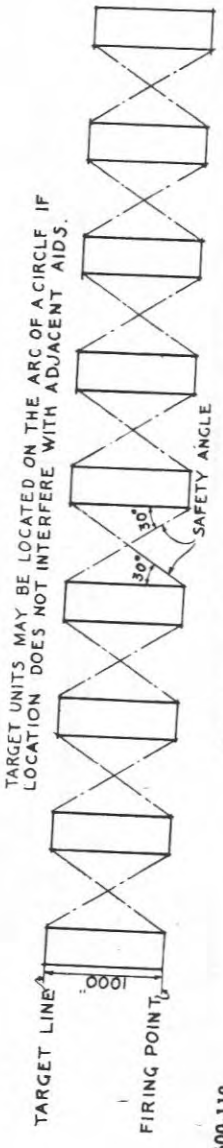


OCE 1600-125

RA PD 60944

Figure 21 — Machine Gun 1,000-inch Range

JRSES



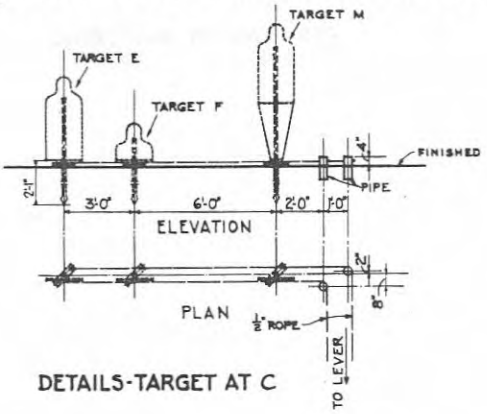
PLAN – LANDSCAPE TARGETS

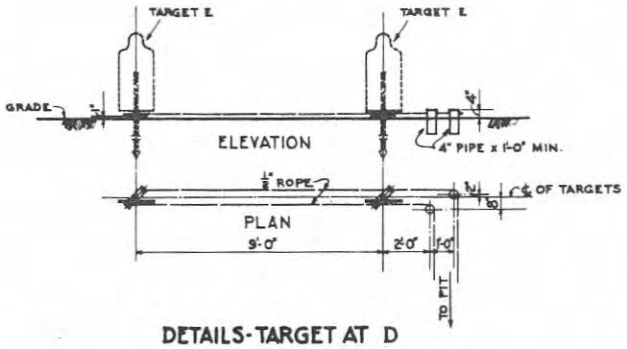
RA PD 60943

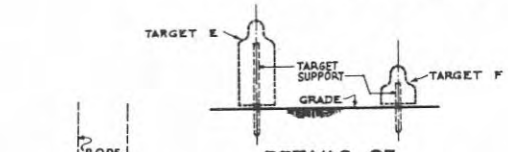
Figure 20 — Landscape Range — Detail Lay-out and Miscellaneous Details

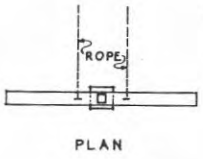
OCE 1600-110

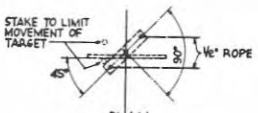
CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

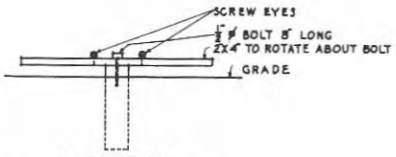


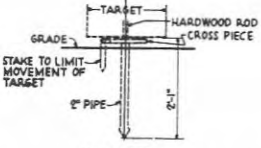








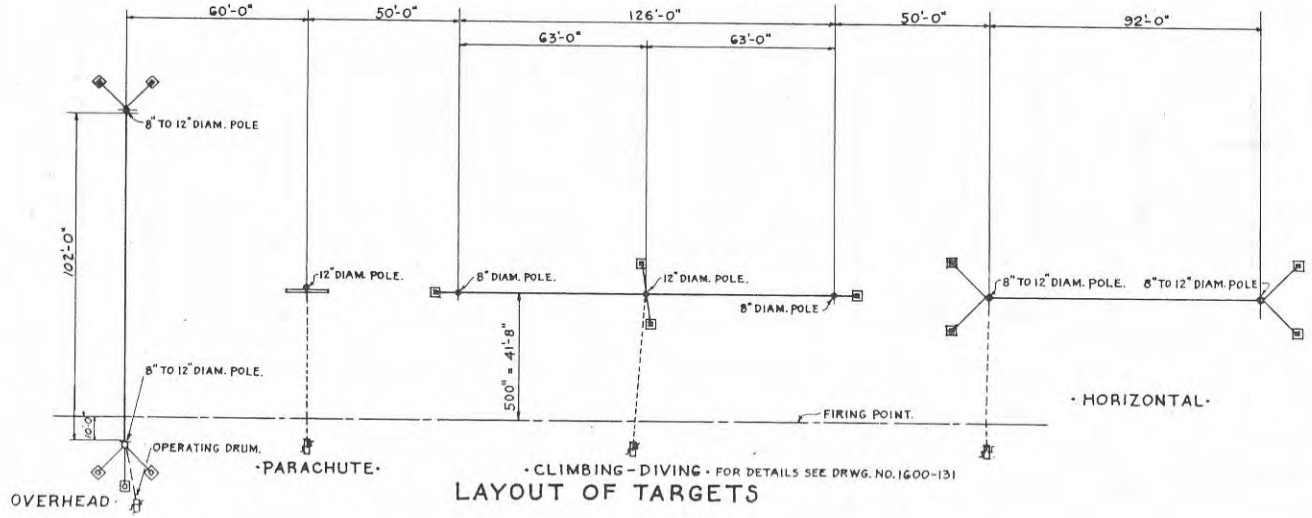




OCE 1600-130

RA PD 60948

Figure 22 — Submachine Gun Range — Miscellaneous Details

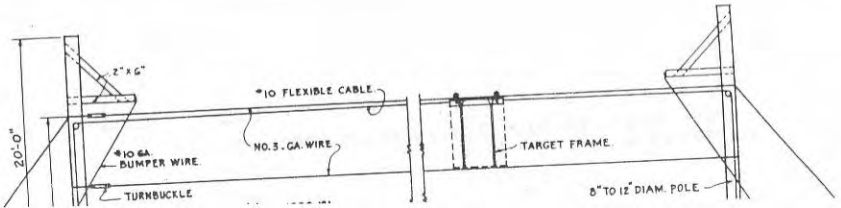


LAYOUT OF TARGETS

OCE 1600-130

RA PD 60949

Figure 23 — Antiaircraft — Miniature — One Complete Range Unit



RA PD 60949

Figure 23 — Antiaircraft — Miniature — One Complete Range Unit

OCE 1600-130

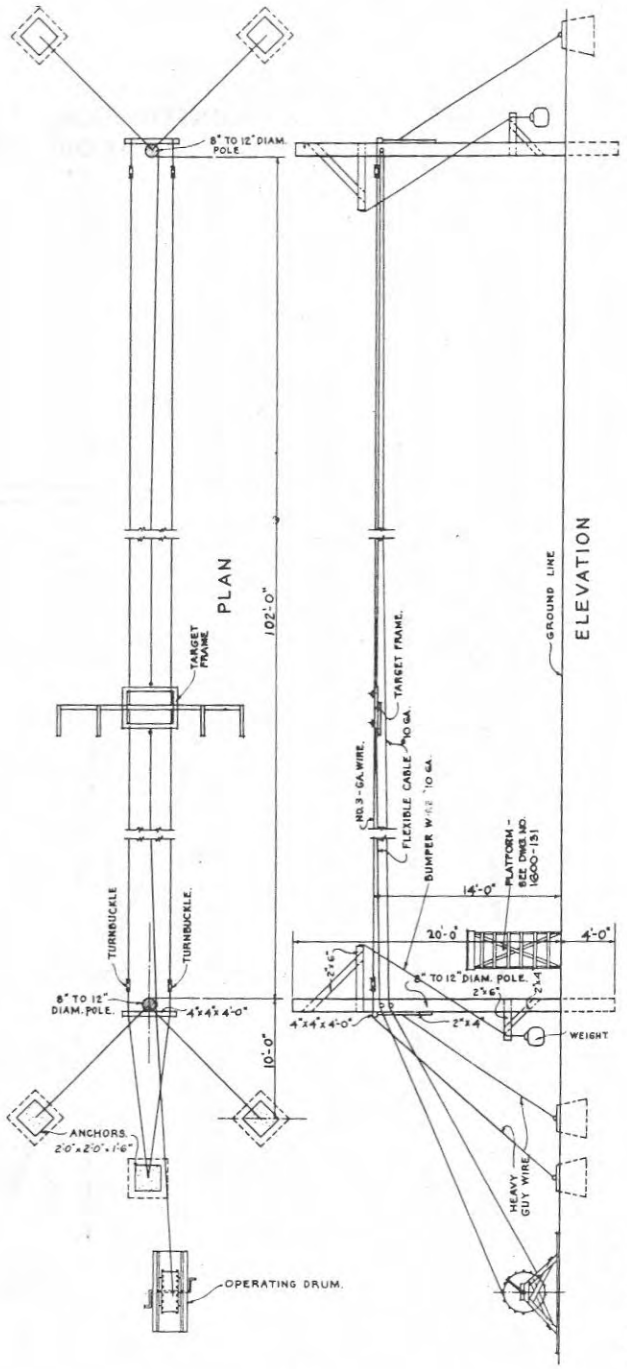
CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

RA PD 60950

Figure 24 — Antiaircraft — Miniature — Horizontal Target

OCE 1600-131

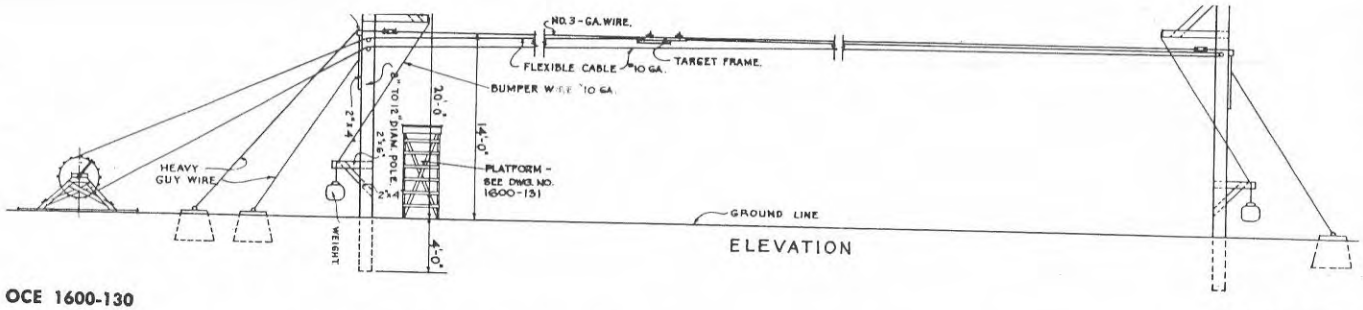
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUT



RA PD 60951

OCE 1600-130

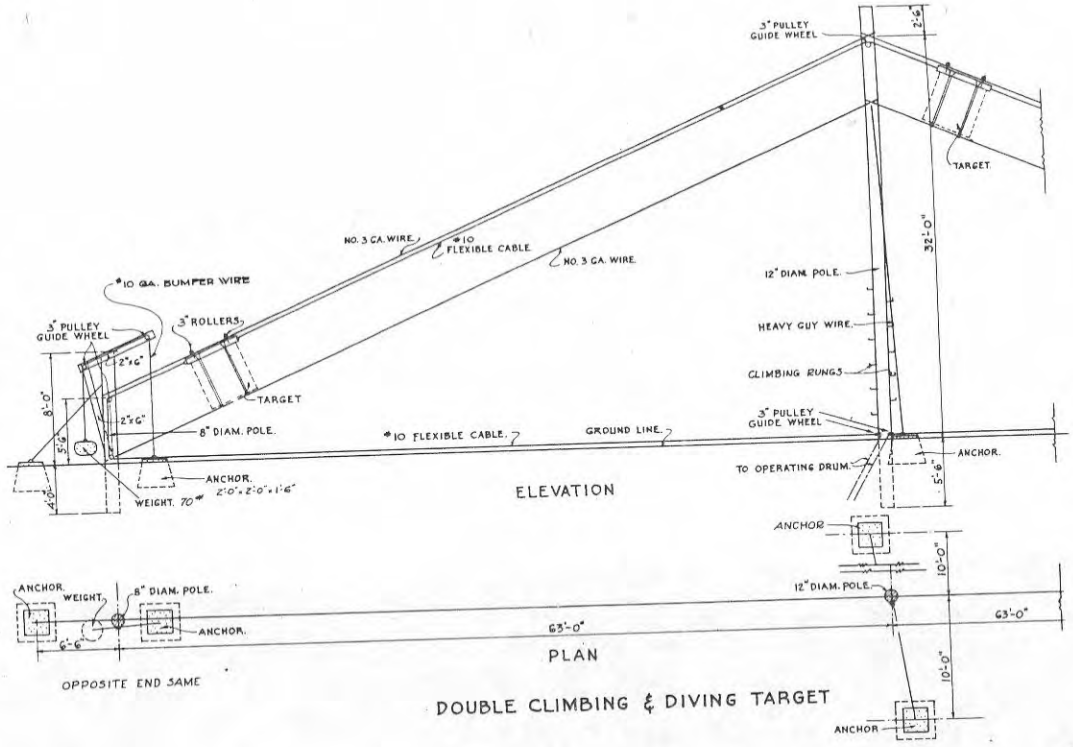
Figure 25 — Antiaircraft Range — Miniature — Overhead Targets



OCE 1600-130

RA PD 60951

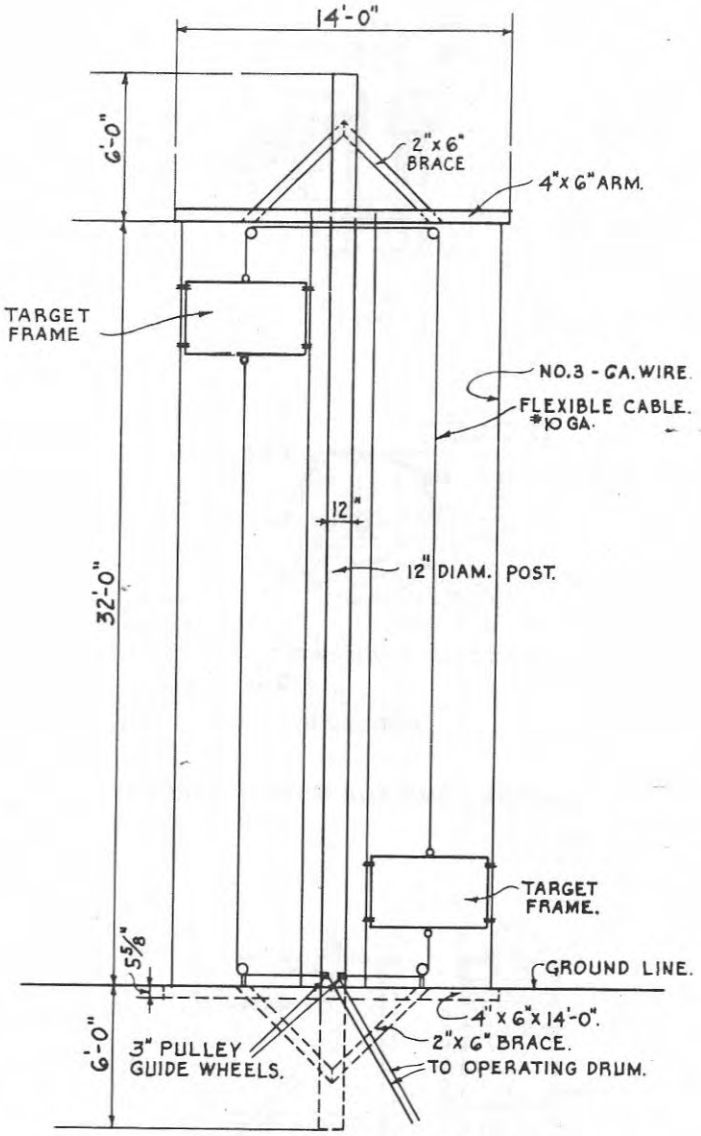
Figure 25 — Antiaircraft Range — Miniature — Overhead Targets



RA PD 22050

Figure 26 — Antiaircraft Range — Miniature — Double Climbing and Diving Target

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUT



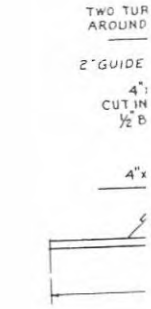
PARACHUTE TARGET

OCE 1600-130

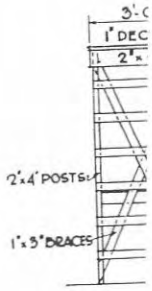
RA PD 60952

Figure 27 — Antiaircraft Range — Miniature — Parachute Target

CONSTRUCTION O
OF VARIOUS C



OPERATIN



END
TAR

OCE 1600-131

Figure 28 — Antiaircr

NING COURSE LAY-OUT

4"x 6" ARM.

NO. 3 - GA. WIRE.

FLEXIBLE CABLE.
#10 GA.

POST.

TARGET
FRAME.

GROUND LINE.

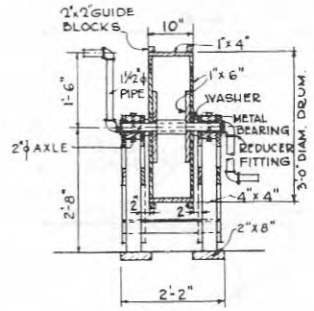
x 6"x 14'-0".
BRACE.
ERATING DRUM.

GET

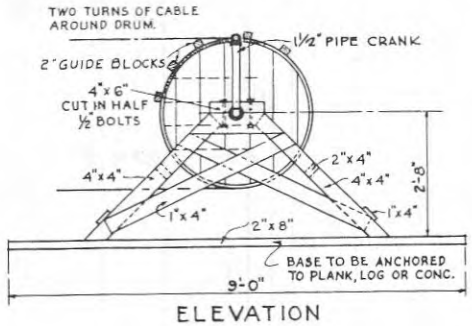
RA PD 60952

Parachute Target

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

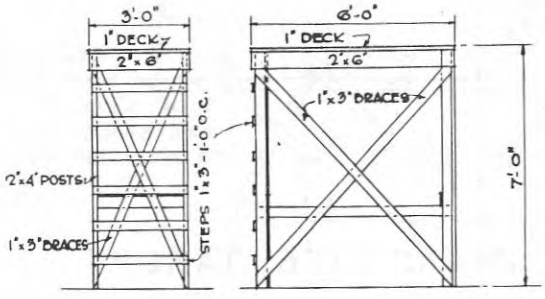


SECTION



ELEVATION

OPERATING DRUM FOR MOVING TARGETS



END VIEW SIDE VIEW.

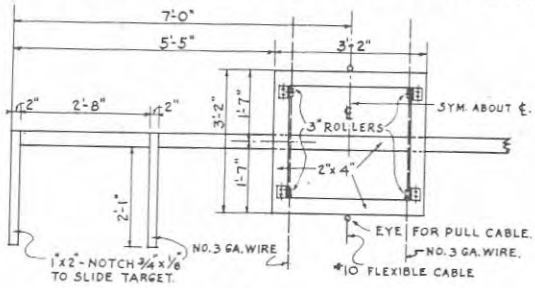
TARGET SCORING PLATFORM

OCE 1600-131

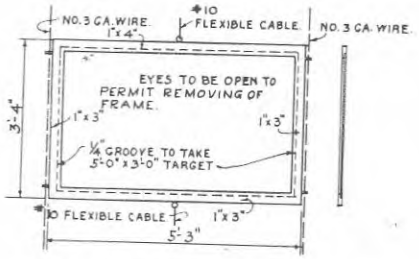
RA PD 60953

Figure 28 — Antiaircraft Range — Miniature — Miscellaneous Details

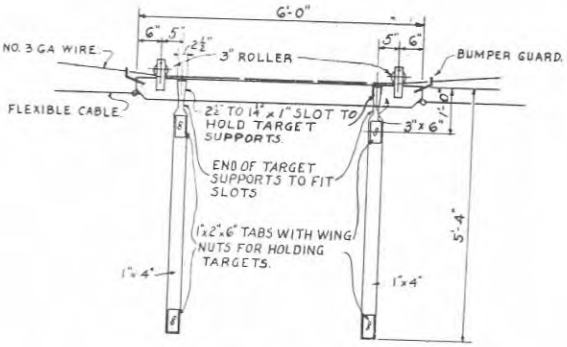
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUT



TARGET FRAME-OVERHEAD



TARGET FRAME FOR PARACHUTE



CARRIER FOR CLIMBING & HORIZONTAL TARGETS

OCE 1600-131

RA PD 60954

Figure 29 — Antiaircraft Range — Miniature — Miscellaneous Details

CONSTRUCTION OF TARGET RA OF VARIOUS OTHER RANG

(f) The individual target should b zone of fire directed at it will not fa Where this condition cannot be avoide be placed in a trench for protection.

(g) All wires should be kept as c and the ground under wires should be allow the wires to move freely.

(h) All wood should be painted down the installation. All wires are t All moving metal parts are to be oil before using if range is not in contin

(i) The order of procedure for s follows:

1. Establish from local terrain, c probable advance through area, and g
2. Locate control points and mai mum protection to installation and n advance.
3. Establish exact location of ind
4. Determine location of points f
5. Determine number and type c
6. Install target units, wire supp
7. Lay wire, insert flexible cable target units, and make proper adjust
8. Grease, oil, and make minor a
9. Excavate small hidden tren target recesses where practicable.

(9) ANTIAIRCRAFT TOWED TAR this range must be established loca necessary clearing to provide firi within the limits of fire and adjac marking limit of fire and characte visibility.

(10) 1,000-INCH ANTITANK R. Smooth operation of target car ov To establish satisfactory operation sary adjustments of target car anc

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

(f) The individual target should be located so that the beaten zone of fire directed at it will not fall on the main line of wires. Where this condition cannot be avoided, the main line wires should be placed in a trench for protection.

(g) All wires should be kept as close to the ground as possible and the ground under wires should be disturbed only as necessary to allow the wires to move freely.

(h) All wood should be painted for preservation and to tone down the installation. All wires are to be kept greased near pulleys. All moving metal parts are to be oiled. Wires should be adjusted before using if range is not in continual operation.

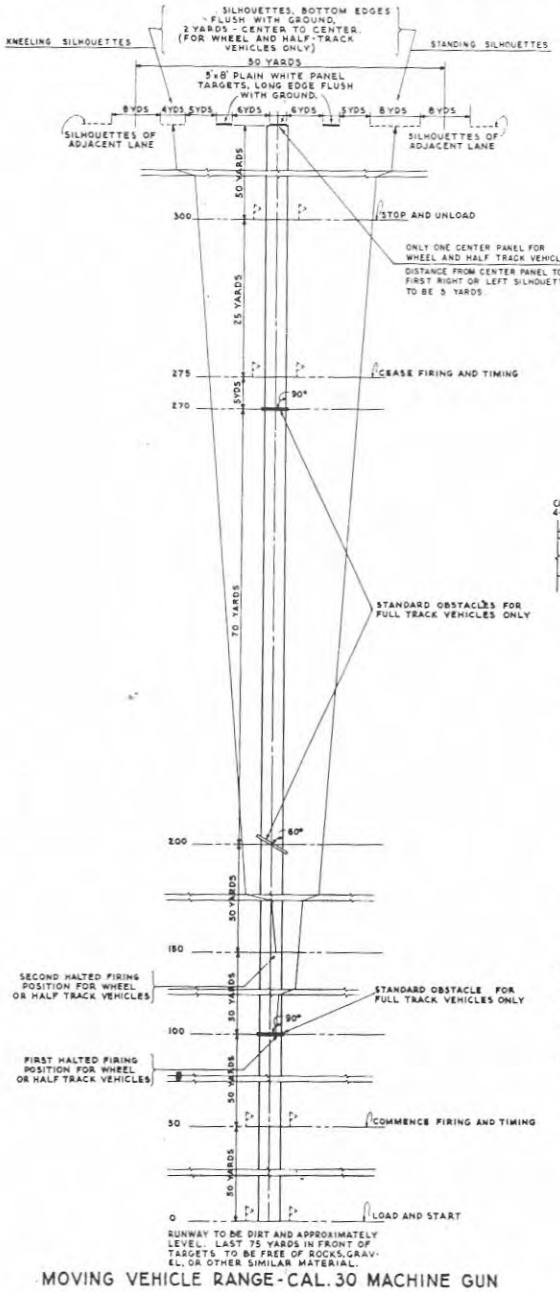
(i) The order of procedure for setting up a combat range is as follows:

1. Establish from local terrain, cover and available danger area, probable advance through area, and general location of target groups.
2. Locate control points and main wire courses to provide maximum protection to installation and minimum interference with troop advance.
3. Establish exact location of individual targets.
4. Determine location of points for wire supports.
5. Determine number and type of supports needed.
6. Install target units, wire supports, and control units.
7. Lay wire, insert flexible cable at pulleys where needed, connect target units, and make proper adjustments at the control racks.
8. Grease, oil, and make minor adjustments where required.
9. Excavate small hidden trenches to drain wire trenches and target recesses where practicable.

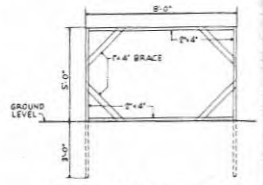
(9) ANTIAIRCRAFT TOWED TARGET RANGE (fig. 37). Details of this range must be established locally. Construction consists only of necessary clearing to provide firing point and required visibility within the limits of fire and adjacent safety area. Height of posts marking limit of fire and character of markings must insure ready visibility.

(10) 1,000-INCH ANTITANK RANGE, MINIATURE (figs. 40 to 42). Smooth operation of target car over the transverse track is essential. To establish satisfactory operation, construction should include necessary adjustments of target car and truck under operating conditions.

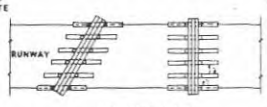
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUT



MOVING VEHICLE RANGE - CAL. 30 MACHINE GUN



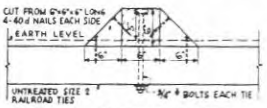
FRAMING FOR PANEL TARGETS



UNTREATED SIZE 8" RAILROAD TIES EQUALLY SPACED

PLAN OF OBSTACLES

TO BE CONSTRUCTED OF TIMBER BOLTED AND NAILED TO CROSSTIES. EACH TIE

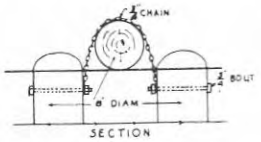


SECTION

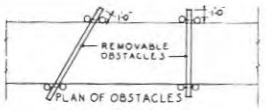
FIELD MANUAL REFERENCE 23-40, 23-50
MATERIAL TO BE FURNISHED BY ORDNANCE (TO BE ERECTED ONLY)
ALL MATERIALS SHOWN DOTTED, THUS -----

DETAILS OF OBSTACLES
(FOR FULL TRACK COURSE)

NOTE -
SUITABLE SPECIES LOGS WITH END AREA AND LENGTH EQUAL TO SIZE 8" TIE MAY BE USED AS SPECIFIED OR PERMITTED BY CONTRACTING OFFICER.



SECTION



DETAILS OF OBSTACLES
(FOR WHEEL OR HALF TRACK COURSE)

OCE 1600-135

RA PD 61000

Figure 30 — Cal. .30 Machine Gun Moving Vehicle Range

Figure 31

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

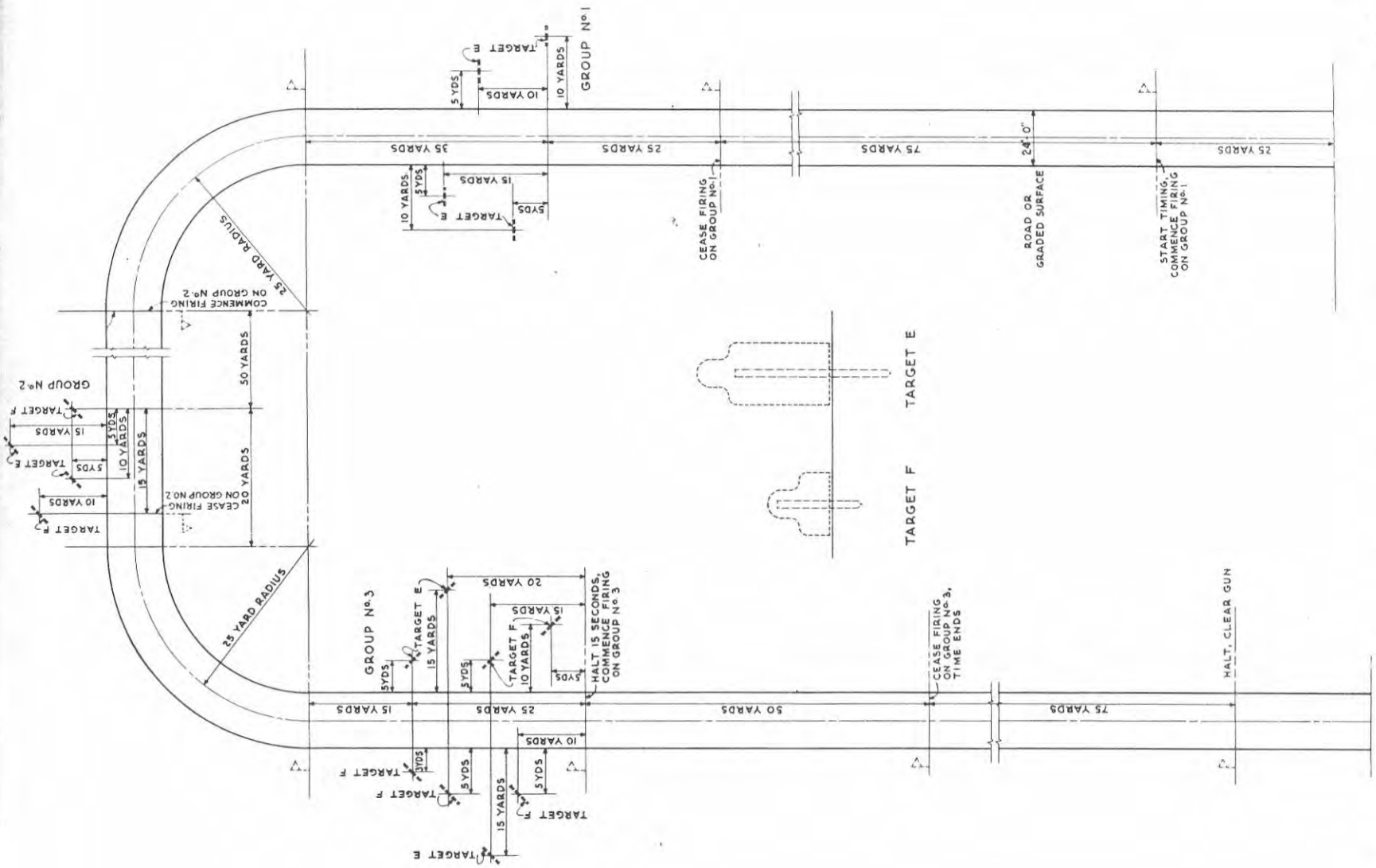
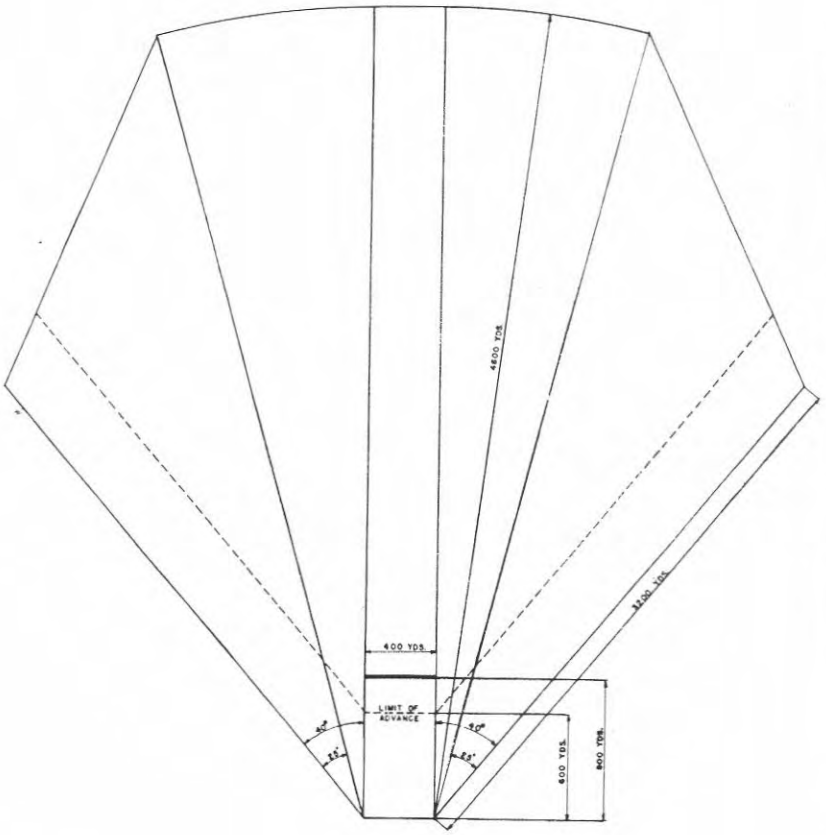


Figure 31 — Submachine Gun Moving Vehicle Range

RA PD 60955

OCE 1600-135

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUT

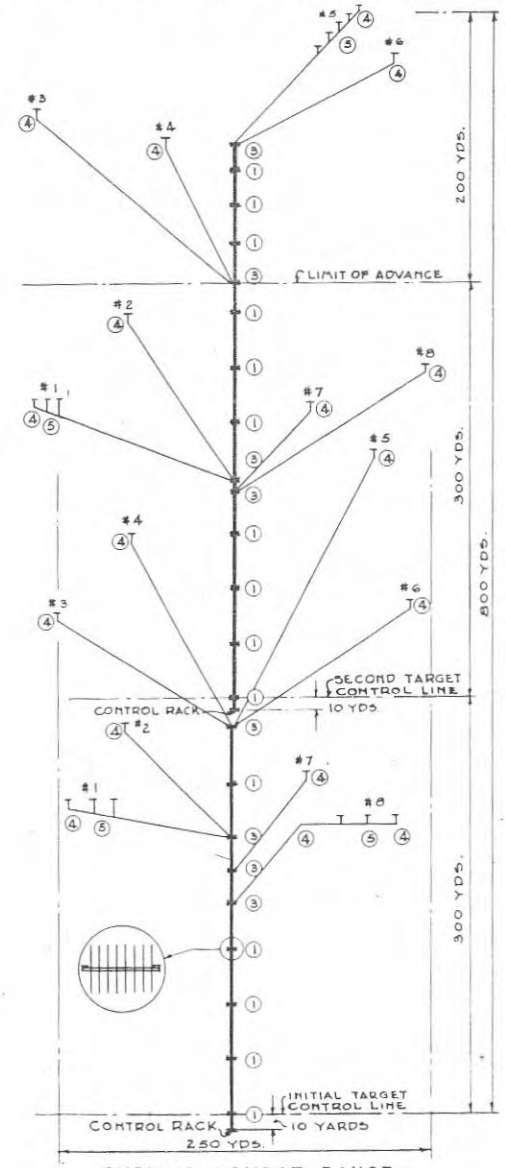


OCE 1600-100

RA PD 60956

Figure 32 — Field Target or Combat Range

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



NOTE: NUMBERS MARKED "1, "2, ETC. INDICATES TARGET GROUPS CONTROLLED BY CORRESPONDING NUMBERS ON THE CONTROL UNIT. NUMBERS MARKED ①, ②, ETC. INDICATES TYPE OF WIRE SUPPORT.

OCE 1600-160

RA PD 60957

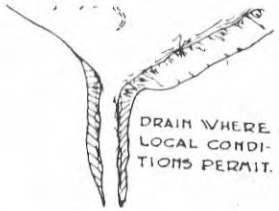
Figure 33 — Field Target or Combat Range — Typical Remote-control Target Lay-out

Figure 34 — Field Target or Combat Range — Target Installation

CONSTRUCTION O
OF VARIOUS C



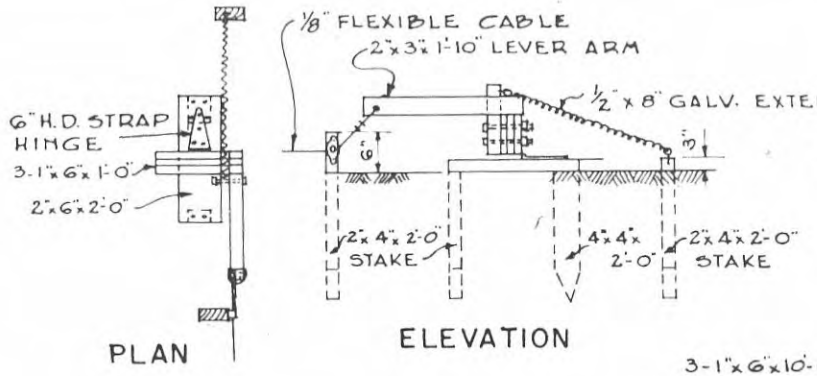
ISOMETRIC VIEW



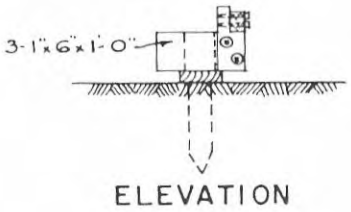
OCE 1600-160

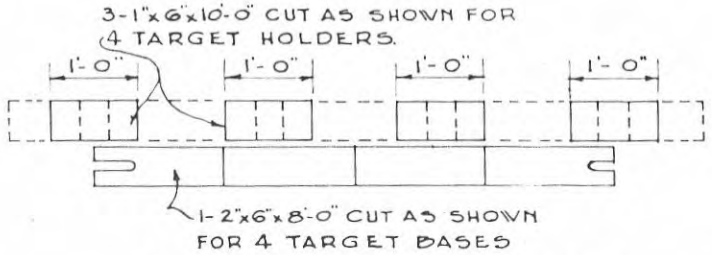
RA PD 60958

Figure 34 — Field Target or Combat Range — Target Installation



NOTE:
STAKES TO BE LOCATED TO SUIT LOCAL CONDITIONS.





(TARGET OMITTED- DETAILS ARE FOR TARGET IN RAISED POSITION)

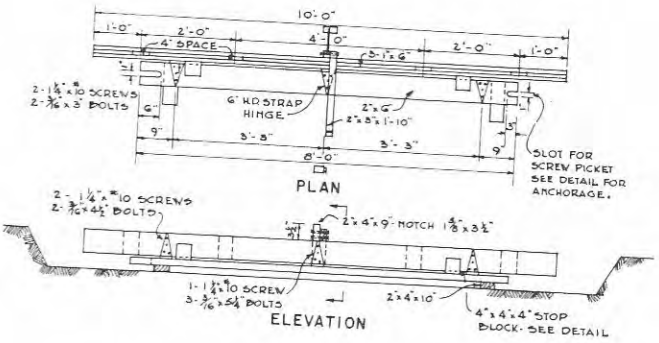
PLAN SHOWING METHOD OF CUTTING GROUP TARGET BAR TO MAKE SINGLE TARGET UNITS.

OCE 1600-160

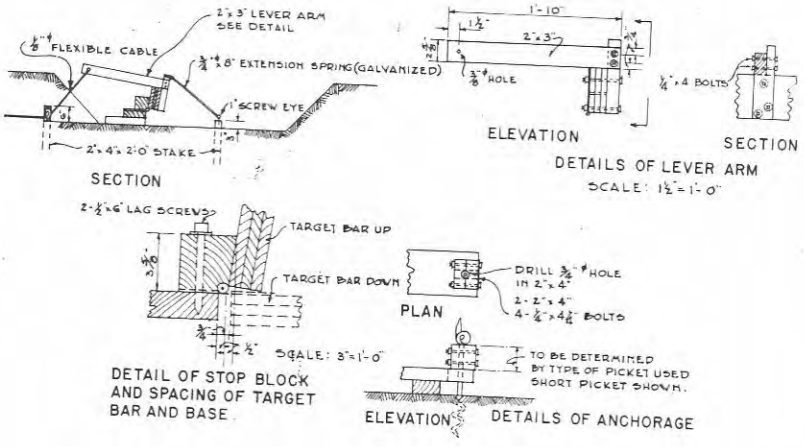
RA PD 60959

Figure 35 — Field Target or Combat Range — Target Unit Details

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUT



DETAILS OF GROUP TARGET UNIT



OCE 1600-160

RA PD 60960

Figure 36 — Field Target or Combat Range — Target Unit Details

CONSTRUCTION OF TARGE
OF VARIOUS OTHER R/

(11) MOVING TARGET RANGE is to provide practice for cal. .30 a up to 75 mm. The preferred lay-c slope to permit proper observation take maximum advantage of local tours to avoid excessive excavatio and II give spiral, deflection and figures 43 to 46, inclusive, and th plans:

(a) Superelevation to be secu lowering the inner equal amounts.

(b) Rails, including guard rail Rail joints to be staggered so that jc with center point of opposite runni of 2 feet either way. Rail with l outside of curves. Cut ends and r

(c) Guard rail joints to be sta opposite center of each inside runn on one side sheared off three-qua spiked.

(d) Ballast should not consis should be of a material which will run gravel should be satisfactory. ties to protect the rolling equipme

(e) Provide ditch between tr adverse soil or drainage conditions drainage requirements within the pair pit drainage.

(f) Use of target cars with lo height of embankment.

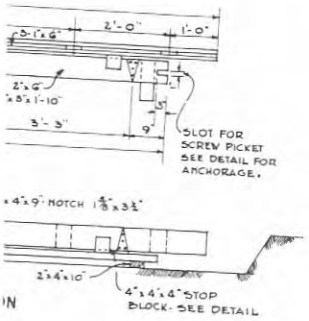
(g) Average car speed of 40 n

(h) Embankment slope of 1½ adverse soil conditions. Seeding where essential for control of serio

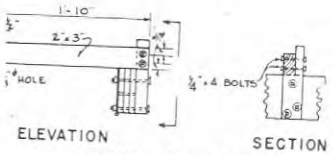
(i) Height of protective emba provide 1-foot to 3-inch clearance fire. Where terrain and ground w in cut to provide balance of cut an

(j) Provide planked turn-out Do not use track turn-outs. It is switches, frogs, and as smooth a light cars.

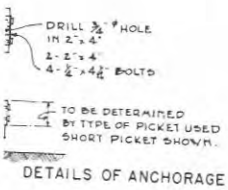
TRAINING COURSE LAY-OUT



ARGET UNIT



DETAILS OF LEVER ARM



DETAILS OF ANCHORAGE

RA PD 60960

ge — Target Unit Details

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

(11) MOVING TARGET RANGE (figs. 43 to 46 incl.). This range is to provide practice for cal. .30 and cal. .50 machine guns and guns up to 75 mm. The preferred lay-out places the target on a forward slope to permit proper observation of fire. Alinement selected should take maximum advantage of local topography, following ground contours to avoid excessive excavation and/or embankment. Tables I and II give spiral, deflection and superelevation data for use with figures 43 to 46, inclusive, and the following notes apply to these plans:

(a) Superelevation to be secured by raising the outer rail and lowering the inner equal amounts.

(b) Rails, including guard rails, to be 60 pounds grade 1 relay. Rail joints to be staggered so that joints in either running rail fall even with center point of opposite running rail with an allowable variation of 2 feet either way. Rail with battered ends will not be used on outside of curves. Cut ends and redrill if necessary.

(c) Guard rail joints to be staggered so as to be approximately opposite center of each inside running rail. Guard rails to have base on one side sheared off three-quarters of an inch and shall be well spiked.

(d) Ballast should not consist of too much fine material, and should be of a material which will not flow or wash out. A fair bank-run gravel should be satisfactory. Ballast should be level with top of ties to protect the rolling equipment in case of derailment.

(e) Provide ditch between track and enbankment only where adverse soil or drainage conditions exist. Provide only for minimum drainage requirements within the interior of the course. Provide repair pit drainage.

(f) Use of target cars with low silhouette will require minimum height of embankment.

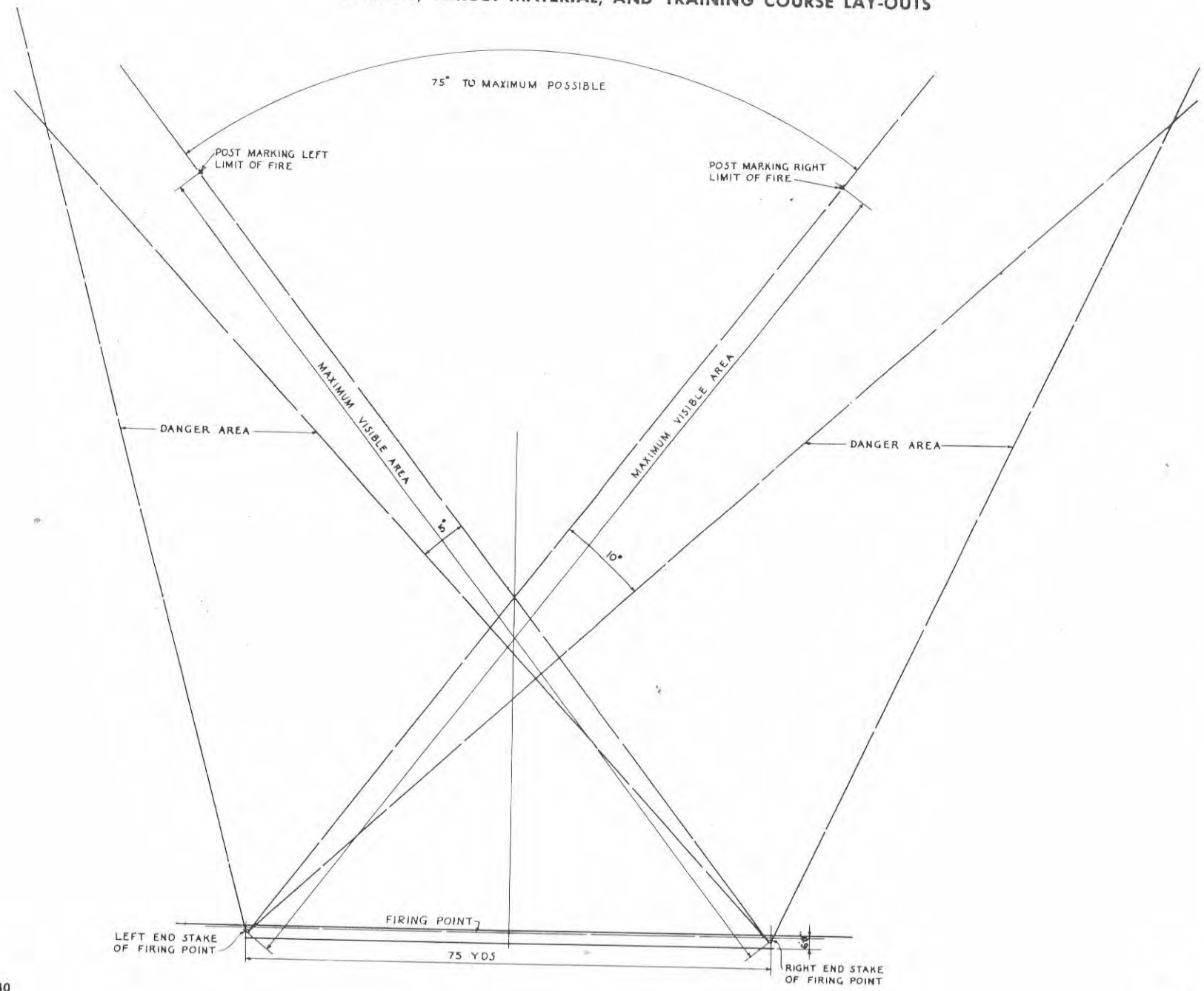
(g) Average car speed of 40 miles per hour or more required.

(h) Embankment slope of 1½:1 satisfactory under all but most adverse soil conditions. Seeding or sodding will be provided only where essential for control of serious erosion.

(i) Height of protective embankment should be only sufficient to provide 1-foot to 3-inch clearance from top of target car to plane of fire. Where terrain and ground water conditions permit, place track in cut to provide balance of cut and fill.

(j) Provide planked turn-out to permit removing car from track. Do not use track turn-outs. It is essential that gage of rail be free of switches, frogs, and as smooth as practicable for high speeds with light cars.

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

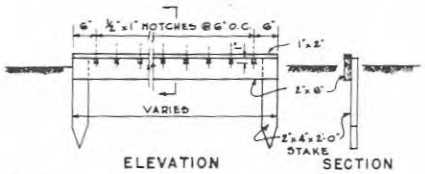


OCE 1600-140

RA PD 60963

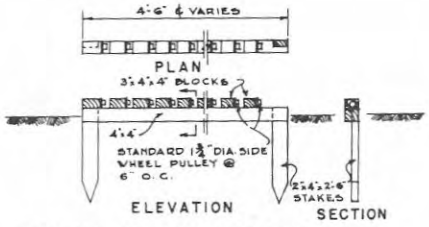
Figure 37 — Antiaircraft Towed Target Range

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



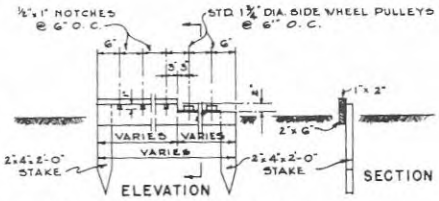
DETAILS OF WIRE SUPPORT Nº. 1

NOTE: TO BE USED WHERE DIRECTION OF WIRES DO NOT VARY MORE THAN 45°. THE WIDTH OF SUPPORT VARIES WITH THE NUMBER OF WIRES CARRIED.



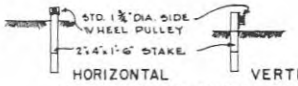
DETAILS OF WIRE SUPPORT Nº. 2

NOTE: TO BE USED FOR VERTICAL CHANGE OF DIRECTION



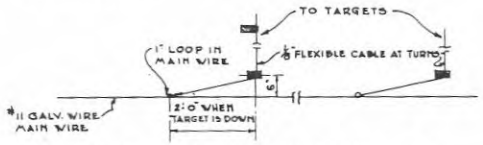
DETAILS OF WIRE SUPPORT Nº. 3

NOTE: THE NUMBER OF NOTCHES & PULLEYS VARY WITH THE NUMBER & DIRECTION OF THE WIRES. PULLEYS ARE USED FOR HORIZONTAL CHANGE OF DIRECTION.



DETAILS OF WIRE SUPPORT Nº. 4

NOTE: TO BE USED WHERE SINGLE WIRES MAKE CHANGES OF DIRECTION.



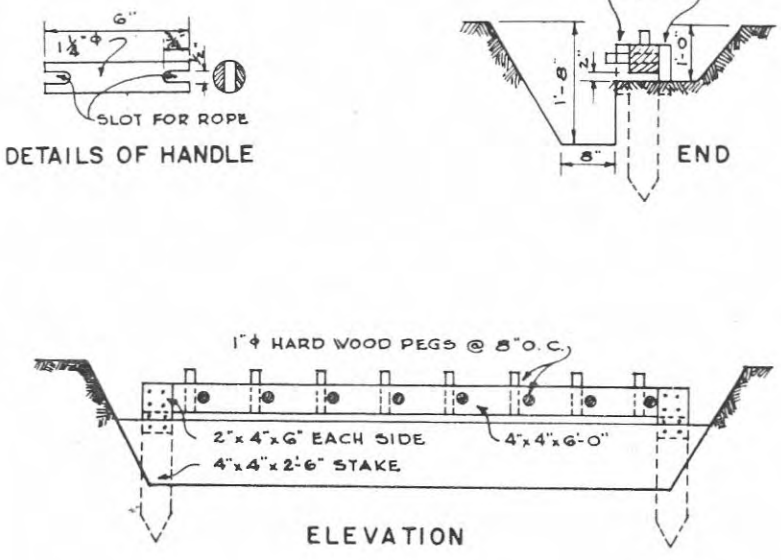
DETAIL OF WIRE SUPPORT Nº. 5

OCE 1600-160

RA PD 60961

Figure 38 — Field Target or Combat Range — Wire Support Details

Figure 37 →

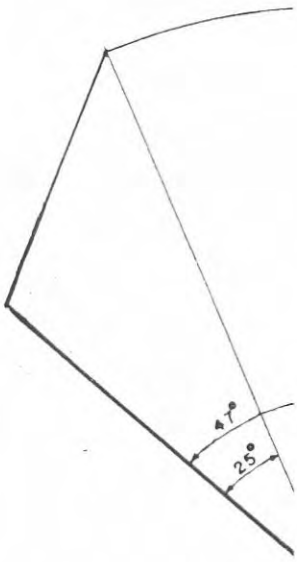


NOTE: RECESSING OF RACK MAY BE OMITTED AT INITIAL FIRING LINE.

OCE 1600-160

RA PD 60962

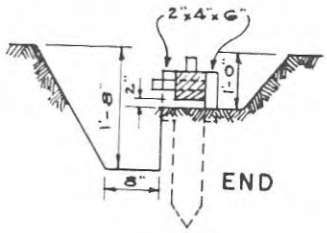
Figure 39 — Field Target or Combat Range — Control Rack Details

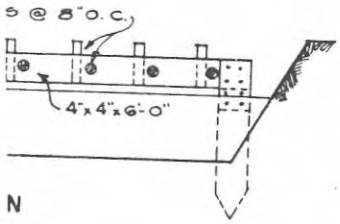


OCE 1600-100

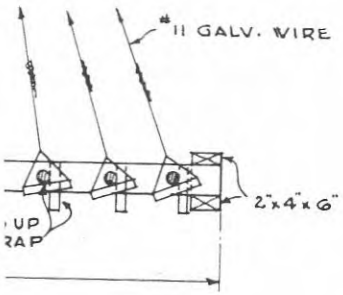
Figure 40 — 1

TRAINING COURSE LAY-OUTS





N

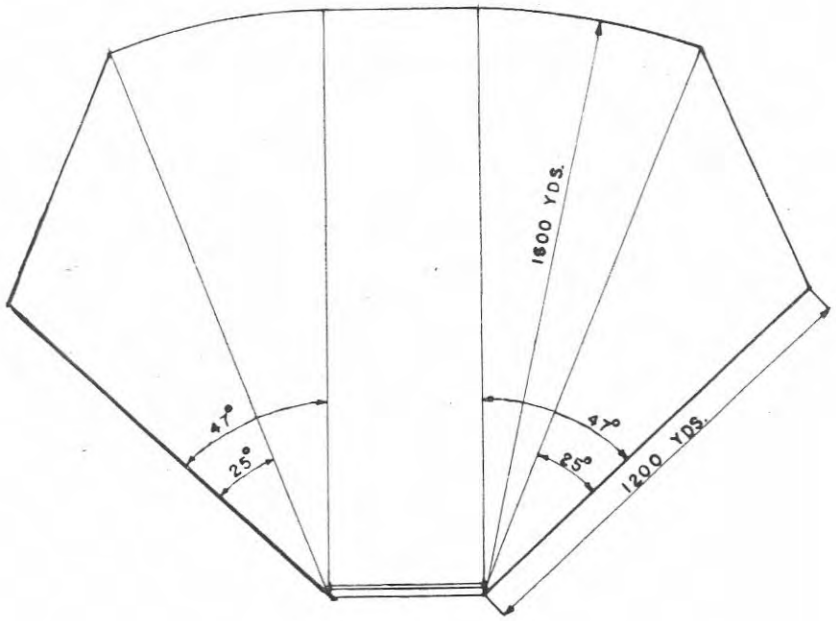


Y BE OMITTED AT

RA PD 60962

ıge — Control Rack Details

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

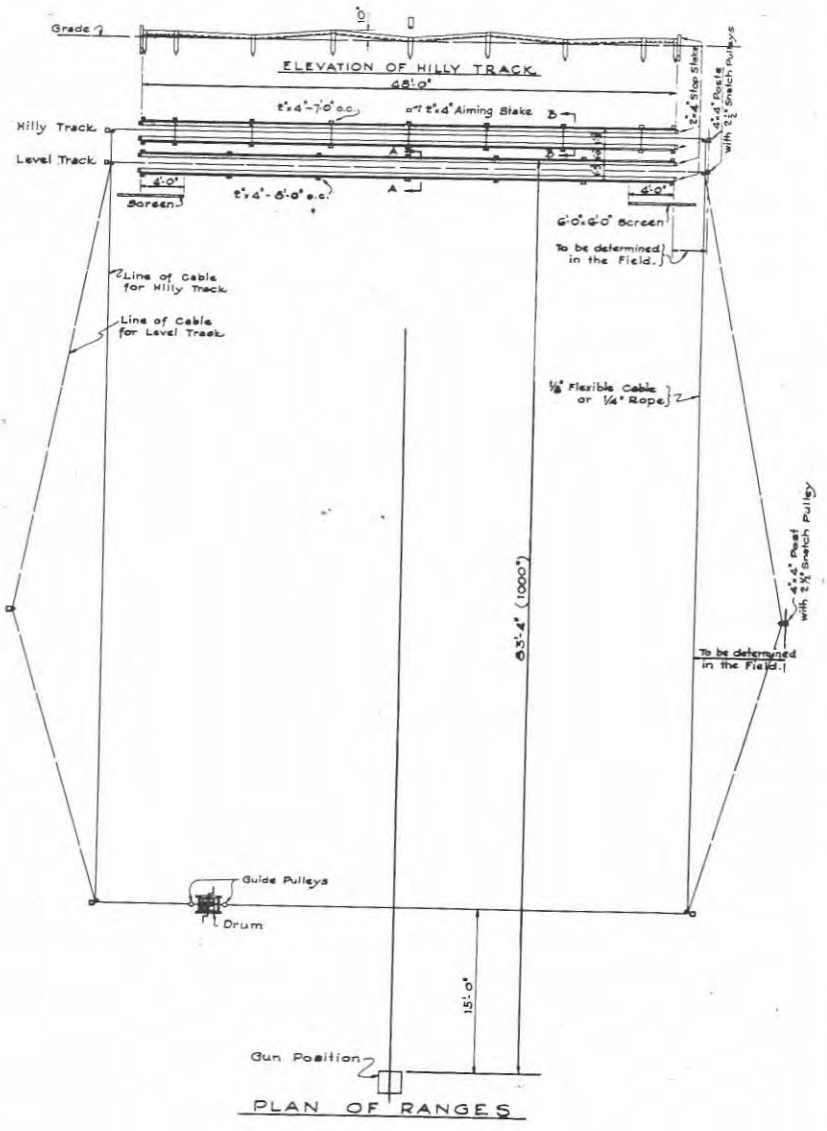


OCE 1600-100

RA PD 60964

Figure 40 — 1,000-inch Antitank Range — Miniature

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

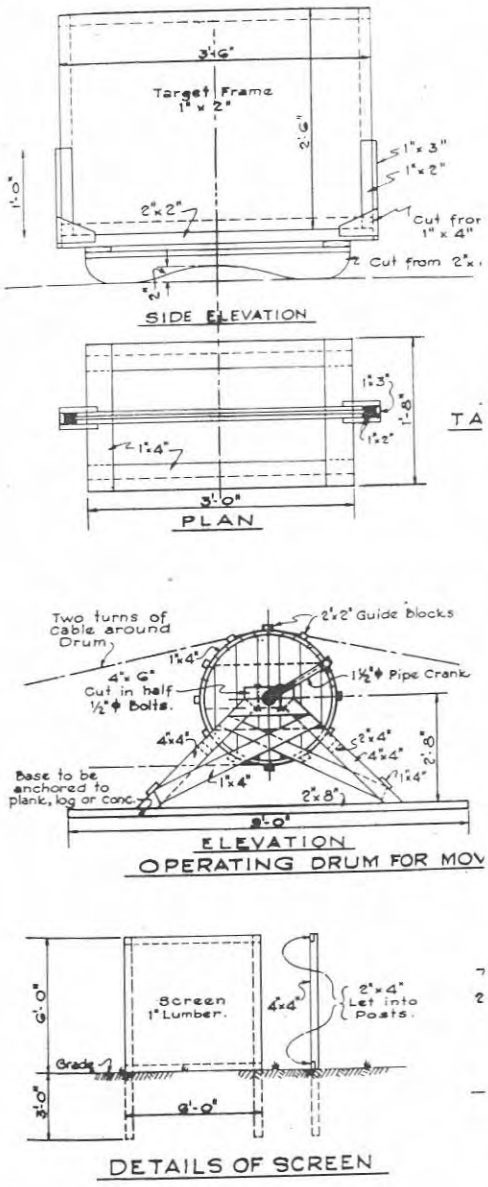


OCE 1600-175

RA PD 60965

Figure 41 — 1,000-inch Antitank Range — Miniature — Detail Lay-out

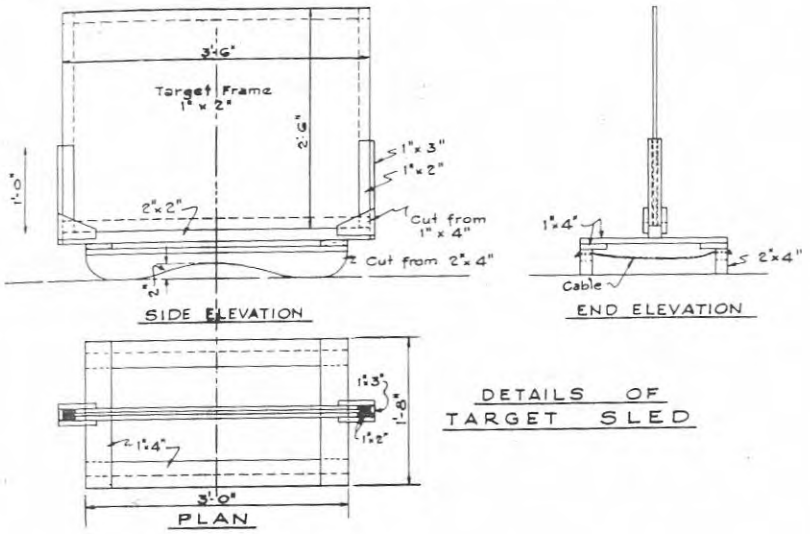
CONSTRUCTION OF TARGET RA
OF VARIOUS OTHER RANGE

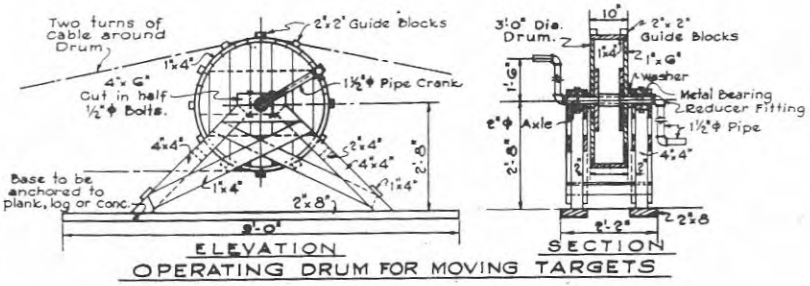


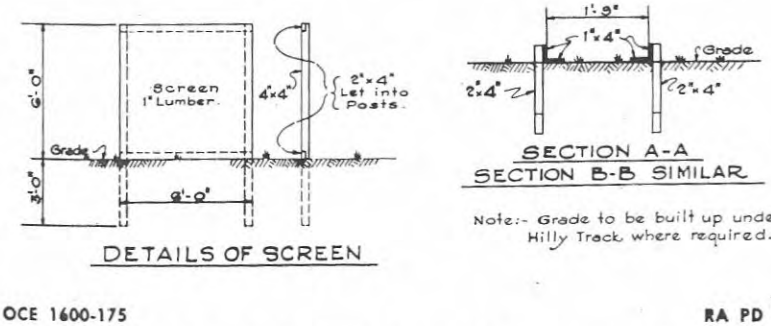
OCE 1600-175

Figure 42 — 1,000-inch Antitank
Miscellaneous

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES







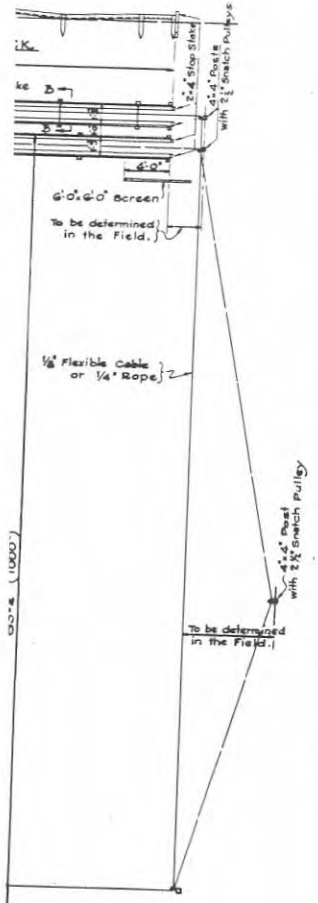
Note:- Grade to be built up under Hilly Track where required.

OCE 1600-175

RA PD 60966

Figure 42 — 1,000-inch Antitank Range — Miniature — Miscellaneous Details

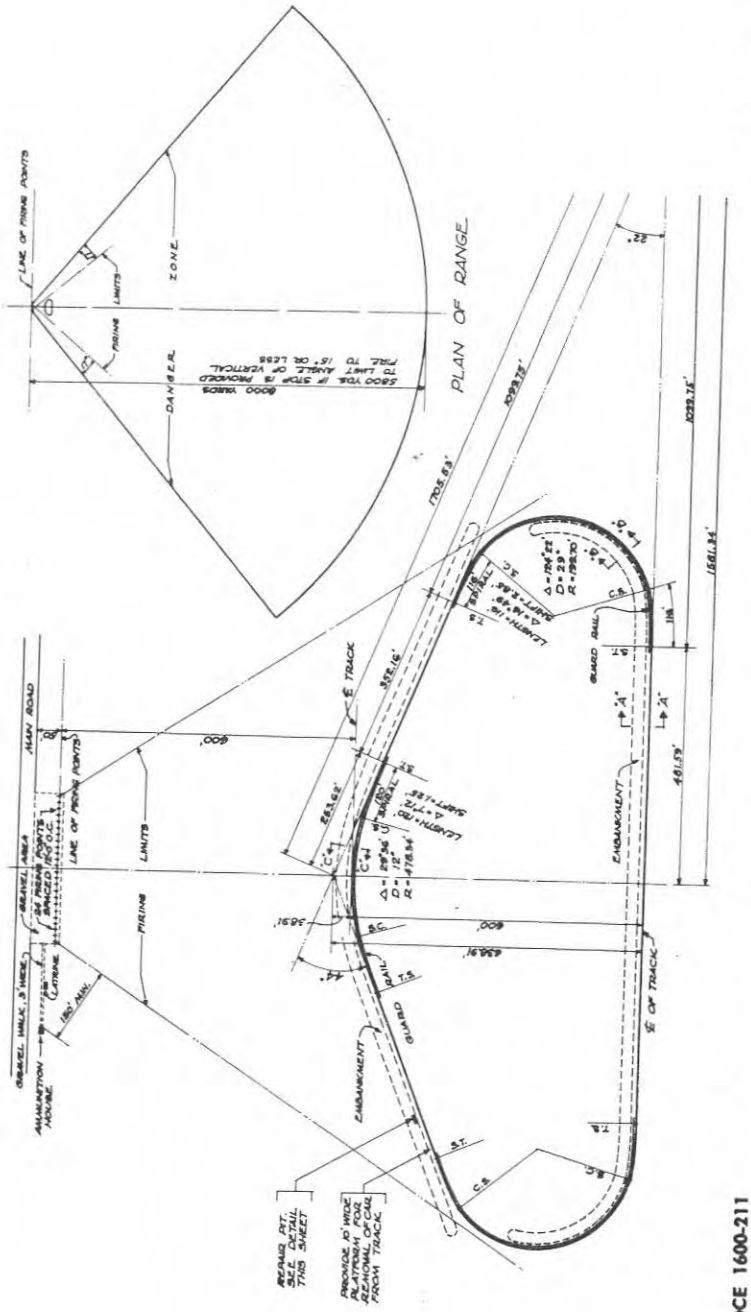
NING COURSE LAY-OUTS



RA PD 60965

niature — Detail Lay-out

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

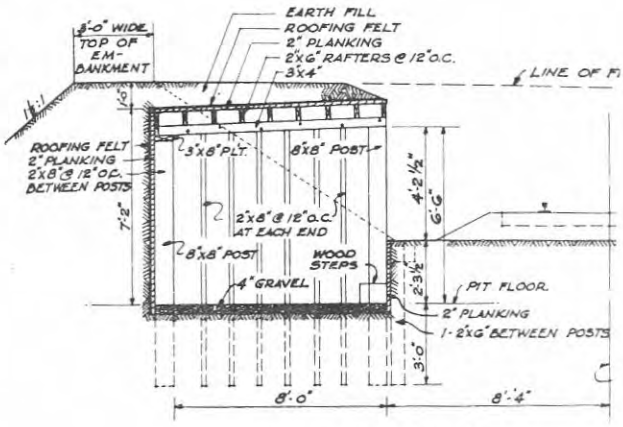


RA PD 60967

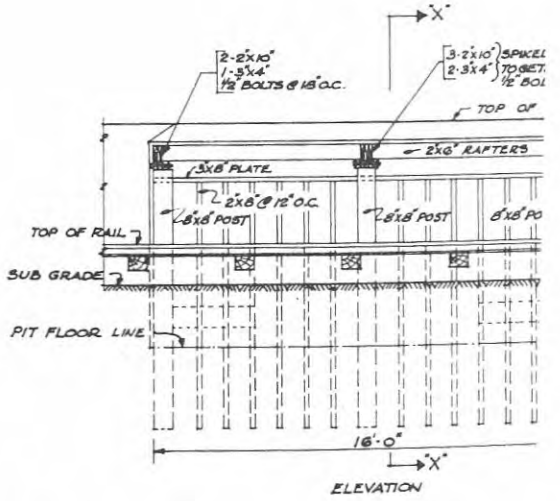
OCE 1600-211

Figure 43 — Cal. .30 and Cal. .50 Track Type Moving Target Range — Maximum Curve 199.70-foot Radius

CONSTRUCTION OF TARGET RANGES AND
OF VARIOUS OTHER RANGES AND CO



SECTION "X-X"

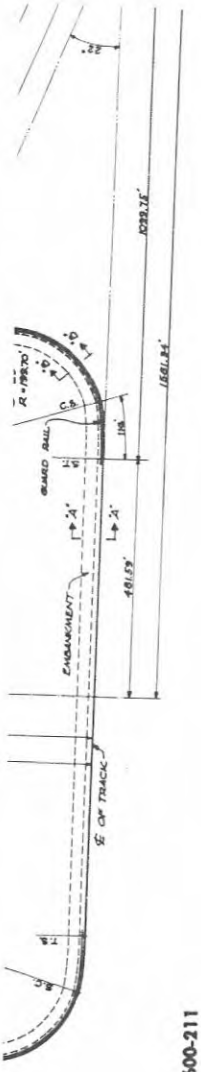


ELEVATION

OCE 1600-211

Figure 44 — Moving Target Range — Repa

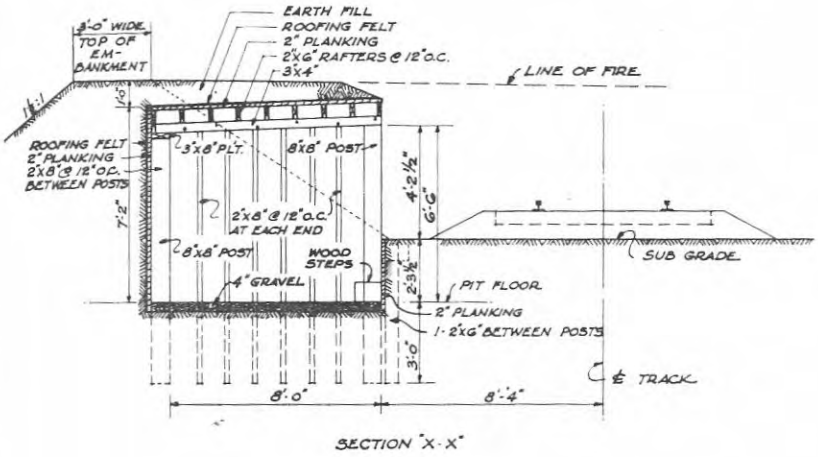
RA PD 60967



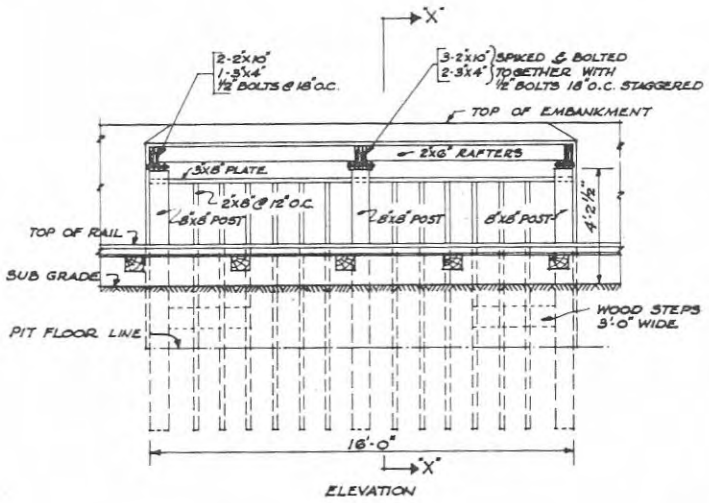
OCE 1600-211

Figure 43 — Cal. .30 and Cal. .50 Track Type Moving Target Range — Maximum Curve 199.70-foot Radius

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



SECTION "X-X"



ELEVATION

OCE 1600-211

RA PD 60970

Figure 44 — Moving Target Range — Repair Pit Details

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

TABLE I — SPIRAL TABLES FOR MAXIMUM CURVE OF 199.70-FOOT RADIUS

Spiral Table for 12-degree Curve 10-foot Sub Chords

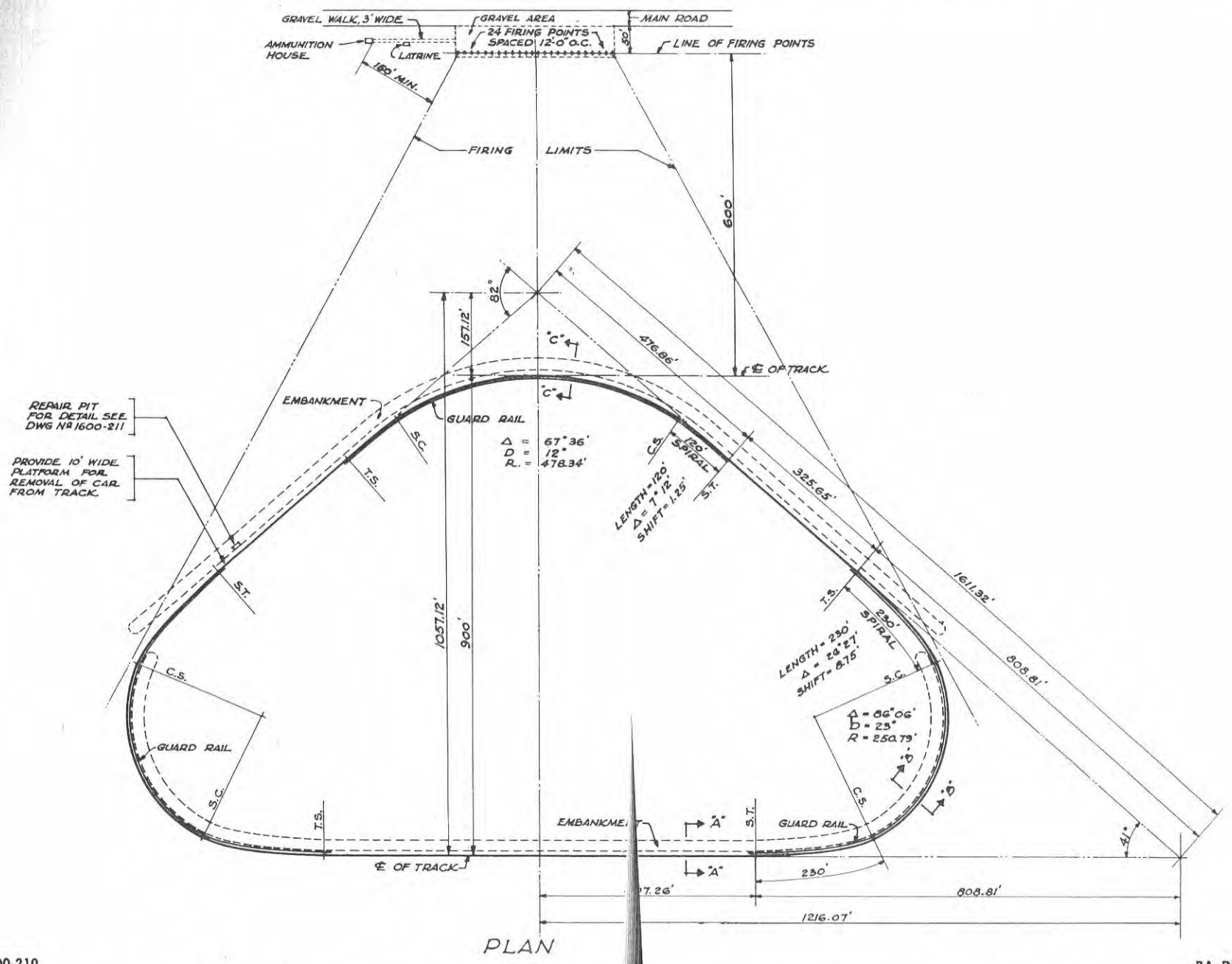
Stations	Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
0–10		0
0+00 T.S.	0 deg 00 min	3/16
0+10	0 deg 01 min	13/16
0+20	0 deg 04 min	1 5/8
0+40	0 deg 16 min	3 5/16
0+60	0 deg 36 min	4 15/16
0+80	1 deg 04 min	6 9/16
1+00	1 deg 40 min	8 1/4
1+10	2 deg 01 min	9 1/8
1+20 S.C.	2 deg 24 min	9 11/16
1+30		9 7/8

Spiral Table for 29-degree Curve 4-foot Sub Chords

Stations	Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
0+12		0
0+00 T.S.		5/16
0+12	0 deg 03 min 30 sec	1 1/4
0+24	0 deg 14 min 30 sec	2 1/2
0+36	0 deg 32 min 30 sec	3 3/4
0+48	0 deg 57 min 30 sec	5
0+60	1 deg 30 min 00 sec	6 1/4
0+72	2 deg 09 min 30 sec	7 1/2
0+84	2 deg 56 min 30 sec	8 3/4
0+96	3 deg 50 min 30 sec	10
1+08	4 deg 51 min 30 sec	11 1/8
1+16 S.C.	5 deg 36 min 20 sec	11 13/16
1+28		12

← Figure 45

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



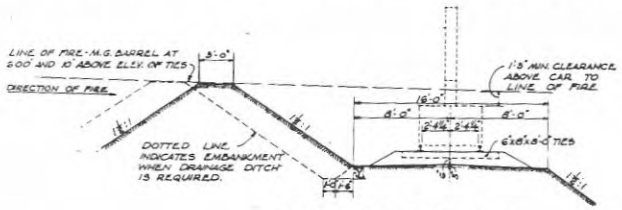
PLAN

OCE 1600-210

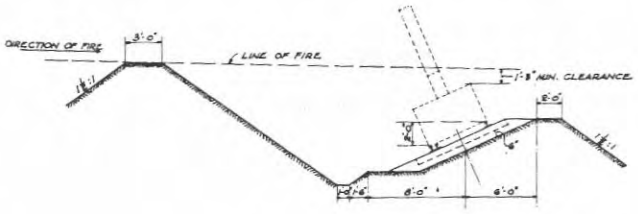
RA PD 60968

Figure 45 — Cal. .30 and Cal. .50 Track Type Moving Tar[illegible] Range — Maximum Curve 250.79-foot Radius

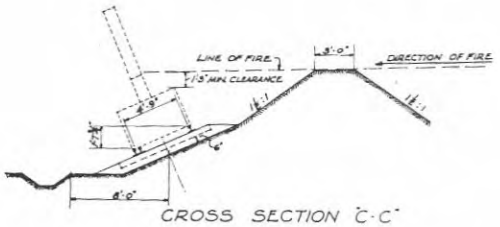
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



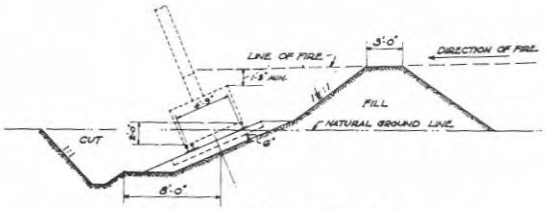
CROSS SECTION "A-A"



CROSS SECTION "B-B"



CROSS SECTION "C-C"



SECTION SHOWING CUT & FILL

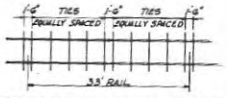


DIAGRAM SHOWING SPACING OF TIES ON TANGENT TRACK.
NO SCALE.

NOTE:
1. MAXIMUM SPACING OF TIES IS 4'-0" ON TANGENTS.
2. BEGINNING AT THE T.S. REDUCE THE SPACING UNIFORMALLY UNTIL 18 TIES PER 33' RAIL IS REACHED AT THE S.C.

OCE 1600-210

RA PD 60969

Figure 46 — Moving Target Range — Cross Sections

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

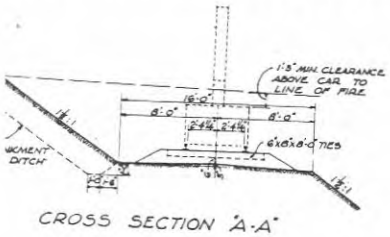
TABLE I — DEFLECTION AND SUPERELEVATION TABLES FOR MAXIMUM CURVE OF 199.70-FOOT RADIUS

Deflection and Superelevation Table for 12-degree Curve

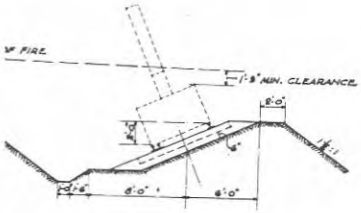
Stations	Chord Length (ft)	Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
0+00 S.C.	25.05	0 deg 00 min	$9\frac{11}{16}$
			Sta. 0+10 $9\frac{7}{8}$
0+25	25.05	1 deg 30 min	$9\frac{7}{8}$
0+50	25.05	3 deg 00 min	$9\frac{7}{8}$
0+75	25.05	4 deg 30 min	$9\frac{7}{8}$
1+00	25.05	6 deg 00 min	$9\frac{7}{8}$
1+25	25.05	7 deg 30 min	$9\frac{7}{8}$
1+50	25.05	9 deg 00 min	$9\frac{7}{8}$
1+75	25.05	10 deg 30 min	$9\frac{7}{8}$
2+00	25.05	12 deg 00 min	$9\frac{7}{8}$
2+25	21.71	13 deg 30 min	$9\frac{7}{8}$
			Sta. 2+36.7 $9\frac{7}{8}$
2+46.67 C.S.		14 deg 48 min	

Long chord: 2 sub chord length = 50.07 ft

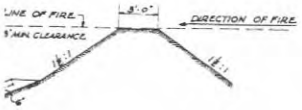
Long chord: 3 sub chord length = 75.06 ft



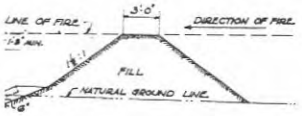
CROSS SECTION 'A-A'



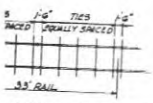
SECTION 'B-B'



SS SECTION 'C-C'



WING CUT & FILL



SHOWING SPACING
ON TANGENT TRACK
NO SCALE
TIES IS 4'-0" ON TANGENTS.
REDUCE THE SPACING
TIES PER 33' RAIL IS
S.C.

RA PD 60969

et Range — Cross Sections

8

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

TABLE I — DEFLECTION AND SUPERELEVATION TABLES FOR MAXIMUM CURVE OF 199.70-FOOT RADIUS

Deflection and Superelevation Table for 29-degree Curve

Stations	Chord Length (ft)	Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
0+00 S.C.	25.25		$11\frac{13}{16}$
			Sta. 0+12 12
0+25	25.25	3 deg 37 min 30 sec	12
0+50	25.25	7 deg 15 min 00 sec	12
0+75	25.25	10 deg 52 min 30 sec	12
1+00	25.25	14 deg 30 min 00 sec	12
1+25	25.25	18 deg 07 min 30 sec	12
1+50	25.25	21 deg 45 min 00 sec	12
1+75	25.25	25 deg 22 min 30 sec	12
2+00	25.25	29 deg 00 min 00 sec	12
2+25	25.25	32 deg 37 min 30 sec	12
2+50	25.25	36 deg 15 min 00 sec	12
2+75	25.25	39 deg 52 min 30 sec	12
3+00	25.25	43 deg 30 min 00 sec	12
3+25	25.25	47 deg 07 min 30 sec	12
3+50	25.25	50 deg 45 min 00 sec	12
3+75	25.25	54 deg 22 min 30 sec	12
4+00	25.25	58 deg 00 min 00 sec	12
			Sta. 4+17 12
4+25	3.85	61 deg 37 min 30 sec	
4+28.85 C.S.		62 deg 11 min 00 sec	$11\frac{13}{16}$

Long chord: 2 sub chord length = 50.40 ft

Long chord: 3 sub chord length = 75.35 ft

CONSTRUCTI(
OF VARI(

TABLE II — :

Spiral To

Stations
0–10
0+00 T.S.
0+10
0+20
0+40
0+60
0+80
1+00
1+10
1+20 S.C.
1+30

Spiral Tabl

Stations
1–10
0+00 T.S.
0+10
0+20
0+40
0+60
0+80
1+00
1+20
1+40
1+60
1+80
2+00
2+20
2+30 S.C.
2+40

AND TRAINING COURSE LAY-OUTS

SUPERELEVATION TABLES FOR F 199.70-FOOT RADIUS

ion Table for 29-degree Curve

Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
	$11\frac{13}{16}$
	Sta. 0+12 12
deg 37 min 30 sec	12
deg 15 min 00 sec	12
deg 52 min 30 sec	12
deg 30 min 00 sec	12
deg 07 min 30 sec	12
deg 45 min 00 sec	12
deg 22 min 30 sec	12
deg 00 min 00 sec	12
deg 37 min 30 sec	12
deg 15 min 00 sec	12
deg 52 min 30 sec	12
deg 30 min 00 sec	12
deg 07 min 30 sec	12
deg 45 min 00 sec	12
deg 22 min 30 sec	12
deg 00 min 00 sec	12
	Sta. 4+17 12
deg 37 min 30 sec	
deg 11 min 00 sec	$11\frac{13}{16}$

= 50.40 ft
= 75.35 ft

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

TABLE II — SPIRAL TABLES FOR MAXIMUM CURVE OF 250.79-FOOT RADIUS

Spiral Table for 12-degree Curve 10-foot Sub Chords

Stations	Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
0–10		0
0+00 T.S.	0 deg 00 min	$\frac{3}{16}$
0+10	0 deg 01 min	$\frac{13}{16}$
0+20	0 deg 04 min	$1\frac{5}{8}$
0+40	0 deg 16 min	$3\frac{5}{16}$
0+60	0 deg 36 min	$4\frac{15}{16}$
0+80	1 deg 04 min	$6\frac{9}{16}$
1+00	1 deg 40 min	$8\frac{1}{4}$
1+10	2 deg 01 min	$9\frac{1}{8}$
1+20 S.C.	2 deg 24 min	$9\frac{11}{16}$
1+30		$9\frac{7}{8}$

Spiral Table for 23-degree Curve 10-foot Sub Chords

Stations	Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
1–10		0
0+00 T.S.	0 deg 00 min	$\frac{1}{8}$
0+10	0 deg 10 min	$\frac{1}{2}$
0+20	0 deg 04 min	1
0+40	0 deg 16 min	$2\frac{1}{16}$
0+60	0 deg 36 min	$3\frac{1}{8}$
0+80	1 deg 04 min	$4\frac{3}{16}$
1+00	1 deg 40 min	$4\frac{3}{4}$
1+20	2 deg 24 min	$6\frac{5}{16}$
1+40	3 deg 16 min	$7\frac{5}{16}$
1+60	4 deg 16 min	$8\frac{3}{8}$
1+80	5 deg 24 min	$9\frac{7}{16}$
2+00	6 deg 40 min	$10\frac{7}{16}$
2+20	8 deg 04 min	$11\frac{1}{2}$
2+30 S.C.	8 deg 49 min	$11\frac{7}{8}$
2+40		12

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

TABLE II — DEFLECTION AND SUPERELEVATION TABLES FOR MAXIMUM CURVE OF 250.79-FOOT RADIUS

Deflection and Superelevation Table for 12-degree Curve

Stations	Chord Length (ft)	Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
0+00 S.C.	25.05	0 deg 00 min	$9\frac{11}{16}$
			Sta 0+10 $9\frac{7}{8}$
0+25	25.05	1 deg 30 min	$9\frac{7}{8}$
0+50	25.05	3 deg 00 min	$9\frac{7}{8}$
0+75	25.05	4 deg 30 min	$9\frac{7}{8}$
1+00	25.05	6 deg 00 min	$9\frac{7}{8}$
1+25	25.05	7 deg 30 min	$9\frac{7}{8}$
1+50	25.05	9 deg 00 min	$9\frac{7}{8}$
1+75	25.05	10 deg 30 min	$9\frac{7}{8}$
2+00	25.05	12 deg 00 min	$9\frac{7}{8}$
2+25	25.05	13 deg 30 min	$9\frac{7}{8}$
2+50	25.05	15 deg 00 min	$9\frac{7}{8}$
2+75	25.05	16 deg 30 min	$9\frac{7}{8}$
3+00	25.05	18 deg 00 min	$9\frac{7}{8}$
3+25	25.05	19 deg 30 min	$9\frac{7}{8}$
3+50	25.05	21 deg 00 min	$9\frac{7}{8}$
3+75	25.05	22 deg 30 min	$9\frac{7}{8}$
4+00	25.05	24 deg 00 min	$9\frac{7}{8}$
4+25	25.05	25 deg 30 min	$9\frac{7}{8}$
4+50	25.05	27 deg 00 min	$9\frac{7}{8}$
4+75	25.05	28 deg 30 min	$9\frac{7}{8}$
5+00	25.05	30 deg 00 min	$9\frac{7}{8}$
5+25	25.05	31 deg 30 min	$9\frac{7}{8}$
5+50	13.35	33 deg 00 min	$9\frac{7}{8}$
			Sta. 5+53.33 $9\frac{7}{8}$
5+63.33 C.S.		33 deg 48 min	$9\frac{11}{16}$

Long chord: 2 sub chord length = 50.07 ft

Long chord: 3 sub chord length = 75.06 ft

CONSTRUCTI
OF VARI

TABLE II — DEFL
MAXIM

Deflection

Stations
0+00 S.C.
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+74.35 C.S.

Long chord: 2 sub

Long chord: 3 sub

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

TABLE II — DEFLECTION AND SUPERELEVATION TABLES FOR MAXIMUM CURVE OF 250.79-FOOT RADIUS

Deflection and Superelevation Table for 23-degree Curve

Stations	Chord Length (ft)	Deflection Angle	Outer Rail Raised and Inner Rail Lowered (in.)
0+00 S.C.	25.15	0 deg 00 min 00 sec	1 7/8
			Sta. 0+10 12
0+25	25.15	2 deg 52 min 30 sec	12
0+50	25.15	5 deg 45 min 00 sec	12
0+75	25.15	8 deg 37 min 30 sec	12
1+00	25.15	11 deg 30 min 00 sec	12
1+25	25.15	14 deg 22 min 30 sec	12
1+50	25.15	17 deg 15 min 00 sec	12
1+75	25.15	20 deg 07 min 30 sec	12
2+00	25.15	23 deg 00 min 00 sec	12
2+25	25.15	25 deg 52 min 30 sec	12
2+50	25.15	28 deg 45 min 00 sec	12
2+75	25.15	31 deg 37 min 30 sec	12
3+00	25.15	34 deg 30 min 00 sec	12
3+25	25.15	37 deg 22 min 30 sec	12
3+50	24.50	40 deg 15 min 00 sec	Sta. 3+64.35 12
3+74.35 C.S.			1 7/8

Long chord: 2 sub chord length = 50.25 ft

Long chord: 3 sub chord length = 75.22 ft

(k) Latrine to be LT-D-T (pit) type. (See drawings Nos. T.O. 700-6625 and T.O. 700-6626.)

(l) Ammunition house to be approximately 8 feet 0 inch x 10 feet 0 inch x 8 feet 0 inch high and of either brick or tile construction. Size and type to be determined by contracting officer.

10. TELEPHONE AND OTHER FACILITIES.

a. Generally, the line of communication should be permanently installed either on poles or in conduits. Ranges will not ordinarily be provided with water-borne sewage. Water will not usually be piped to training aids.

11. CARE OF RANGE AND FACILITIES.

a. The area between the firing points and targets will be kept free of all rubbish or plant growth which would obstruct the visibility of targets from firing points. Drainage ditches and structures should be kept clean and functioning properly. Erosion control measures, where provided, should be inspected periodically and maintenance performed as warranted.

12. LAY-OUT OF OTHER RANGES AND COURSES.

a. The lay-outs shown in figures 47 to 78, inclusive, are for various ranges and courses pertaining to the training of the soldier in the use of arms, as described in detail on drawings:

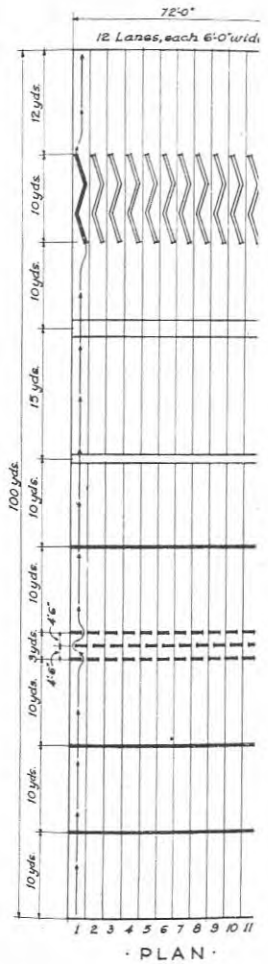
(1) Obstacle course (fig. 47).

(2) Pistol course, mounted (fig. 48).

(3) Skeet range (figs. 49 to 51 incl.).

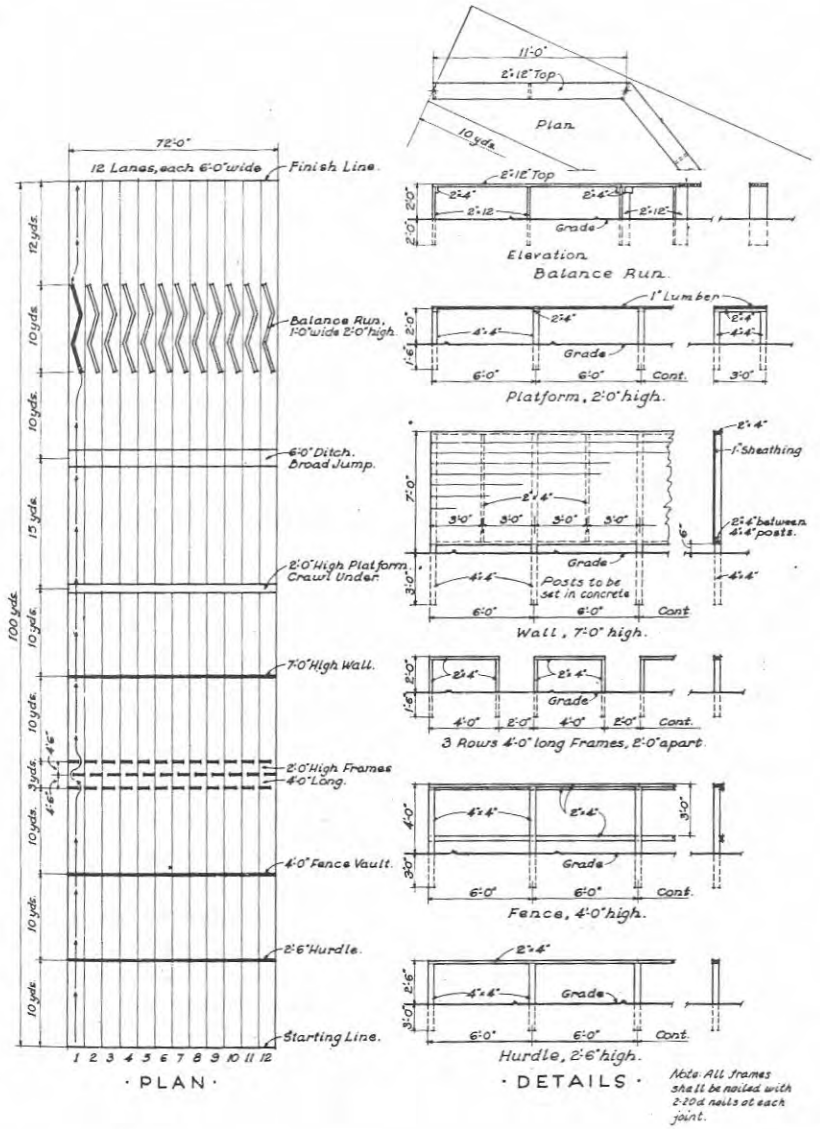
(4) Bayonet Instruction (figs. 52 to 56 incl.) Bayonet assault courses should be laid out on rough terrain, preferably wooded. The length of the course may vary from 200 to 300 yards. The number, location, and type of obstacles on the course will depend upon local conditions and ingenuity of the builder. Make effective use of natural obstacles such as streams, ravines, ridges, and thick woods. Improvise artificial obstacles such as trenches, ditches, craters, trip wires, fences, log walls, hurdles and horizontal ladders. Locations of targets are typical only, and should consist of logically placed dummies, preferably movable, so that the course can be altered frequently. Place surprise targets at various points and suspend dummies from trees to swing out as the attacker approaches. Others may be hinged to swing out from behind trees or thickets.

(5) GRENADE COURTS (figs. 59 and 60). In the use of these courts, masks for protection of the officers who have control of the firing line during live practice with fragmentation grenades should be placed along the trenches about 10 yards in rear of the parados.



· PLAN ·

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



OCE 1600-145

RA PD 60971

Figure 47 — Obstacle Course

ND TRAINING COURSE LAY-OUTS

)it) type. (See drawings Nos. T.O.

approximately 8 feet 0 inch x 10 and of either brick or tile construc- ied by contracting officer.

ER FACILITIES.

munication should be permanently nduits. Ranges will not ordinarily ewage. Water will not usually be

FACILITIES.

ng points and targets will be kept which would obstruct the visibility ainage ditches and structures should roperly. Erosion control measures, cted periodically and maintenance

ANGES AND COURSES.

es 47 to 78, inclusive, are for various the training of the soldier in the use drawings:

).

fig. 48).

51 incl.).

gs. 52 to 56 incl.) Bayonet assault gh terrain, preferably wooded. The om 200 to 300 yards. The number, n the course will depend upon local ilder. Make effective use of natural , ridges, and thick woods. Improvise es, ditches, craters, trip wires, fences, l ladders. Locations of targets are of logically placed dummies, pref- se can be altered frequently. Place s and suspend dummies from trees proaches. Others may be hinged to hickets.

59 and 60). In the use of these he officers who have control of the th fragmentation grenades should be t 10 yards in rear of the parados.

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

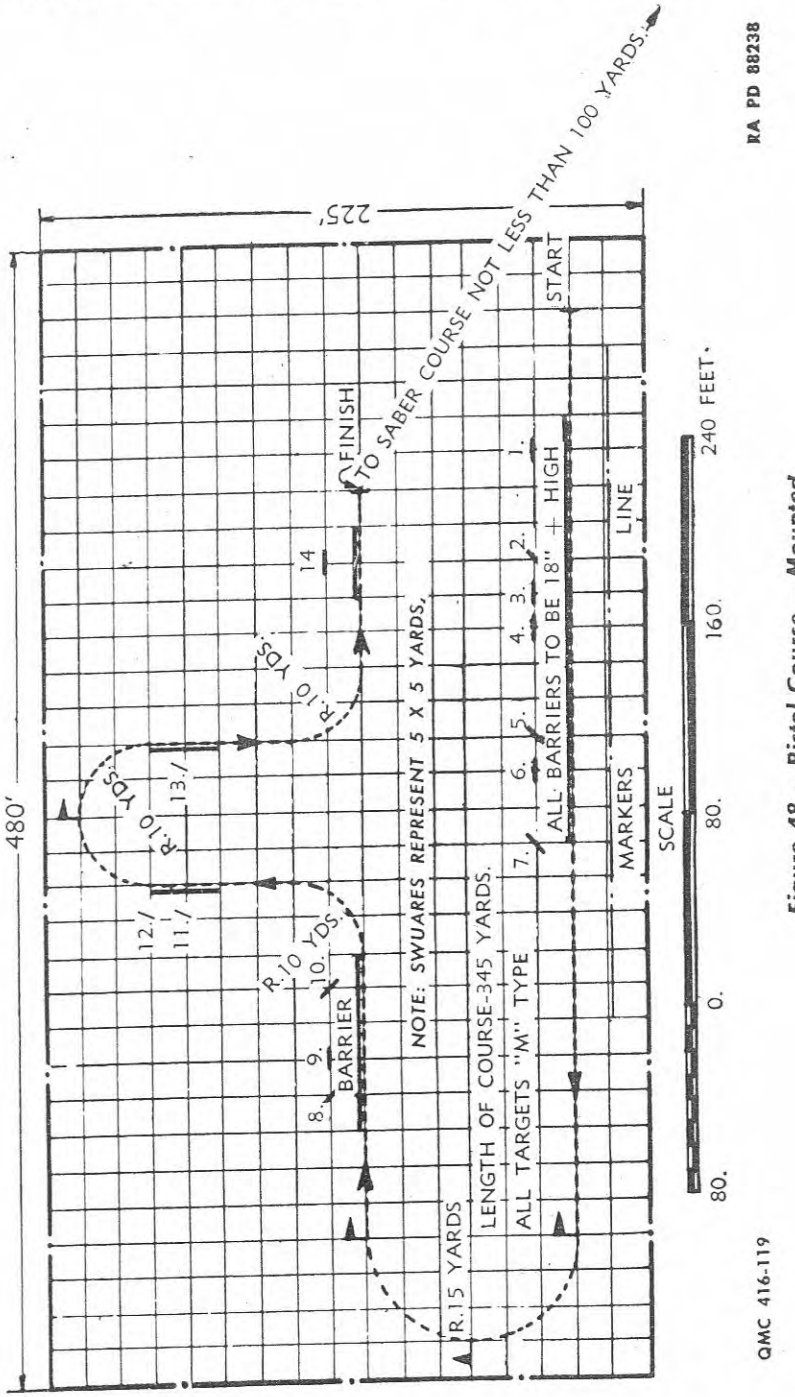


Figure 48 — Pistol Course — Mounted

Figure 49

RA PD 88238

240 FEET.

160.

QMC 416-119

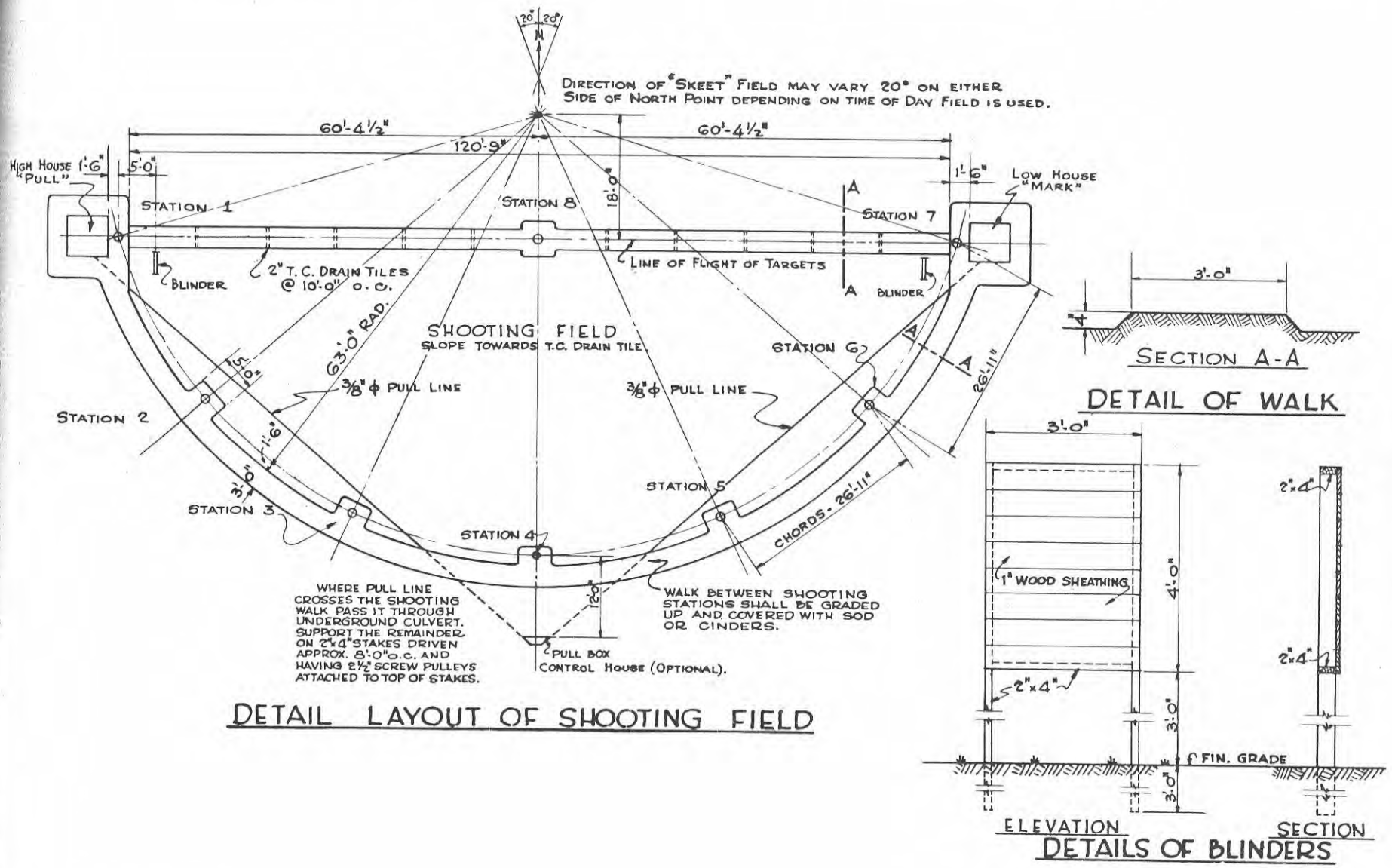


Figure 48 — Pistol Course — Mounted

OCE 1600-170

RA PD 60997

Figure 49 — Skeet Range — Lay-outs

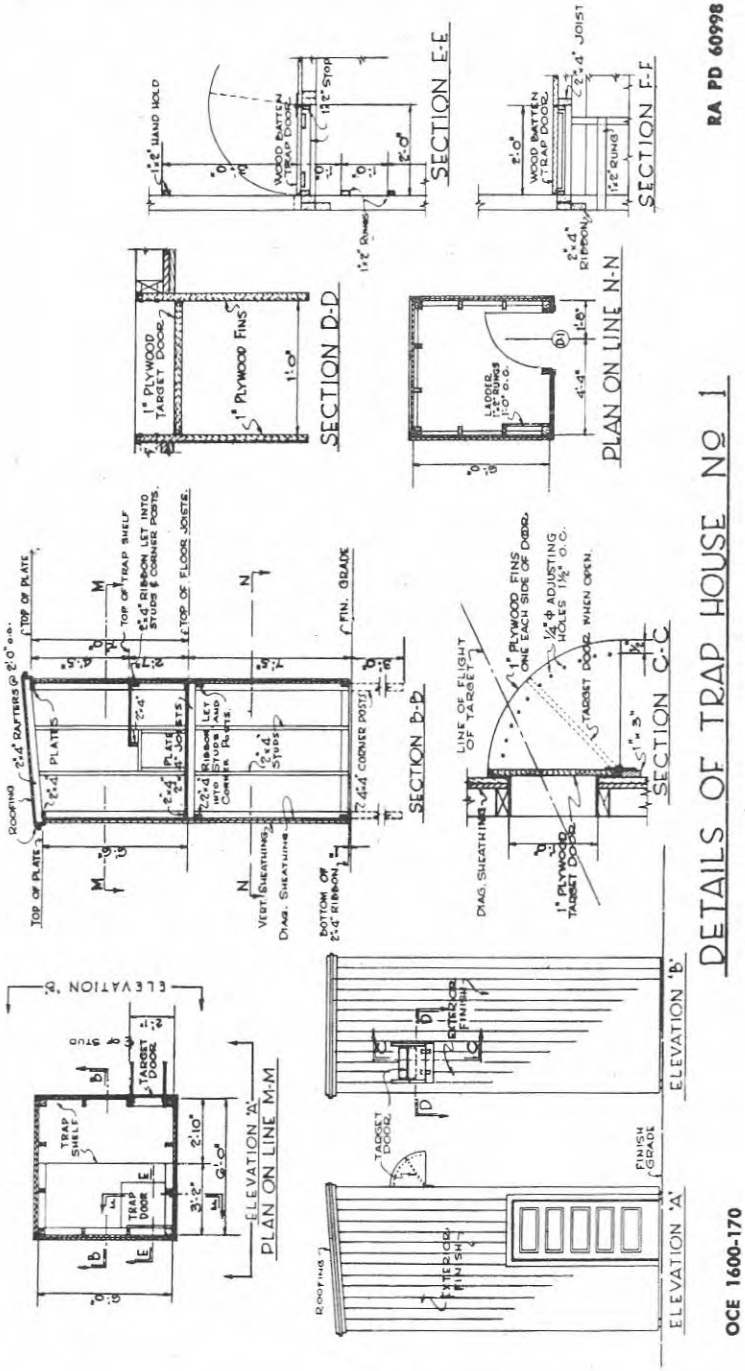


Figure 50 — Skeet Range — Trap House Details

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These masks a
on the circumfe

(6) "COMB
following notes

(a) A mini
quarters, Army
subject: "Trai
Mock Villages,
traction of lay-
buildings or ad
doned building

(b) Framir
construction.
used lumber.
six men at a ti
structures mov
establish repair
ments.

(c) Mock
to simulated pe
tion in camoufl
recognize and

(d) In ord
have it locate
Whenever poss
field of fire ca
use of M2 cal.
exceeding 4,00

(e) Where
artillery range,
observation as
to fire over the
of artillery uni

(7) Infiltr
(8) Close
(9) Trans
(10) Rang
details.

(11) Rang
figures 73 to 7

(12) Arra
figures 76 to 7

(13) Trap

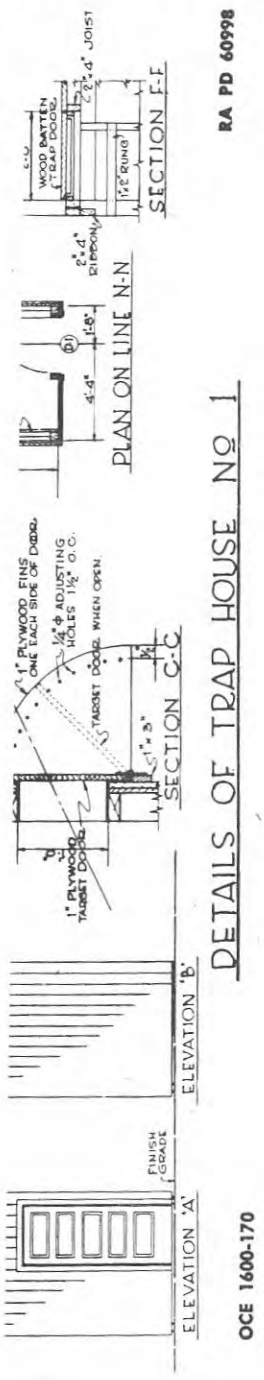


Figure 50 — Skeet Range — Trap House Details

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

These masks are sandbag walls 7 feet high, 12 feet long, and built on the circumference of a 12-foot circle.

(6) "COMBAT IN CITIES" COURSE (figs. 57, 58, and 61). The following notes apply to figures 57, 58, and 61:

(a) A minimum of 14 structures, authorized in letter from Headquarters, Army Ground Forces, 353.9/48—GNGCT/00289 (1-20-43), subject: "Training Aid 'Combat in Cities' Course—Construction of Mock Villages," have been indicated on the typical lay-outs. Contraction of lay-outs may be desirable to provide a greater density of buildings or additional structures may be added where existing abandoned buildings are available and can be readily moved to the site.

(b) Framing details have been prepared as a guide for typical construction. These details contemplate the use of sound scrap or used lumber. Construction is capable of supporting not to exceed six men at a time on the roofs of the one-story buildings. Existing structures moved to the site should be inspected in final position to establish repairs or strengthening necessary to meet minimum requirements.

(c) Mock villages may include camouflage features in addition to simulated personnel, booby traps, land mines, etc., both for instruction in camouflage and to familiarize troops with caution necessary to recognize and avoid such features.

(d) In order to permit varied use of the range, it is desired to have it located where it will least interfere with other activities. Whenever possible, the village should be installed where 180 degrees field of fire can be provided. The range should be restricted to the use of M2 cal. .30 or other ammunition not requiring a danger range exceeding 4,000 yards.

(e) Where it is necessary to locate the mock village on the artillery range, it is desired to locate it so as to interfere with artillery observation as little as possible and at the same time to allow artillery to fire over the heads of using troops during normal service practice of artillery units.

(7) Infiltration course (figs. 62 to 65 incl.).

(8) Close combat course (figs. 66 to 68 incl.).

(9) Transition firing course (figs. 69 to 71 incl.).

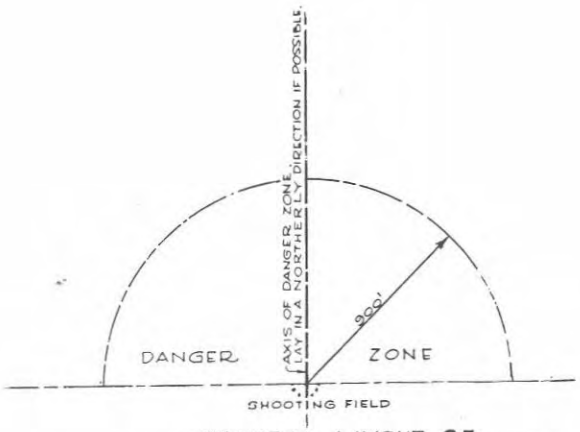
(10) Range for cal. .30 moving field target. See figure 72 for details.

(11) Range for firing 37-mm ammunition at towed targets. See figures 73 to 75, inclusive, for details.

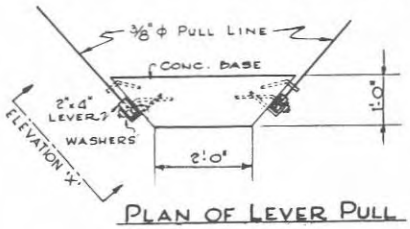
(12) Arrangements of a 1,000-inch moving target range. See figures 76 to 77, inclusive, for details.

(13) Trapshooting Range. See figure 78 for details.

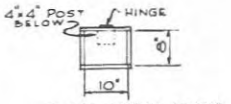
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



GENERAL LAYOUT OF
DANGER ZONE AND SHOOTING FIELD

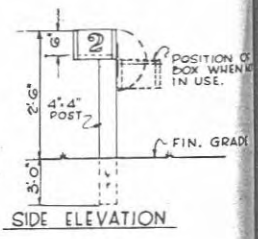


PLAN OF LEVER PULL



PLAN FROM ABOVE

DETAILS OF
STATION BOX

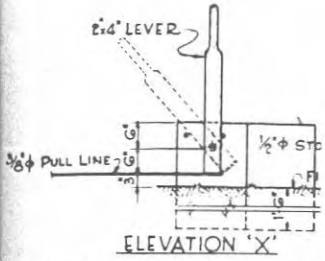


SIDE ELEVATION

RA PD 60999

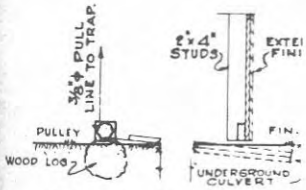
Figure 51 — Skeet Range —

CONSTRUCTION
OF VARIOU



ELEVATION 'X'

DETAIL OF LEVER



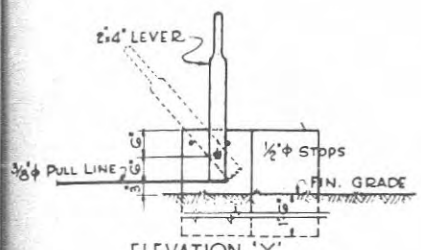
SECTION THROUGH
TRAP HOUSES SHOWIN
ENTRANCE OF PULL LI

NOTES

1. TYPE OF TRAP AND CONNECTION OF PULL LINE TO TRAP TO BE DETERMINED BY CONTRACTING OFFICER..
2. DOOR TYPE "D-1" - 2'-6"x6'-8"x1 3/8".

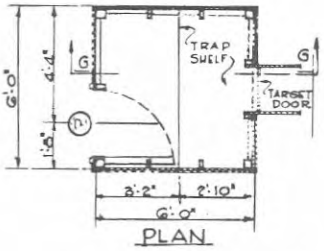
OCE 1600-170

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

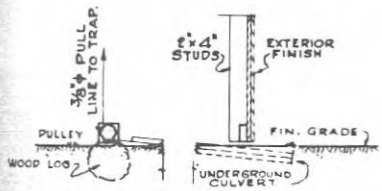


ELEVATION 'X'

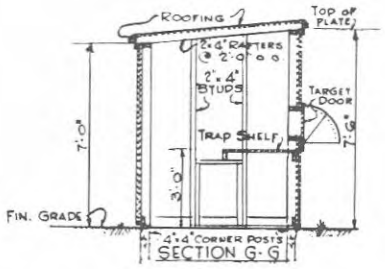
DETAIL OF LEVER PULL



PLAN



SECTION THROUGH TRAP HOUSES SHOWING ENTRANCE OF PULL LINE



SECTION G-G

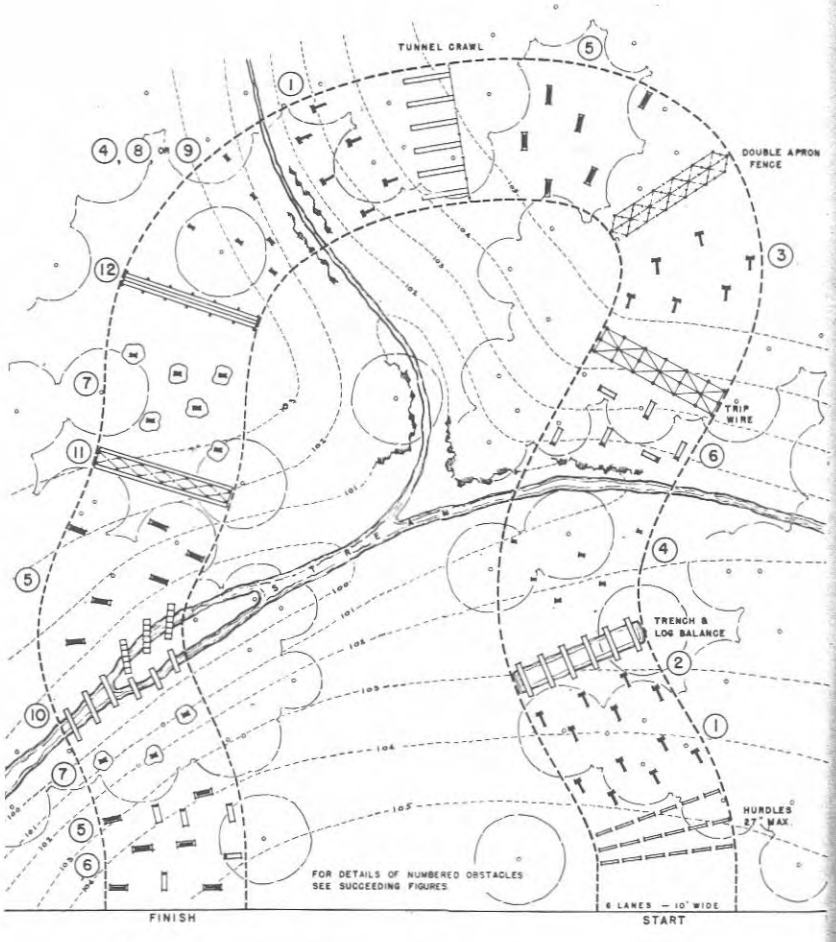
DETAILS OF TRAP HOUSE № 7

NOTE:- TARGET DOOR DETAILS SIMILAR TO THOSE OF TRAP HOUSE # 1

NOTES

1. TYPE OF TRAP AND CONNECTION OF PULL LINE TO TRAP TO BE DETERMINED BY CONTRACTING OFFICER..
2. DOOR TYPE " D-1" - 2'-6"x6'-8"x1⅜".

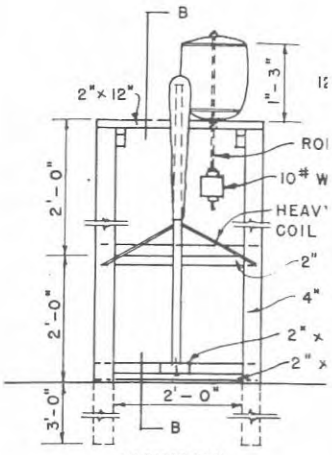
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



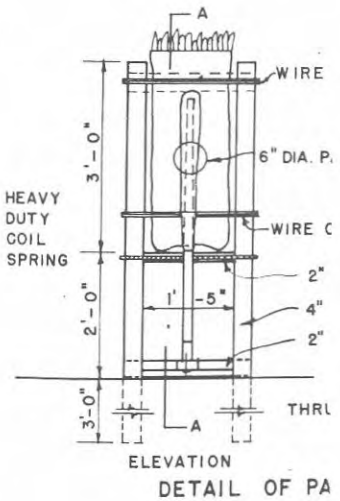
OCE 1600-205

RA PD 60972

Figure 52 — Bayonet Course — Typical Lay-out



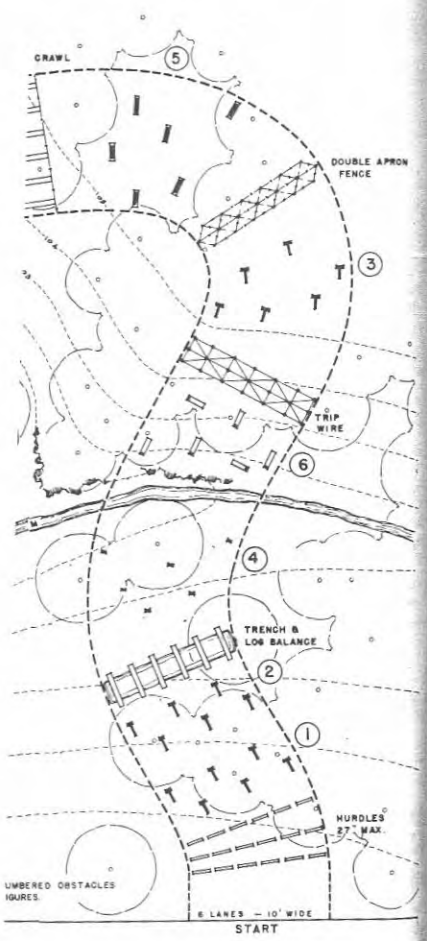
DETAIL OF PARRY & HO



DETAIL OF PA

OCE 1600-205

Figure 53 — Ba

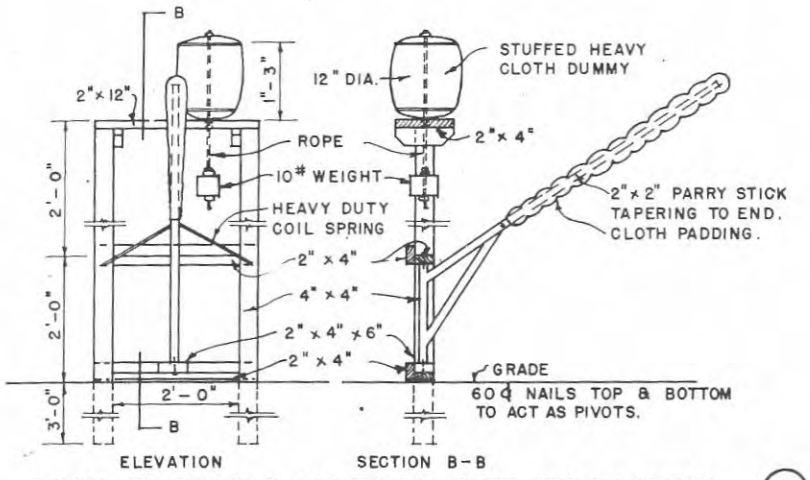


RA PD 60972

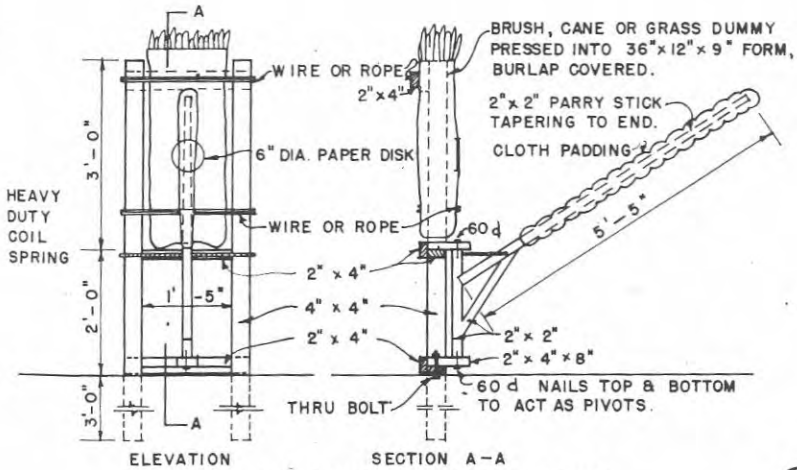
ourse — Typical Lay-out

'2

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



DETAIL OF PARRY & HORIZONTAL BUTT STROKE DUMMY (2)



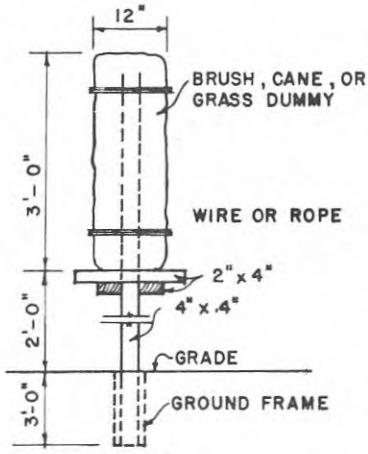
DETAIL OF PARRY & THRUST DUMMY (1)

OCE 1600-205

RA PD 60973

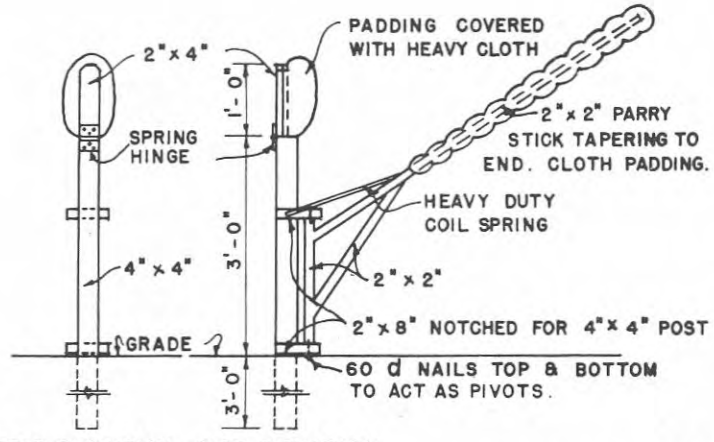
Figure 53 — Bayonet Course — Dummy Details

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



ELEVATION

MOVABLE THRUSTING DUMMY (4)



REAR ELEVATION SIDE ELEVATION

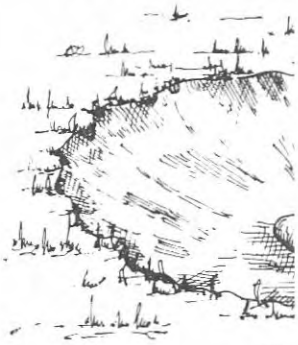
DETAIL OF PARRY & VERTICAL BUTT STROKE DUMMY (3)

OCE 1600-205

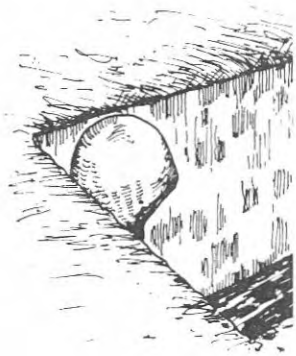
RA PD 60974

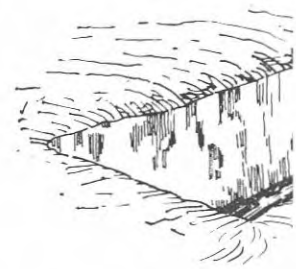
Figure 54 — Bayonet Course — Dummy Details

CONSTRUCTION OF T
OF VARIOUS OTHI



SHELL HOLE

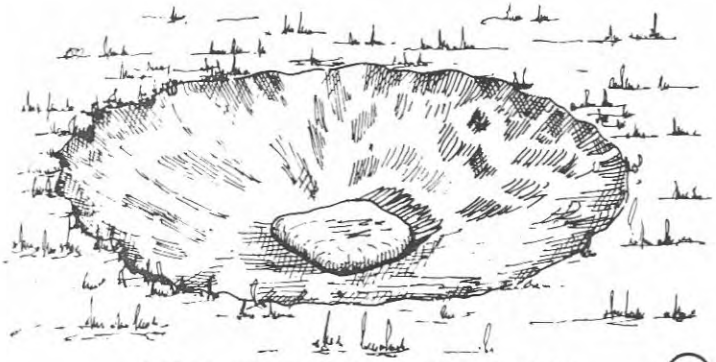




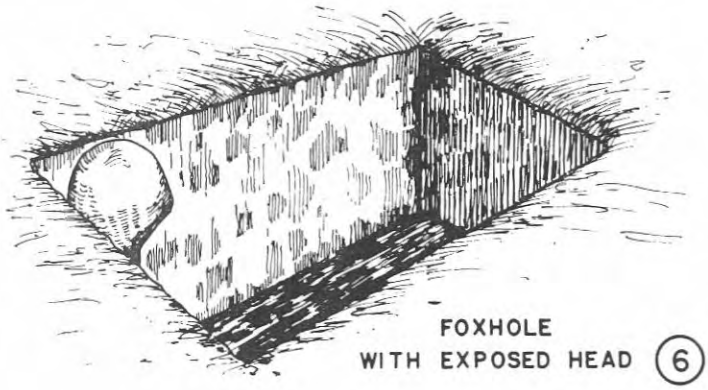
OCE 1600-205

Figure 55 — Bayonet Course —

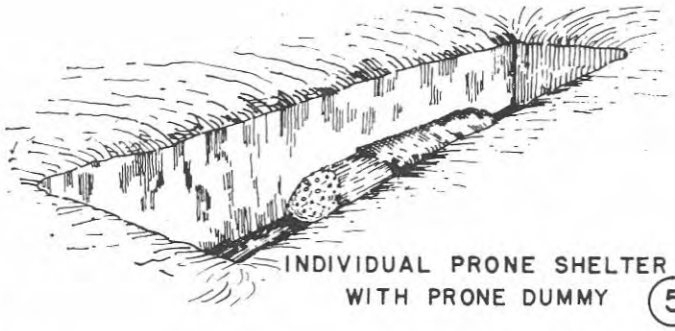
CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



SHELL HOLE WITH PRONE DUMMY (7)



FOXHOLE
WITH EXPOSED HEAD (6)

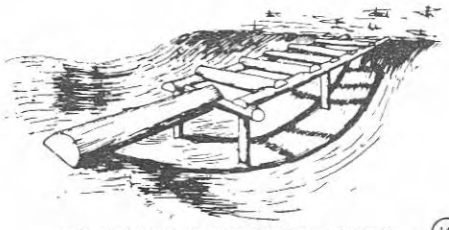


INDIVIDUAL PRONE SHELTER
WITH PRONE DUMMY (5)

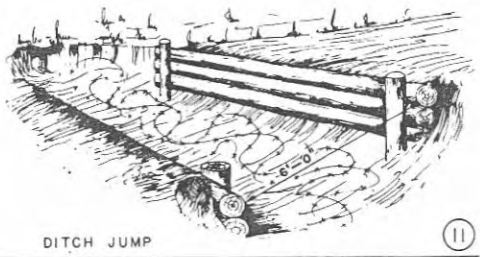
OCE 1600-205 RA PD 60975

Figure 55 — Bayonet Course — Sketches Showing Dummy Installation

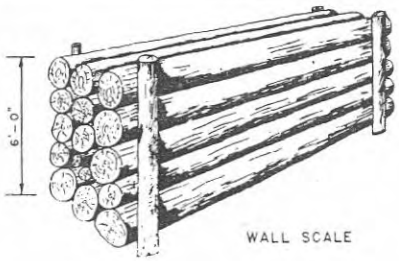
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



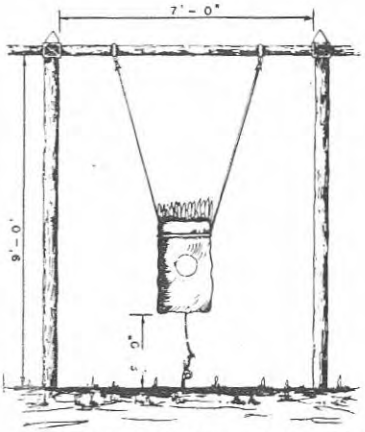
LOG BALANCE & HORIZONTAL LADDER (10)



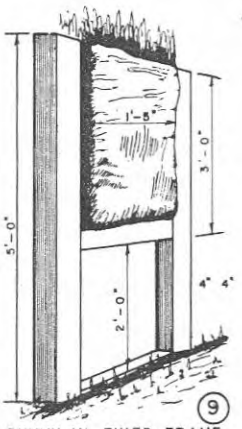
DITCH JUMP (11)



WALL SCALE (12)



SWINGING DUMMY & FRAME (8)



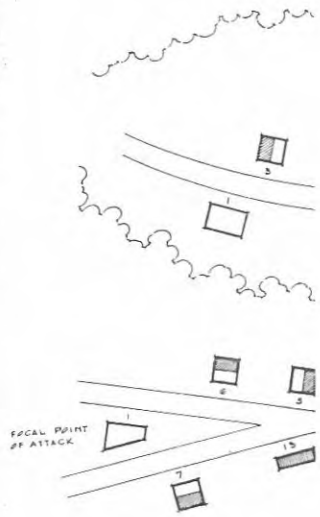
DUMMY IN FIXED FRAME (9)

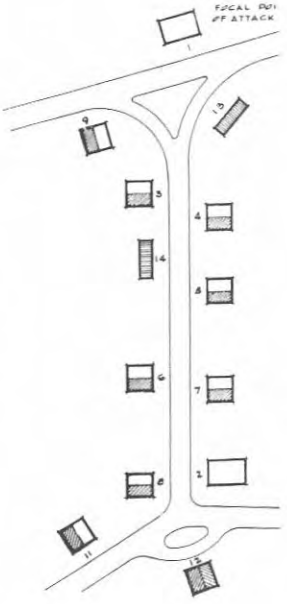
OCE 1600-205

RA PD 60976

Figure 56 — Bayonet Course — Sketches Showing Dummy Installation

CONSTRUCTION O
OF VARIOUS C

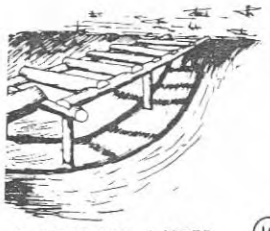




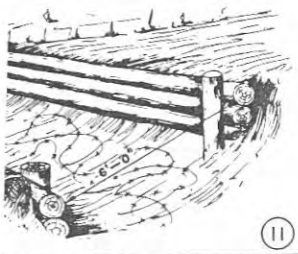
OCE 1600-185

Figure 57 — "Combat i

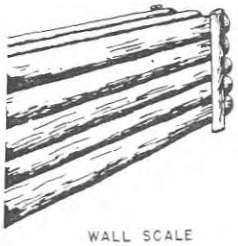
TRAINING COURSE LAY-OUTS



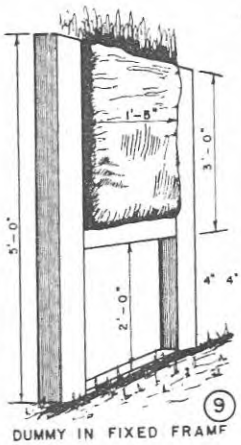
8 HORIZONTAL LADDER (10)



(11)



WALL SCALE (12)



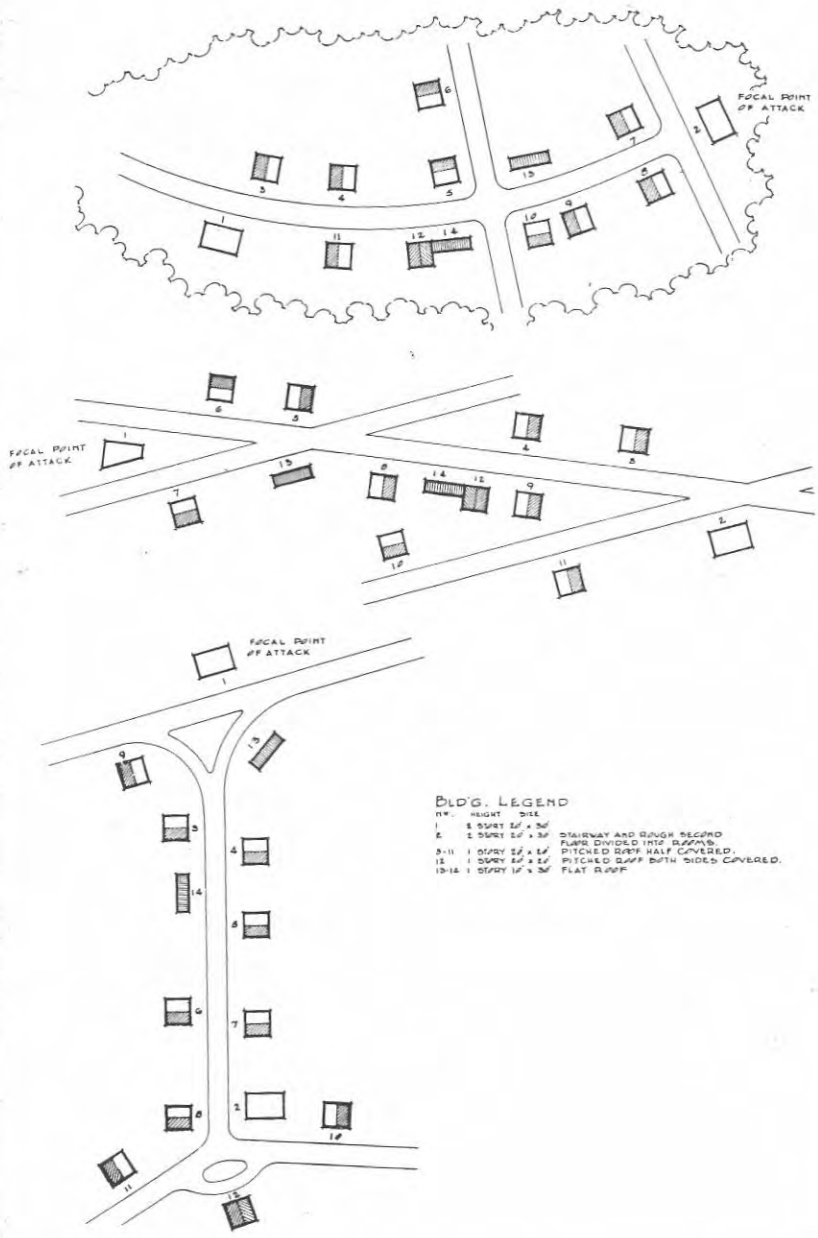
(9)

DUMMY IN FIXED FRAME

RA PD 60976

etches Showing Dummy Installation

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

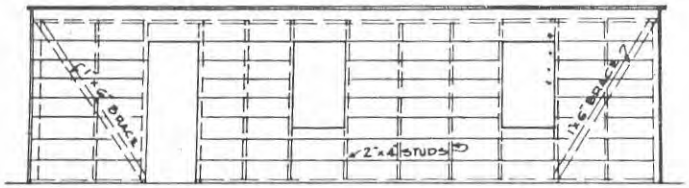


OCE 1600-185

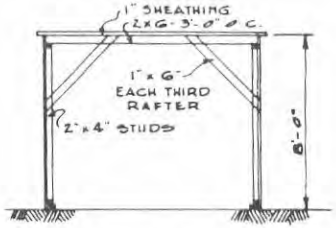
RA PD 60978

Figure 57 — "Combat in Cities" Courses — Typical Lay-outs

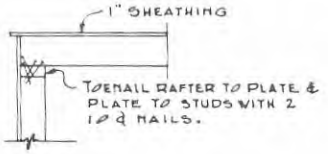
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

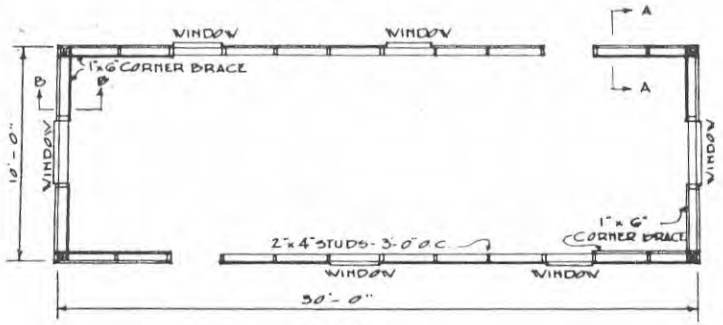


SIDE ELEVATION

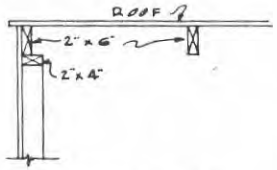


TYPICAL SECTION

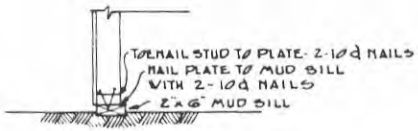




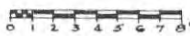
PLAN



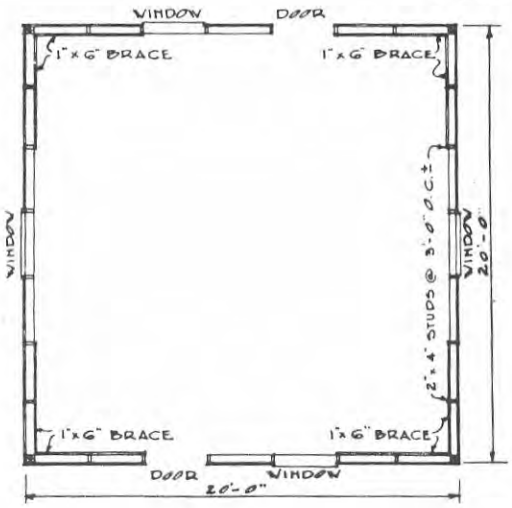
SECTION B-B



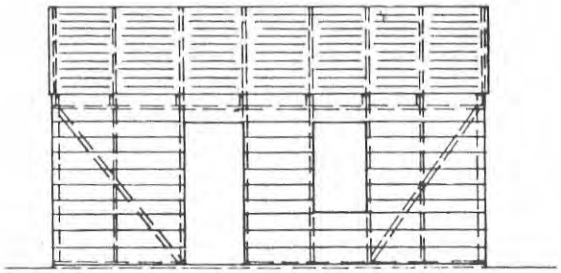
SECTION A-A



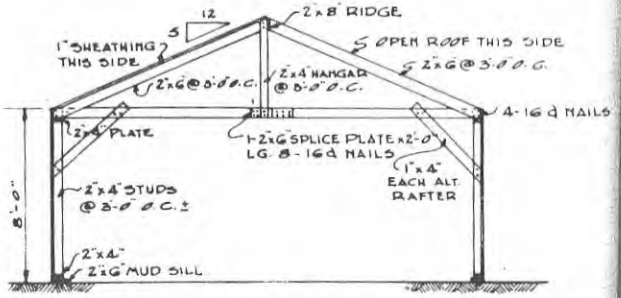
FRAMING DETAILS
10' x 30' - 1 STORY - FLAT ROOF



PLAN



ELEVATION



TYPICAL SECTION



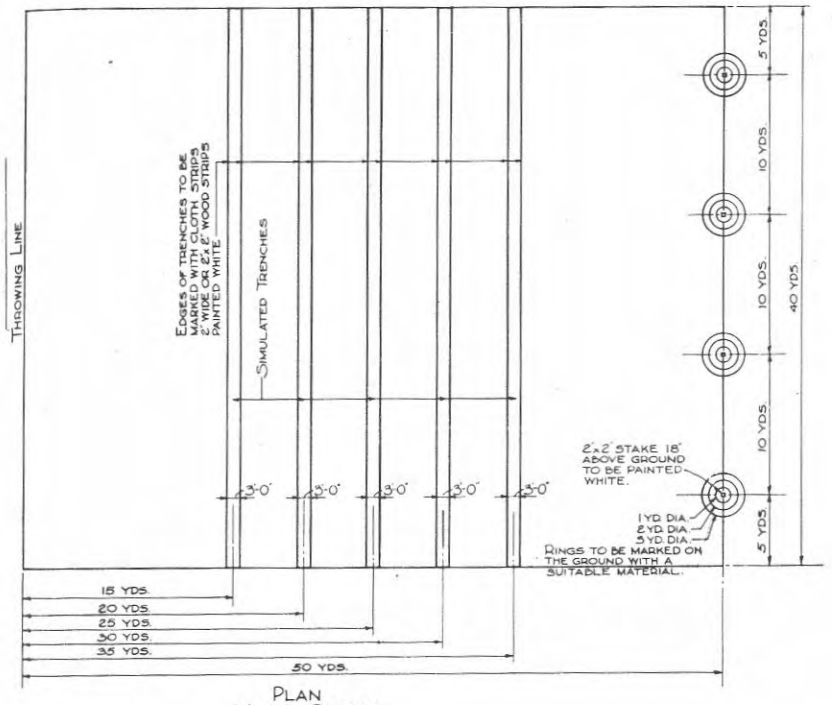
FRAMING DETAILS
20' x 20' - 1 STORY - PEAK ROOF

OCE 1600-185

RA PD 60971

Figure 58 — "Combat in Cities" Courses — House Framing Details

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



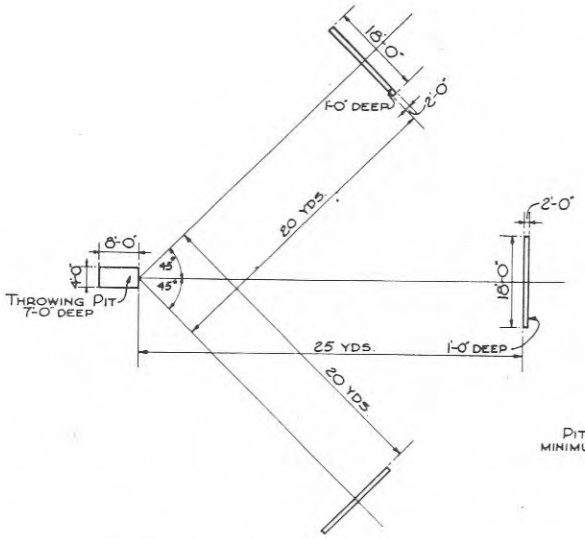
PLAN
MAIN COURT

RA PD 60977

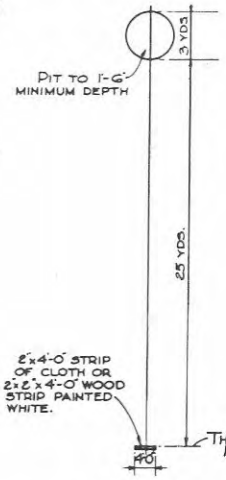
Figure 59 — Grenade Courts

Figure 58 →

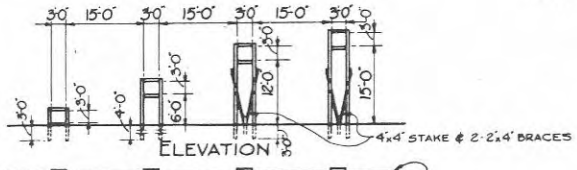
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



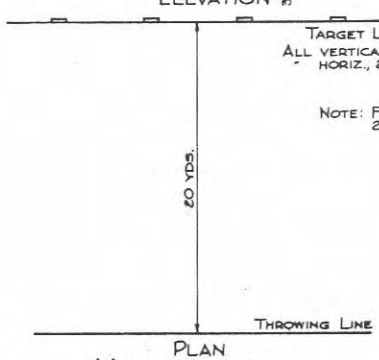
PLAN
THROWING PIT COURT



PLAN
CRATER COURT



ELEVATION



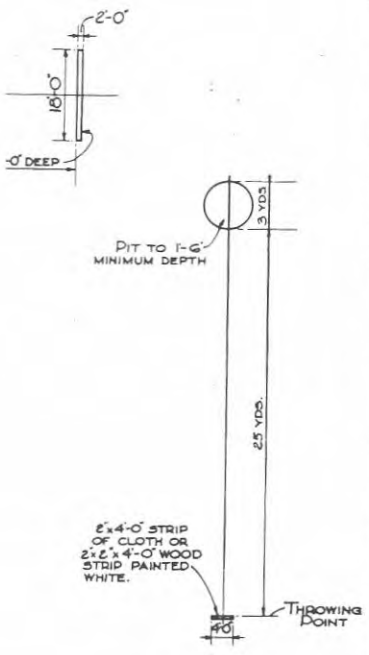
NOTE: FRAME SHALL BE NAILED WITH 2-20d NAILS AT EACH JOINT.

PLAN
VERTICAL COURT

RA PD 22081

Figure 60 — Grenade Courts

RAINING COURSE LAY-OUTS



2-2x4" BRACES

x4"

L BE NAILED WITH AT EACH JOINT.

RA PD 22081

le Courts

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

RA PD 60980

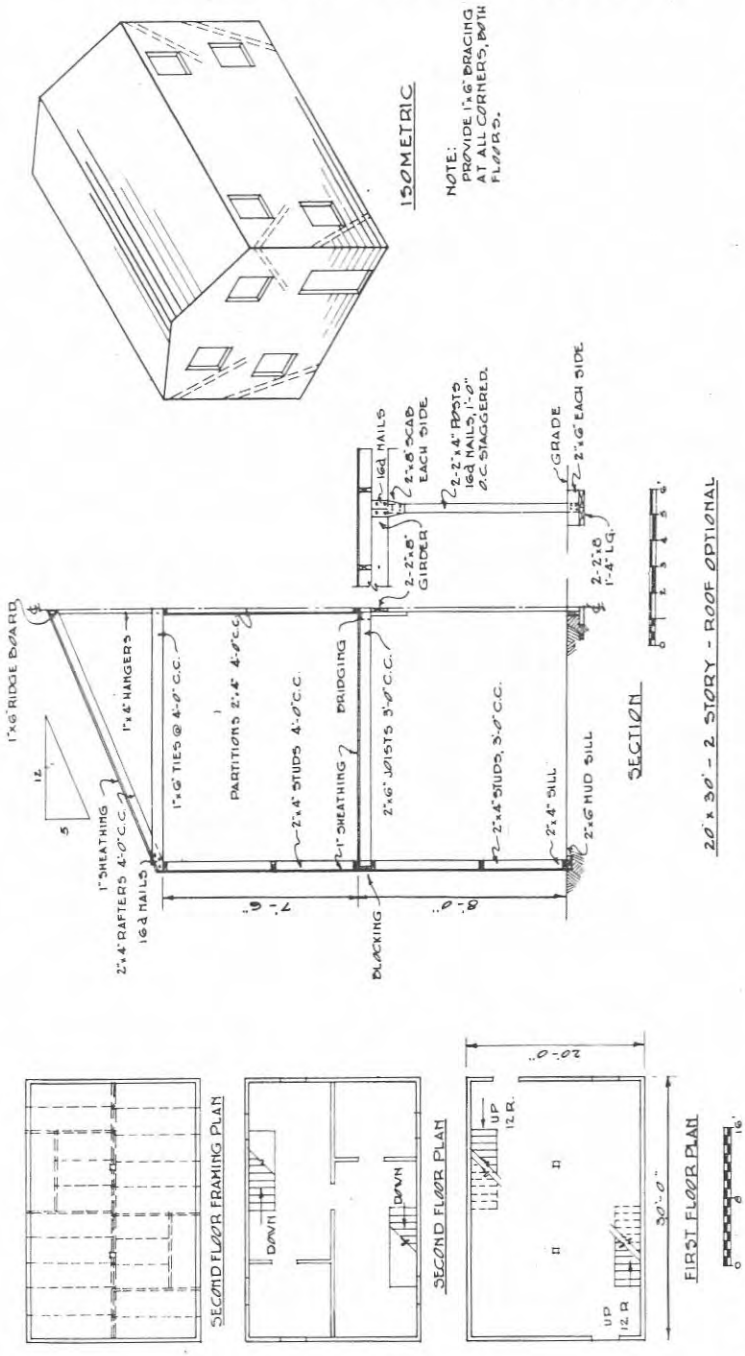
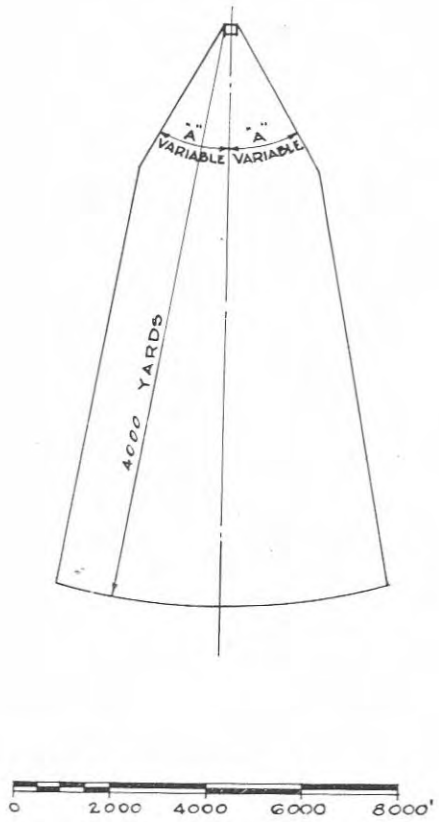


Figure 61 — "Combat in Cities" Courses — House Framing Details

OCE 1600-185

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



NOTE:

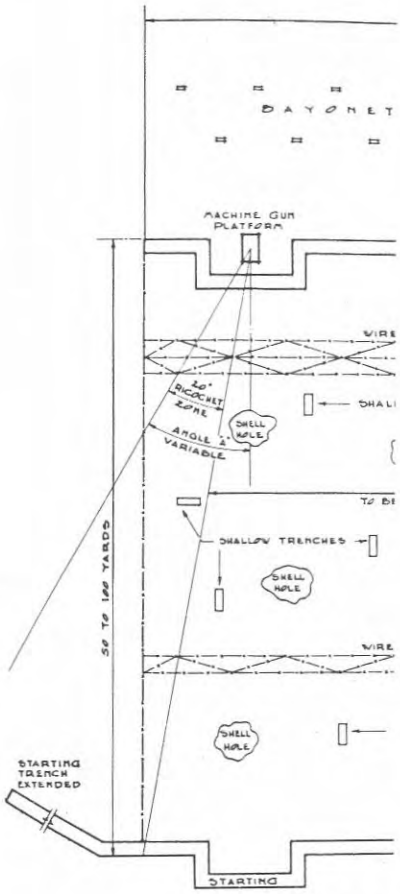
WHERE ADEQUATE DANGER AREA IS NOT AVAILABLE ADJUST VERTICAL POSTS LIMITING THE HORIZONTAL TRAVERSE AS REQUIRED TO MEET LOCAL CONDITIONS.

OCE 1600-190

RA PD 60981

Figure 62 — Infiltration Course — Typical Danger Area

CONSTRUCTION OF TAR
OF VARIOUS OTHER



TYPICA

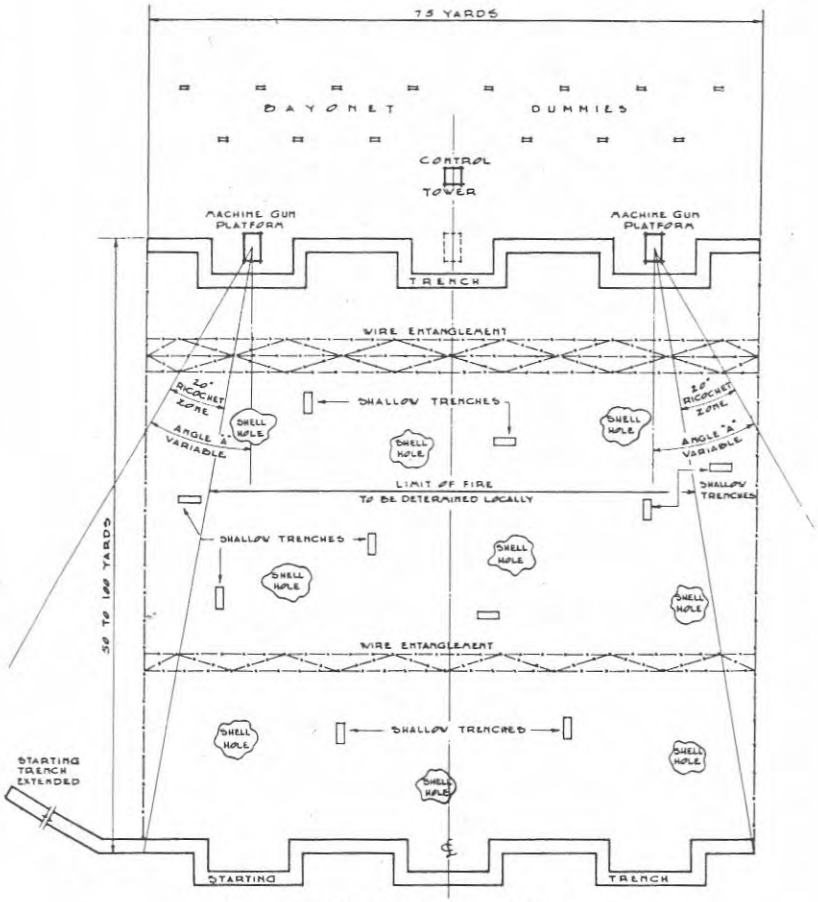
NOTES:
1. EXTEND STARTING
2. PLACE SIMULATED
3. AVOID STUMPS OF
4. WIRE ENTANGLEME
5. HEIGHT OF MACHIN

POSITION FOR TH

OCE 1600-190

Figure 63 — Infiltrati

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



·TYPICAL LAYOUT PLAN·

0 20 40 60 80'

NOTES:

1. EXTEND STARTING TRENCH TO THE FLANK BEYOND RICOCHET ZONE TO PERMIT MEN TO ENTER THE TRENCH WHILE FIRING IS IN PROGRESS.
2. PLACE SIMULATED MINES (EXPLOSIVE CHARGES) AT VARIOUS LOCATIONS THROUGHOUT AREA. PLACE CHEVAL-DE-FRISE, GOOSEBERRY, OR CONCERTINE OVER AREA TO INSURE PROPER SAFETY TO PERSONNEL.
3. AVOID STUMPS OR SNAGS EXTENDING INTO PLANE OF FIRE.
4. WIRE ENTANGLEMENTS SHOULD BE LOOSE ENOUGH TO ENABLE RAISING OF WIRE TO PERMIT PERSONNEL TO WORK THEIR WAY UNDER IN PRONE POSITION.
5. HEIGHT OF MACHINE GUN PLATFORM WILL BE DETERMINED BY LOCAL TERRAIN.

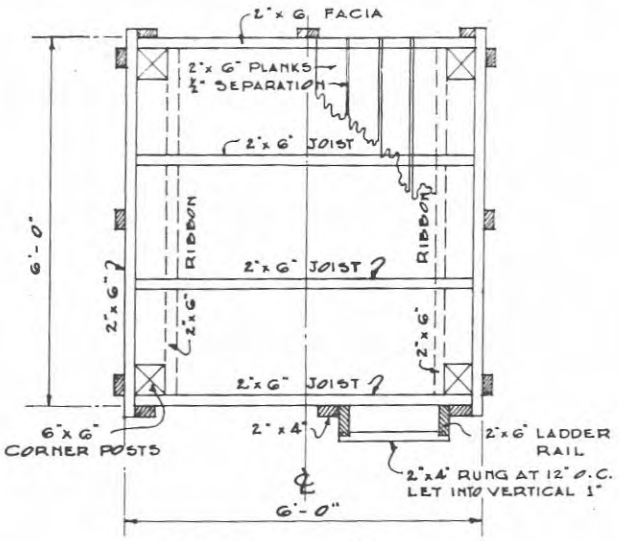
[ ] POSITION FOR THIRD MACHINE GUN IF DESIRED.

OCE 1600-190

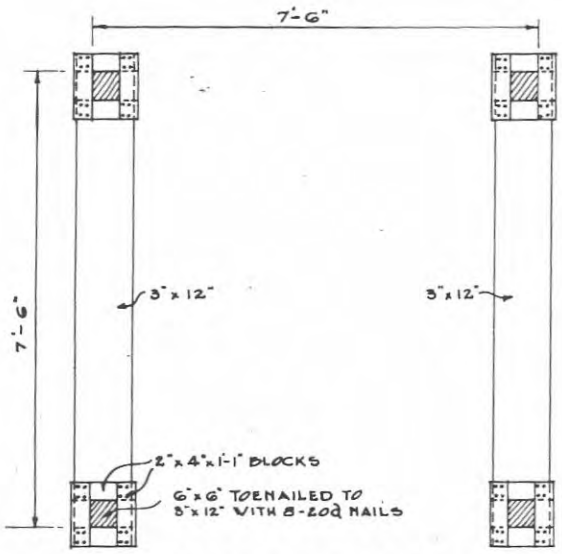
RA PD 60982

Figure 63 — Infiltration Course — Detail Lay-out

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



• PLATFORM PLAN •



• FOUNDATION PLAN •

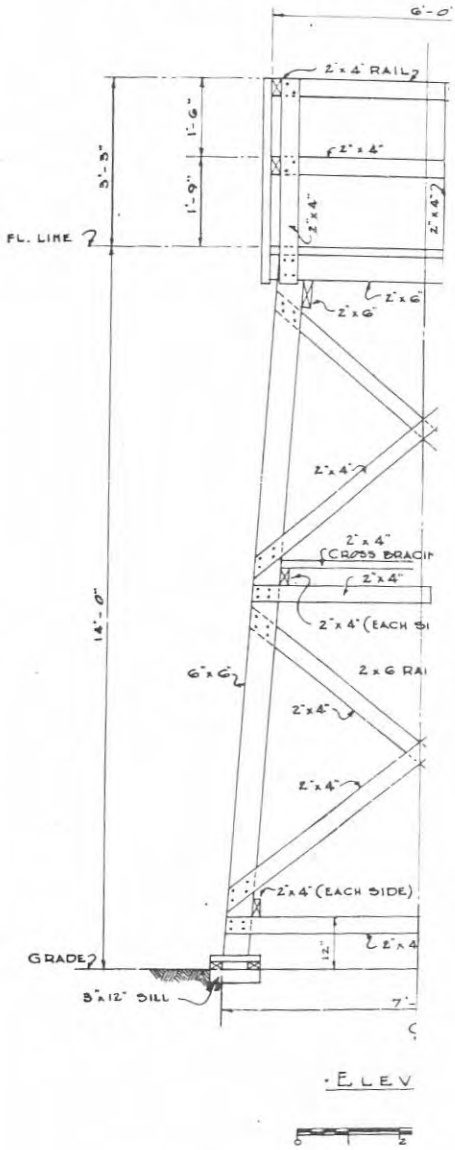
NOTE:
ALL NAILS TO BE 16d UNLESS OTHERVISE NOTED.

OCE 1600-190

RA PD 60983

Figure 64 — Infiltration Course — Control Tower Details

CONSTRUCTION OF TARGET RA
OF VARIOUS OTHER RANG

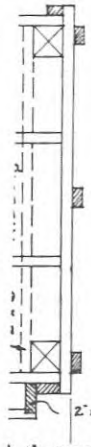


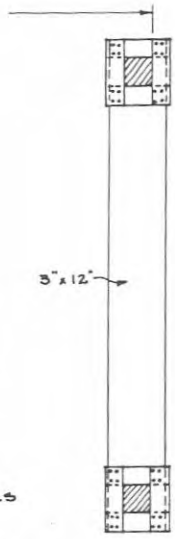
NOTE:
THE CONTROL TOWER AS DE
TOTAL LOAD OF 1000 POUNC
BE USED FOR OBSERVATIC
CAN BE REDUCED AND THE

OCE 1600-190

Figure 65 — Infiltration Cour

NG COURSE LAY-OUTS





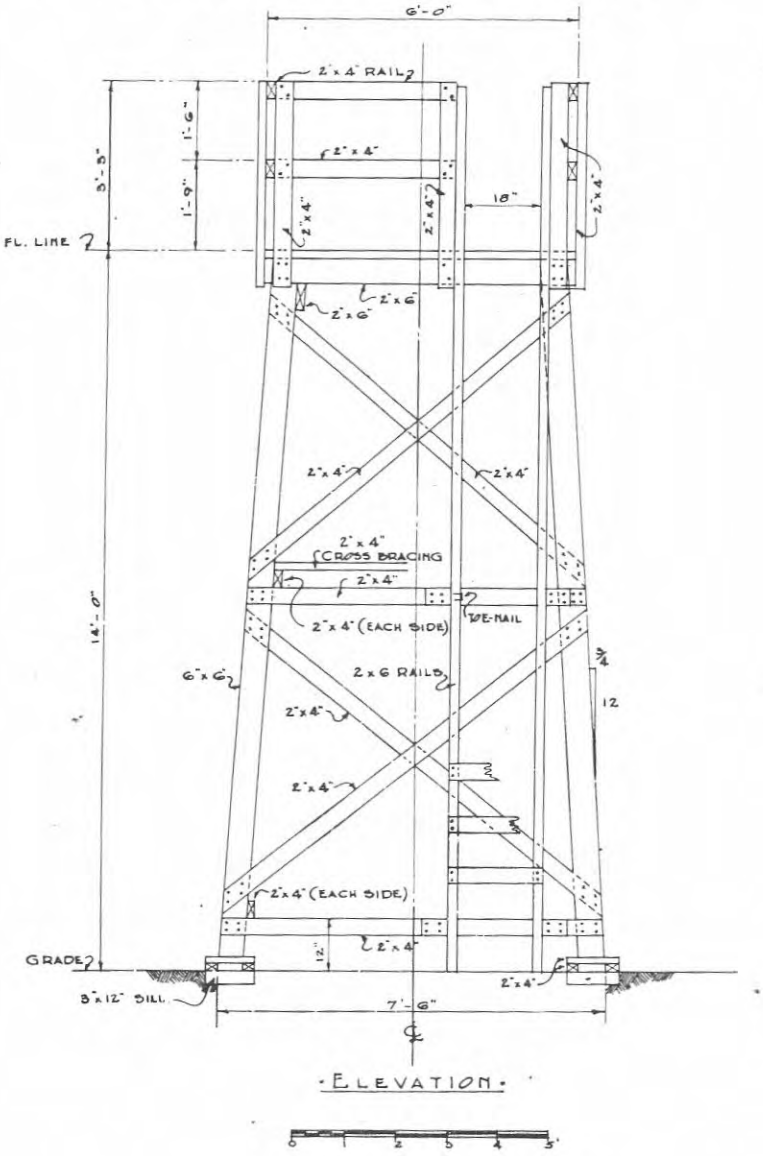
PLAN.

NLESS

RA PD 60983

ntrol Tower Details

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

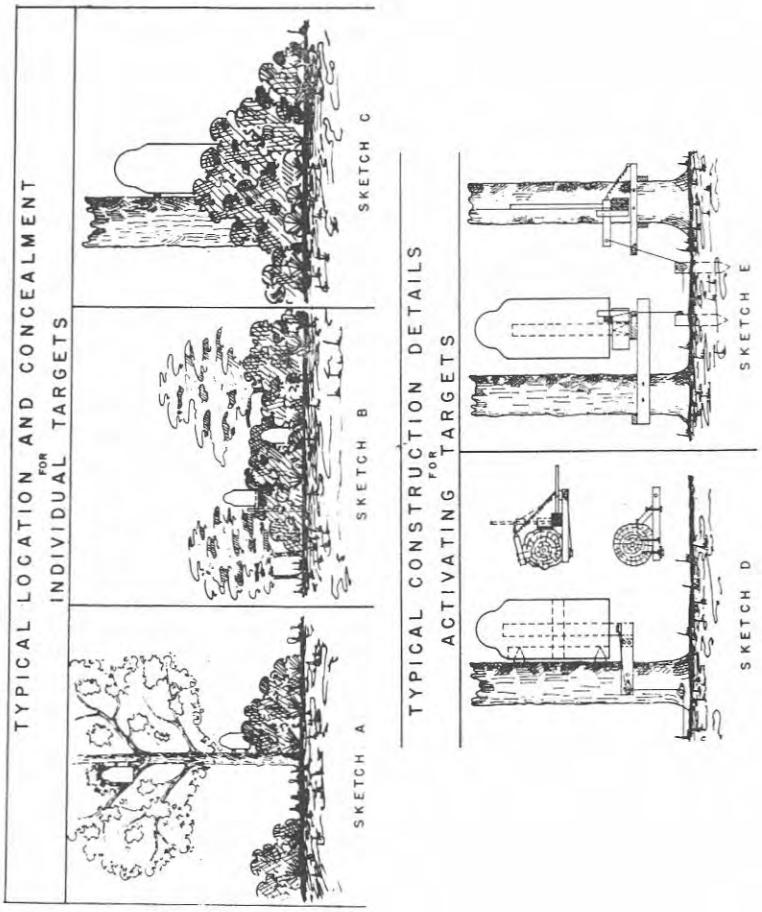


NOTE:
THE CONTROL TOWER AS DESIGNED IS PREDICATED ON A TOTAL LOAD OF 1000 POUNDS. IF THIS TOWER IS NOT TO BE USED FOR OBSERVATION, THE SIZE OF THE PLATFORM CAN BE REDUCED AND THE ENTIRE DESIGN LIGHTENED.

OCE 1600-190

RA PD 60984

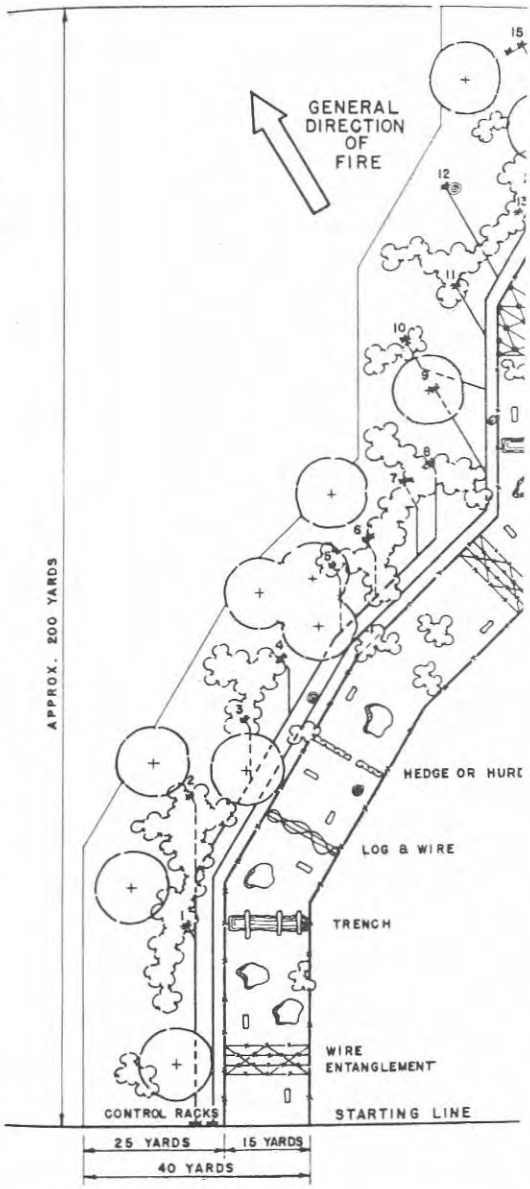
Figure 65 — Infiltration Course — Control Tower Details



RA PD 60987

Figure 66 — Close Combat Course — Detail Sketches

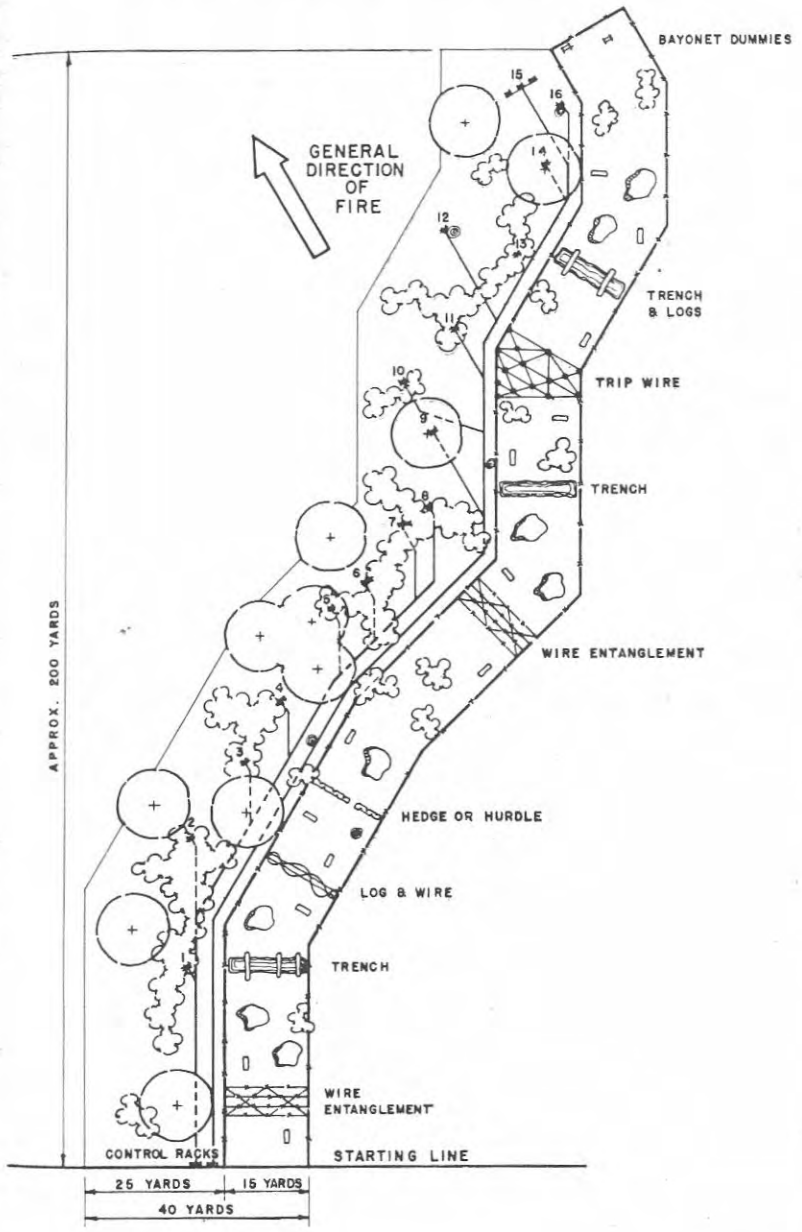
OCE 1600-195



OCE 1600-195

Figure 67 — Close Combat Course

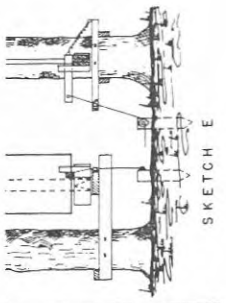
CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



OCE 1600-195 RA PD 60986

Figure 67 — Close Combat Course — Single Leg

RA PD 60987



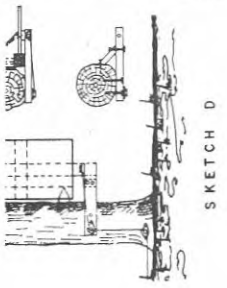
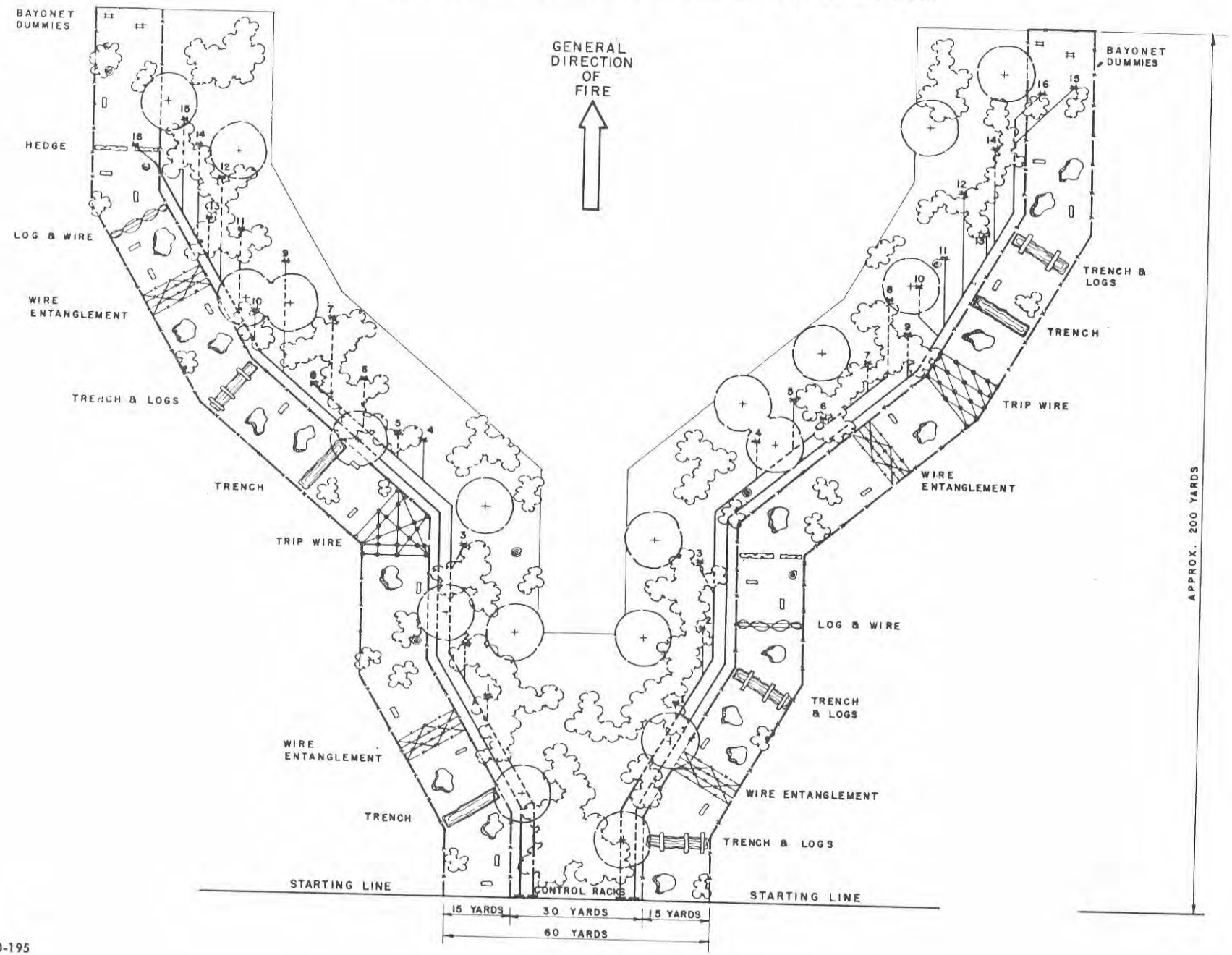


Figure 66 — Close Combat Course — Detail Sketches

OCE 1600-195

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

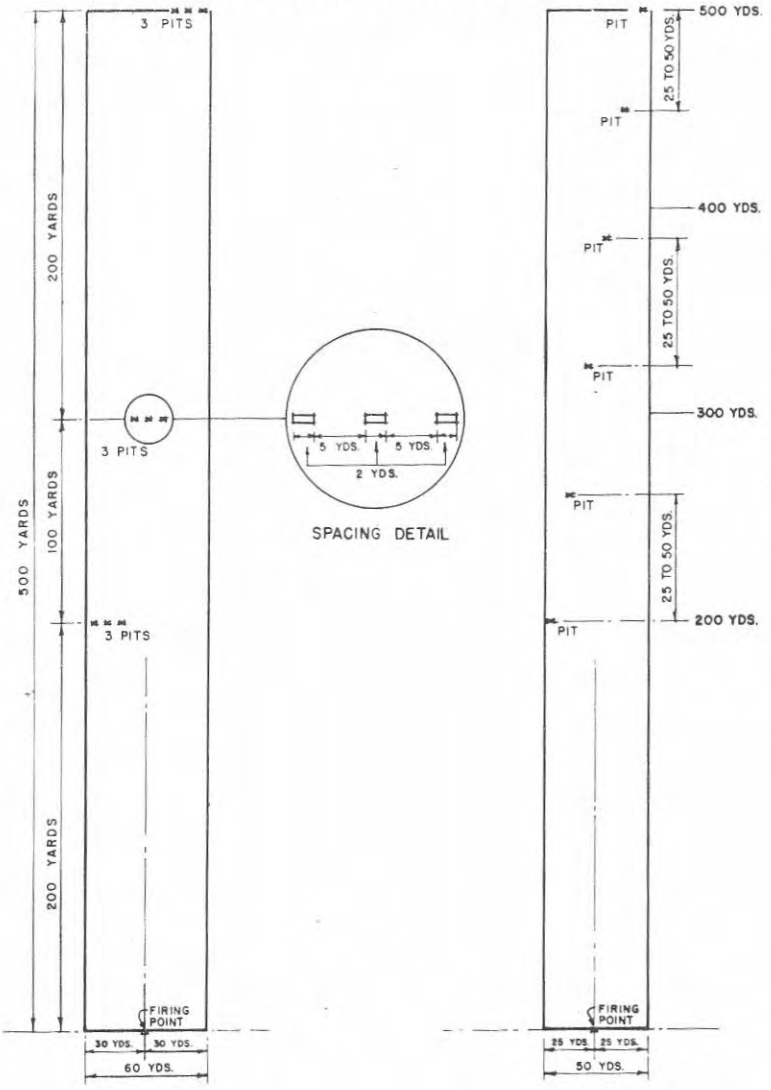


OCE 1600-195

RA PD 60985

Figure 68 — Close Combat Course — Double Leg

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



TYPICAL FIRING POINT
TYPE – I

TABLE VI TC-30 MARCH 10, 1943

A NUMBER OF THESE FIRING POINTS TOGETHER CONSTITUTE A TRANSITION FIRING COURSE RANGE, TYPE I.

TYPICAL FIRING POINT
TYPE–II

TABLE VII TC-30 MARCH 10, 1943

A NUMBER OF THESE FIRING POINTS TOGETHER CONSTITUTE A TRANSITION FIRING COURSE RANGE, TYPE II

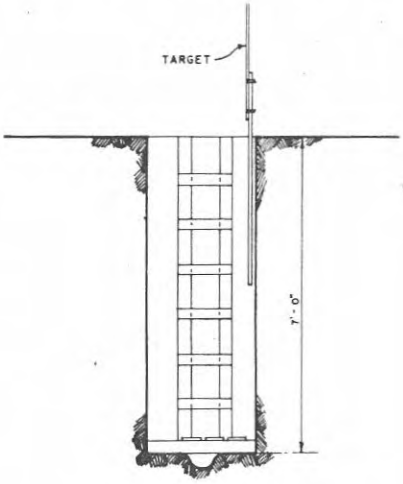
OCE 1600-200

RA PD 60988

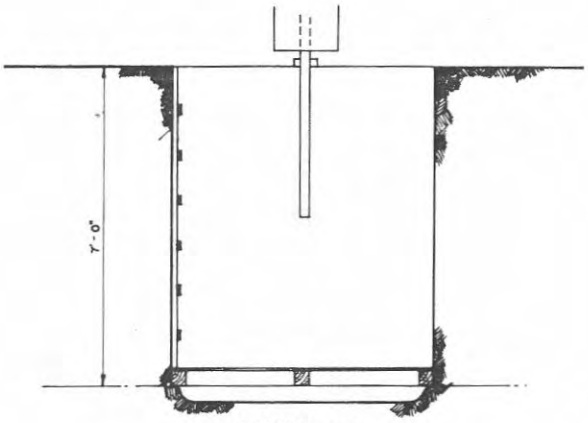
Figure 69 – Transition Firing Course – Typical Firing Points

Figure 68 →

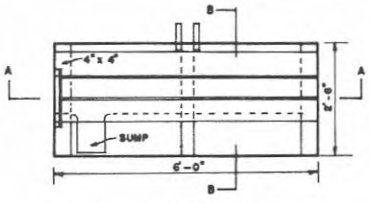
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



SECTION B-B



SECTION A-A



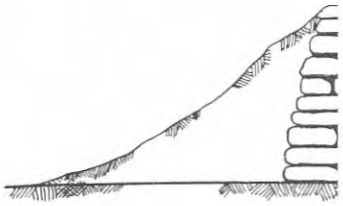
PLAN

OCE 1600-200

RA PD 60989

Figure 70 — Transition Firing Course — Deep Pit Details

CONSTRUCTION OF
OF VARIOUS O

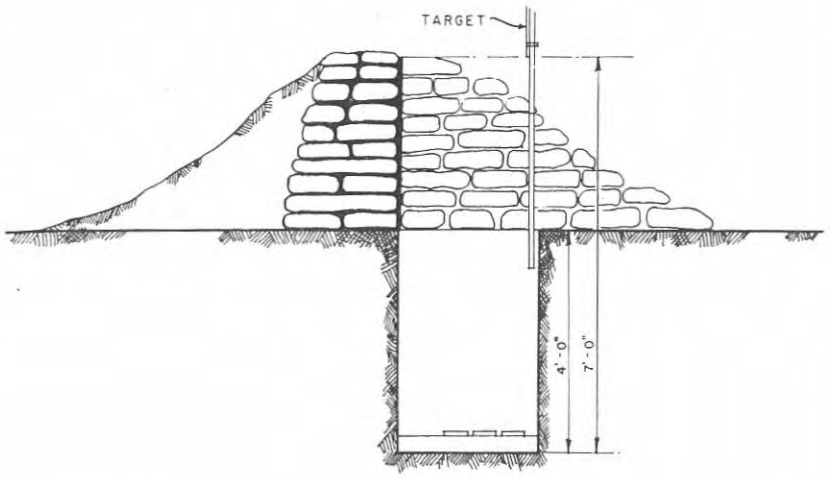


7'-0"

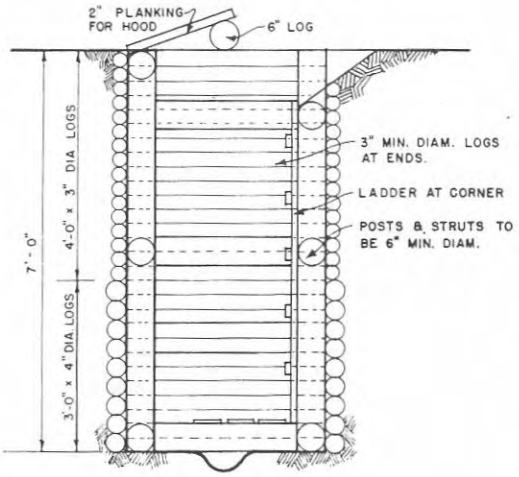
OCE 1600-150

Figure 71 — Transition Firi

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES



SECTION FOR
SHALLOW PIT



ALTERNATE SECTION
SHORING & OVERHEAD PROTECTION

OCE 1600-150

RA PD 60990

Figure 71 — Transition Firing Course — Alternate Section and Shallow Pit Details

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

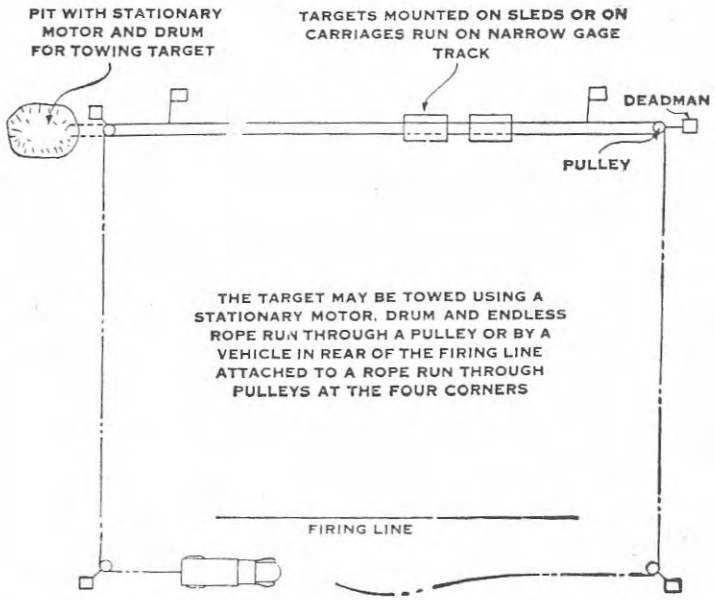


Figure 72 — Range for Cal. .30 Moving Field Target

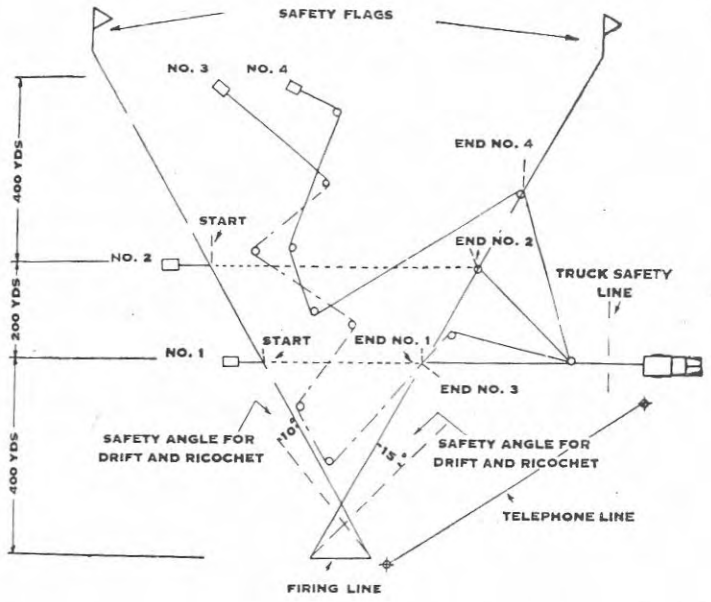
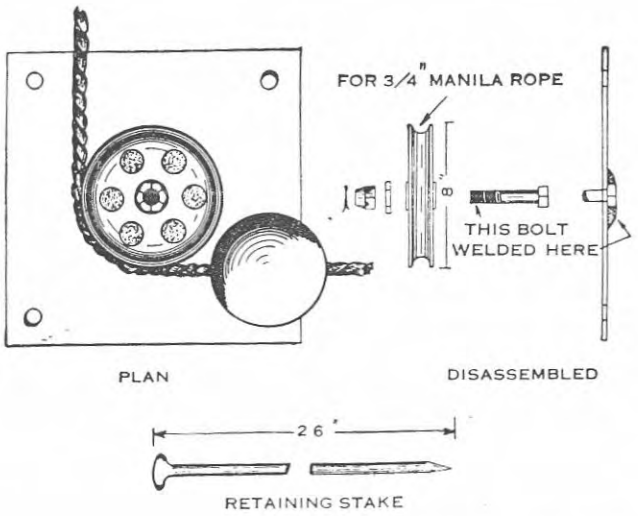


Figure 73 — Range for Firing 37-mm Ammunition at Towed Targets

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

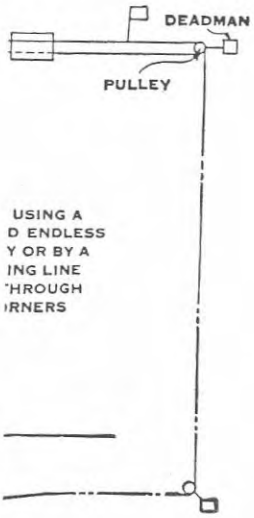
PULLEY LAYOUT,
GROUND MOVING-TARGET RANGE



RA PD 22672

Figure 74 — Pulley Lay-out for Towed Target Range Shown in Figure 73

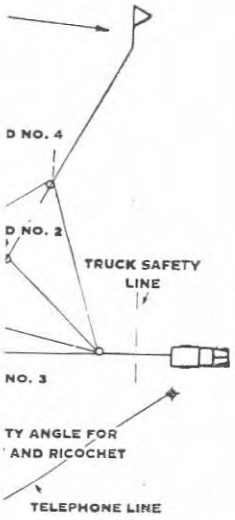
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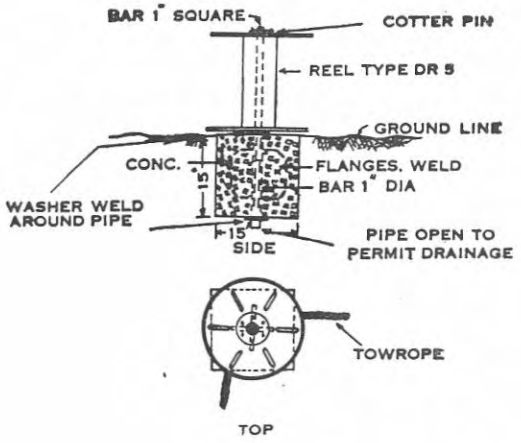
RA PD 22670

ing Field Target



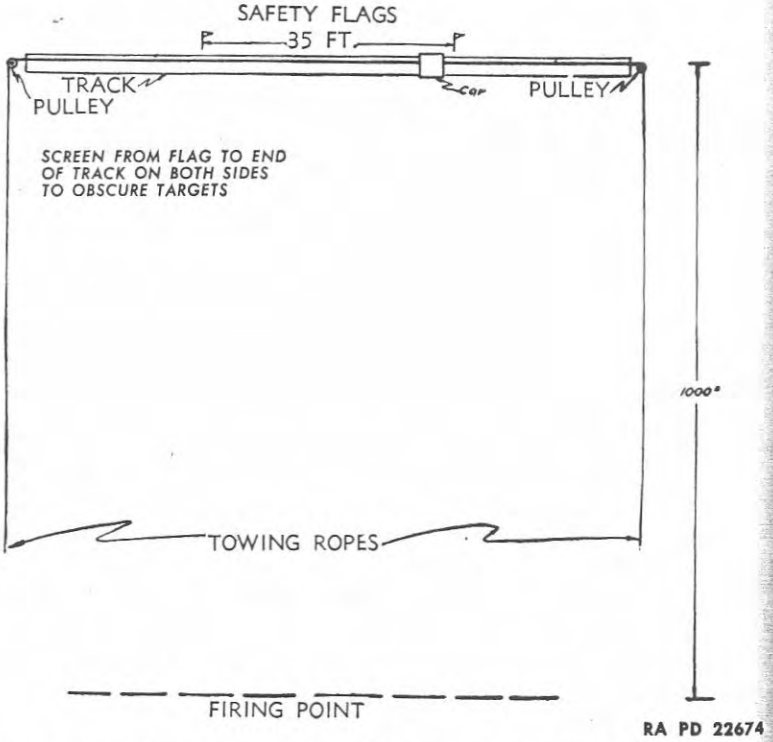
RA PD 22671

nition at Towed Targets



RA PD 22673

Figure 75 — Roadway Drum for Towed Target Range Shown in Figure 73



RA PD 22674

Figure 76 — Arrangement of a 1,000-inch Track-type Moving Target Range

G COURSE LAY-OUTS

:OTTER PIN

'E DR 5

ROUND LINE

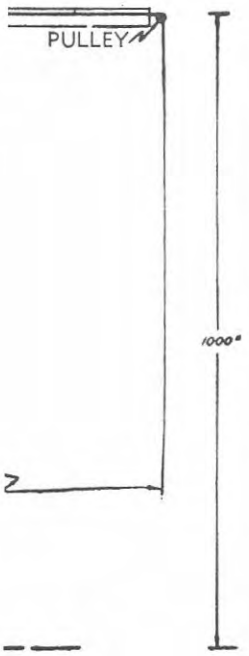
5. WELD
)IA

'E OPEN TO
MIT DRAINAGE

/ROPE

RA PD 22673

rget Range Shown



RA PD 22674

Track-type Moving

CONSTRUCTION OF TARGET RANGES AND LAY-OUT OF VARIOUS OTHER RANGES AND COURSES

RA PD 22675

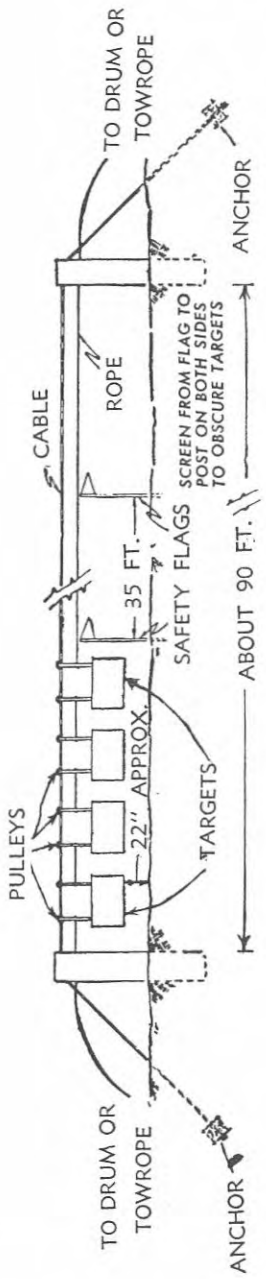
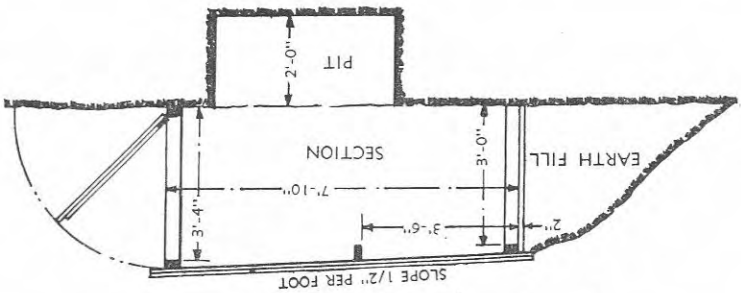
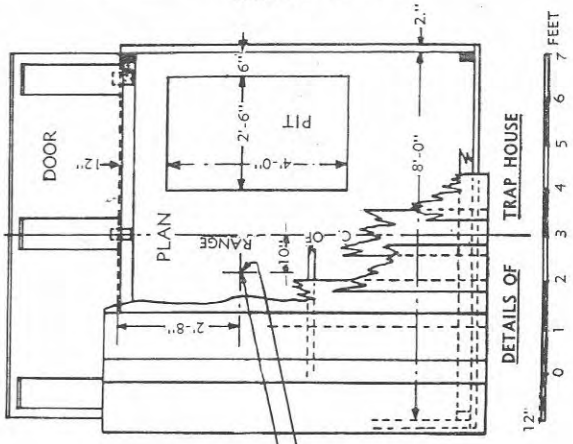


Figure 77 — Arrangement of 1,000-inch Cable-type Moving Target Range

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

RA PD 88237





MATERIALS.

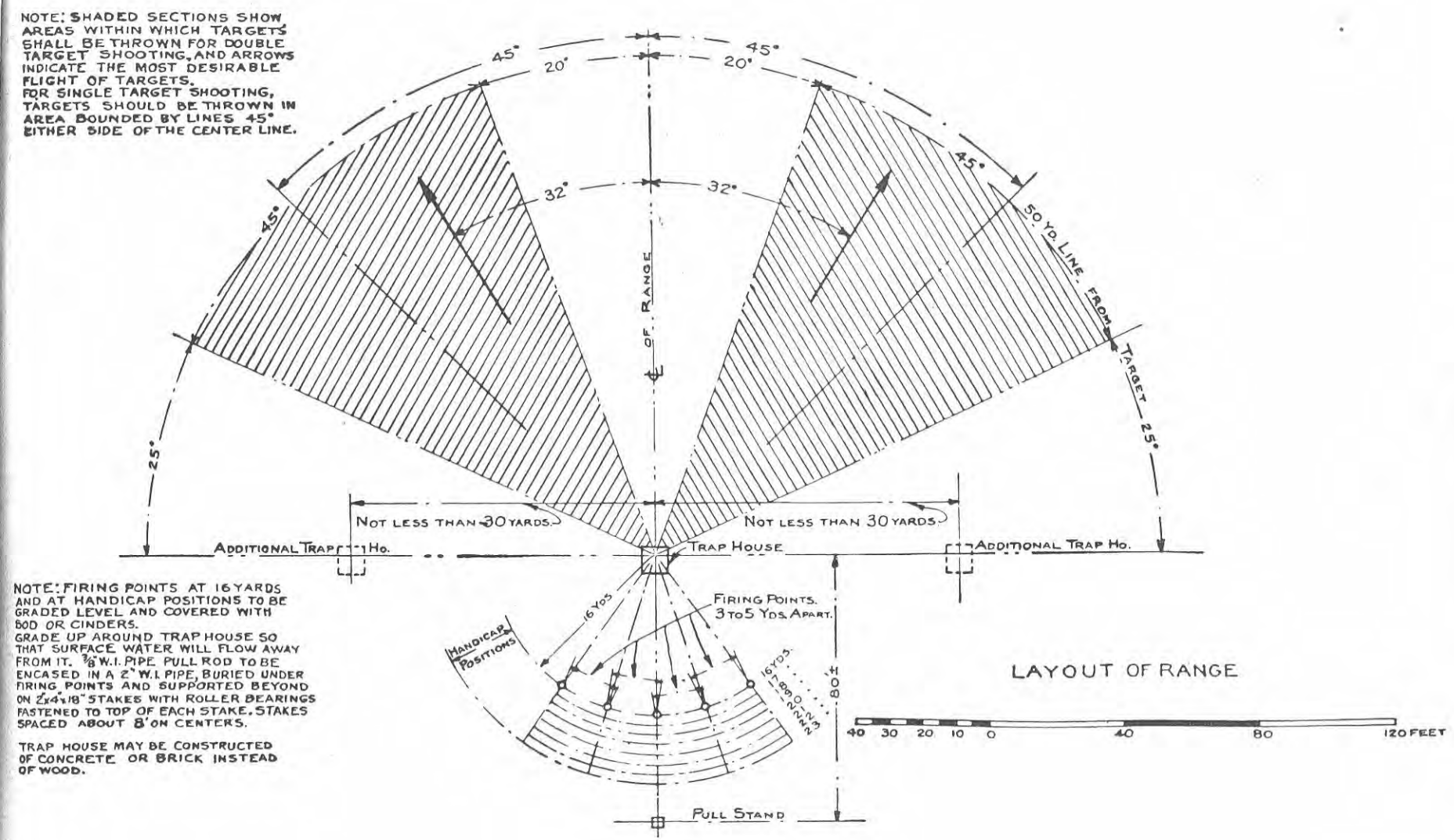
4 P.CS. 2" X 4" X 8' RAFTERS
1 P.CS. 2" X 4" X 14' POSTS
11 P.CS. 1" X 12" X 9' ROOF
5 P.CS. 1" X 8" X 8' DOOR
11 P.CS. 2" X 10" X 8' SIDES
3 — 3" X 3" BUTTS
1 — HASP & STAPLE
1 — PADLOCK
5 LBS. 20c SPIKES
10 LBS. 5c NAILS.

Figure 78 — Trapshooting Range

QMC 416-119

Figure 78A

RA PD 88237



RA PD 88237A

Figure 78 — Trapshooting Range

Figure 78A — Trapshooting Range — Continued

QMC 416-119

Section IV

TARGETS AND EQUIPMENT FOR CLASS A AND CLASS B RANGES

13. GENERAL.

a. The articles described in this section are normally required and installed on class A and class B target ranges.

14. CURTAIN ROLL-TYPE TARGETS (figs. 79 to 84 incl.).

a. The following method for constructing curtain roll-type targets is not mandatory and is published for information only:

(1) Cut a bolt of target cloth into sections 6 by 6⅚ feet to form a curtain (fig. 79).

(2) Sew a 4-inch hem at each end of the curtain to provide space for inserting wooden curtain rods (fig. 80).

(3) Using 1- by 1½-inch lumber, cut each curtain rod 6⅓ feet long. Insert the rods in the curtains.

(4) Notch the top of the vertical rails of the target frame to provide support for the top curtain rod (fig. 81).

(5) Fasten an 8-inch spring on each side of the target frame near the bottom about 1 foot below the lower curtain rod. Fasten a metal hook or ring on the other end of the spring, so that it will slip over the end of the curtain rod which is inserted in the lower hem of the curtain (fig. 82).

(6) Mix the glue as follows:
2 pounds of animal flake or powdered glue
1 pound (approx 1 pt) of glycerine
Water, enough to make 1 gallon of mixture

(7) Thoroughly mix the glue and glycerine. Stir the mixture as the water is added. Allow it to stand until the mixture becomes fairly stiff. Then heat the mixture until its consistency becomes thin enough to permit application with a brush.

(8) Using glue, mixed as directed in step (6), above, follow the procedures listed below for gluing the target to the cloth.

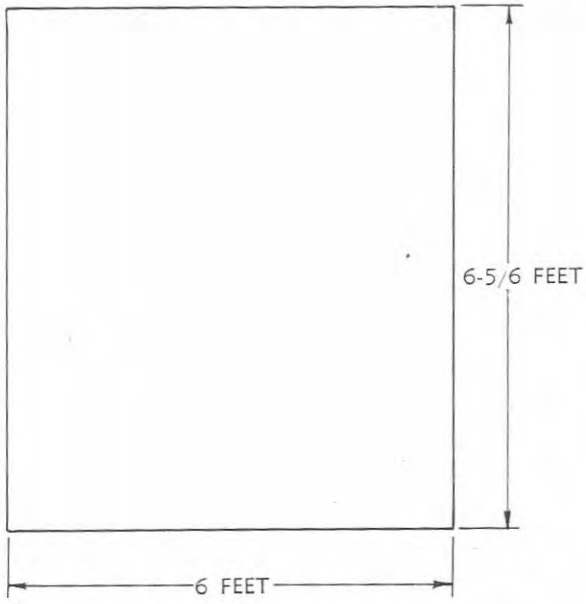
(9) Stretch the curtain over a work table.

(10) Spread a light coat of glue on the back of the target.

(11) Place the target on the curtain and smooth it with stiff bristle brushes. Immediately hang up to dry.

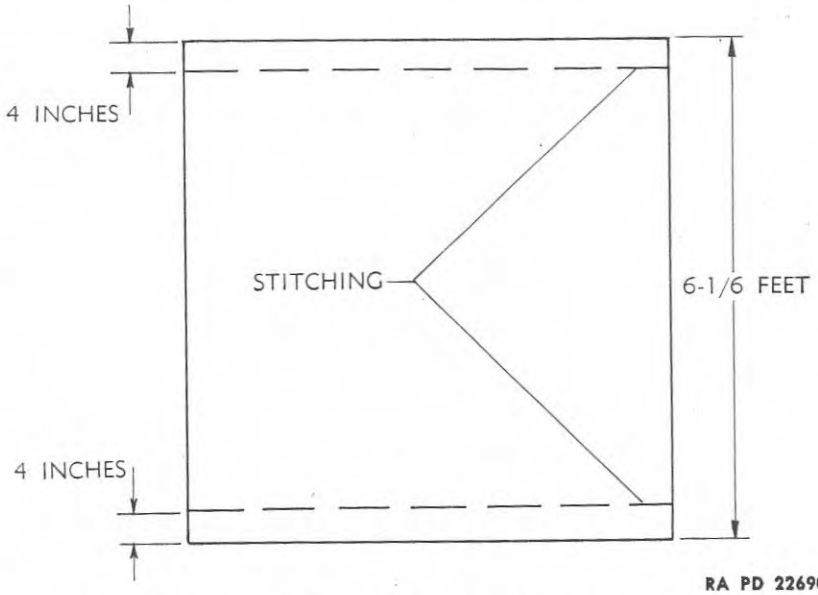
(12) When the target is dry (after approx 30 min), roll up and store for future use (fig. 83).

(13) When the curtain roll-type target is to be used, insert a curtain rod at the bottom of the curtain (fig. 84).



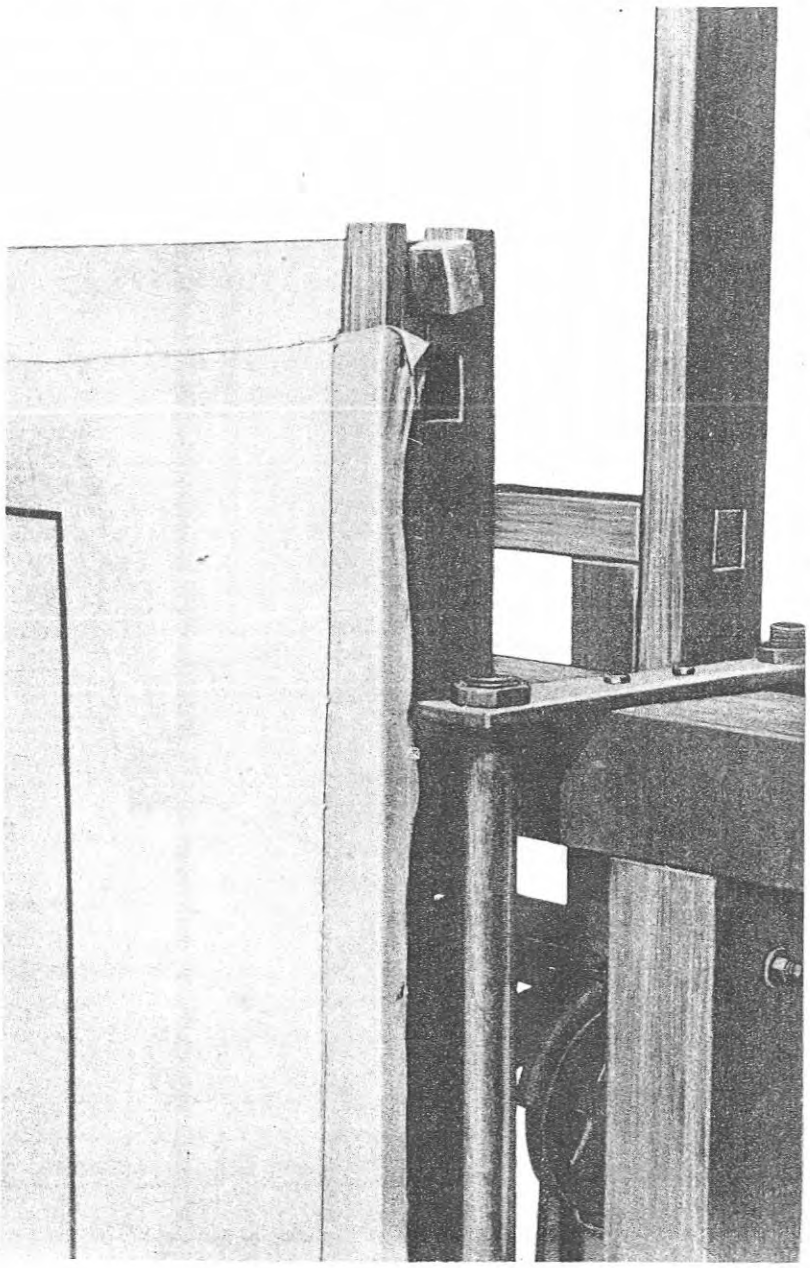
RA PD 22689

Figure 79 — Target Cloth Cut 6 x 6 5/6 Feet



RA PD 22690

Figure 80 — Target Cloth With 4-inch Hem at Each End



RA PD 22691

Figure 81 — Notched Mounting at Top of Target Frame

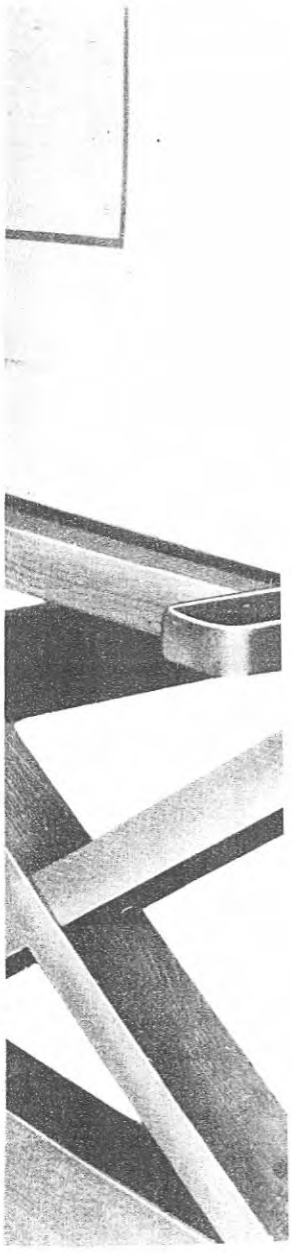
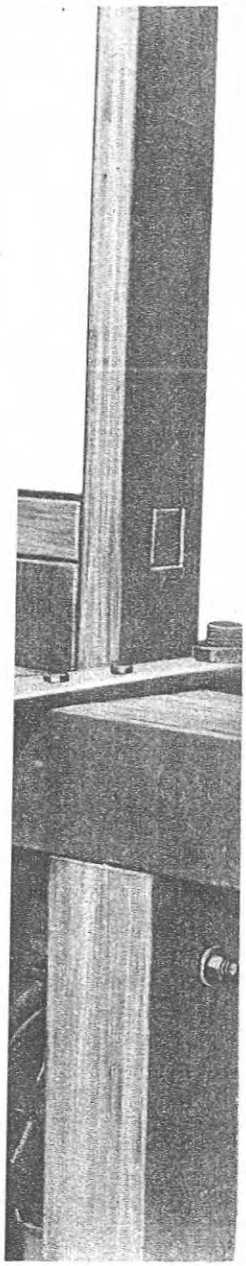
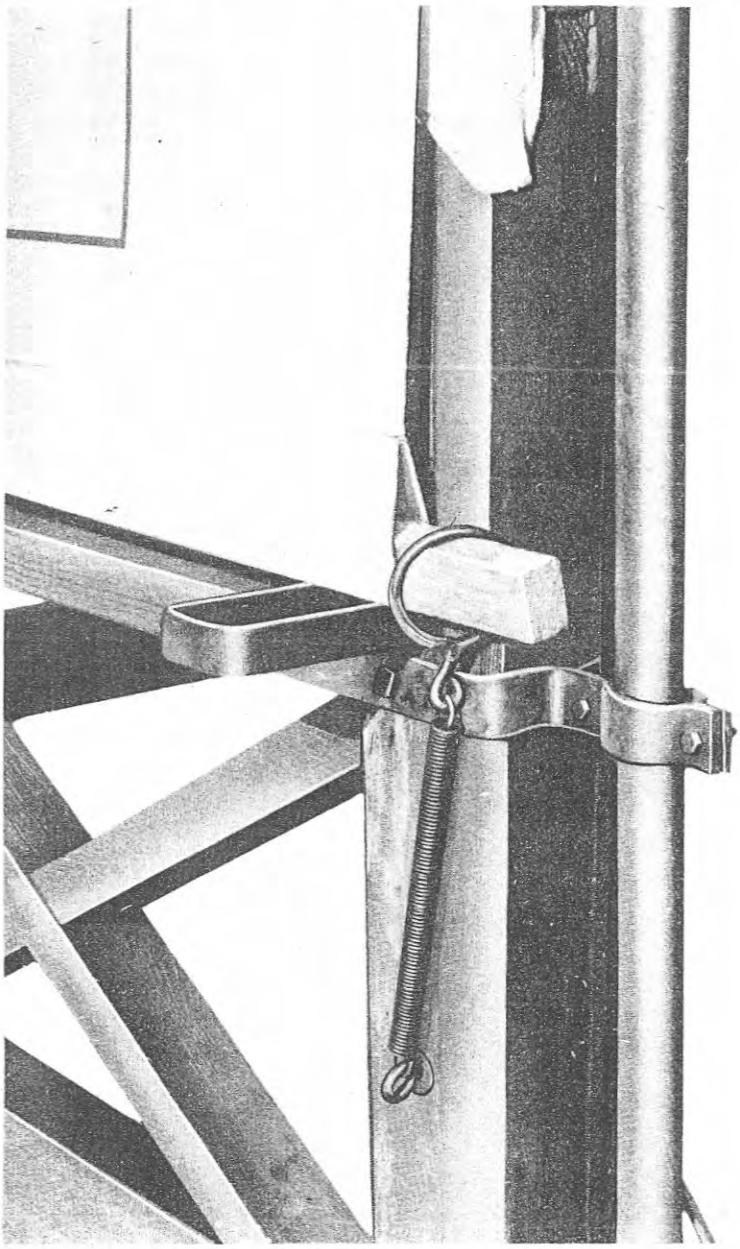


Figure 82 — Spring



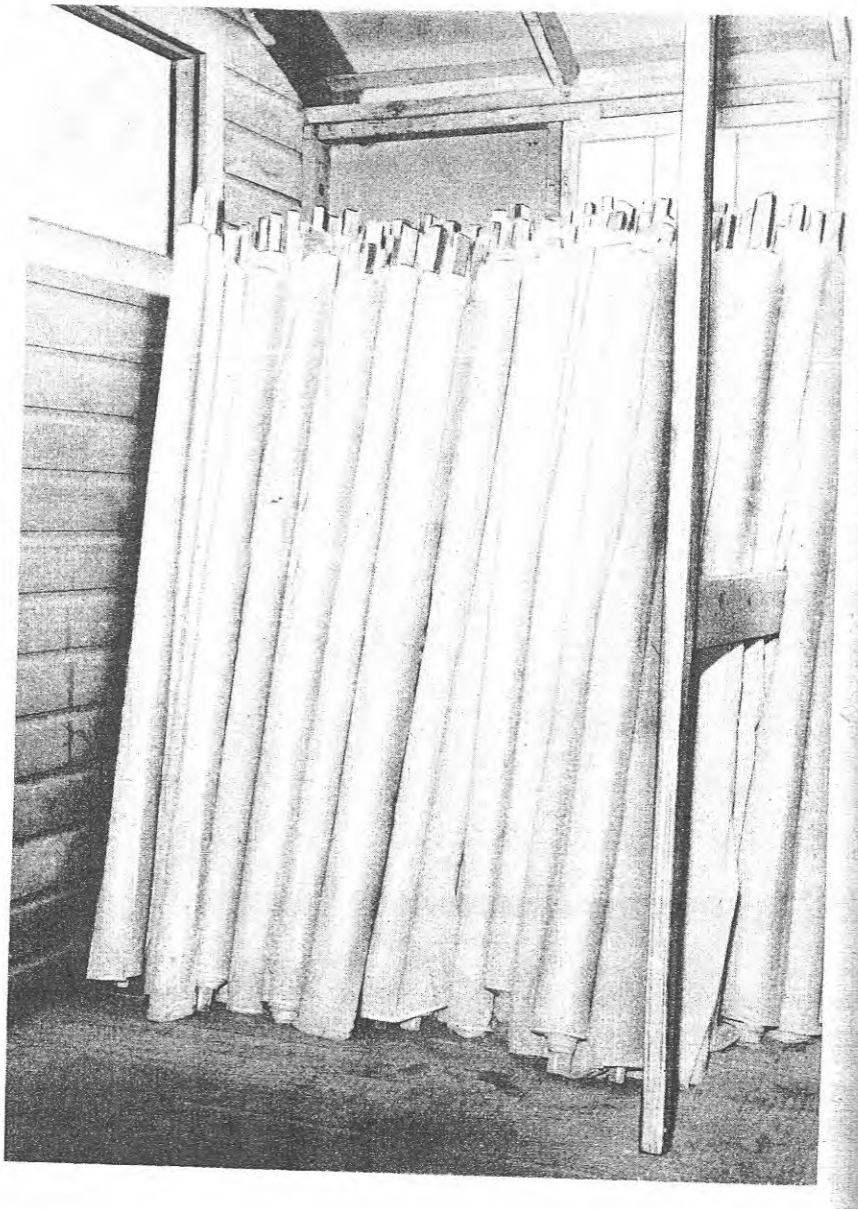
RA PD 22691

Target Frame



RA PD 22692

Figure 82 — Spring Assembly for Roll-type Target



RA PD 22693

Figure 83 — Curtain Roll-type Targets in Storage

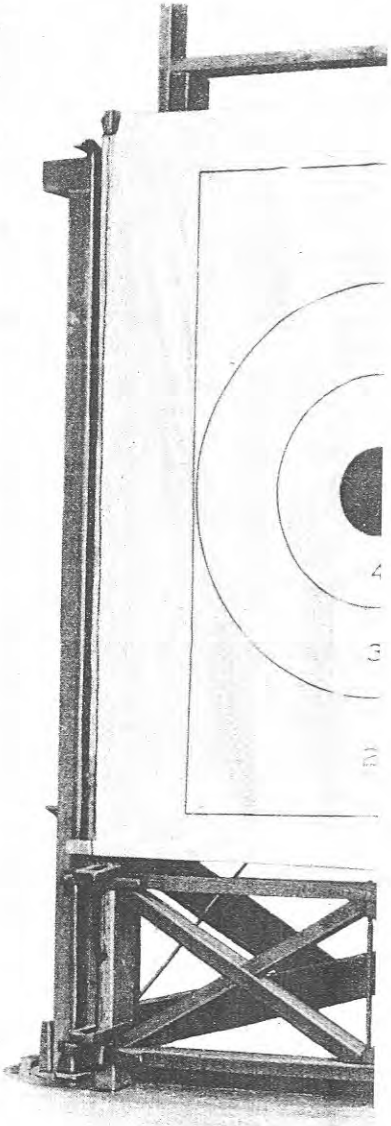
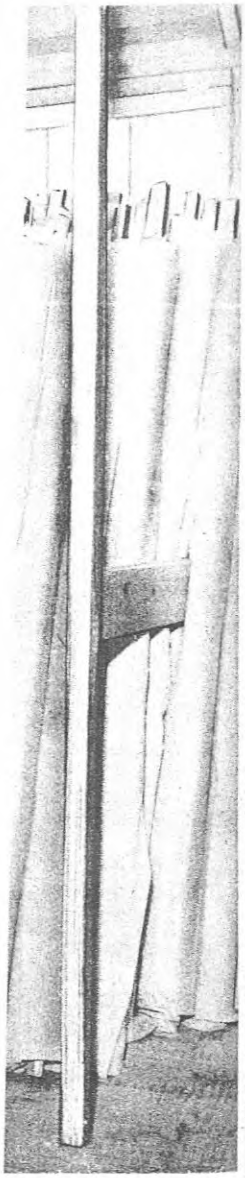
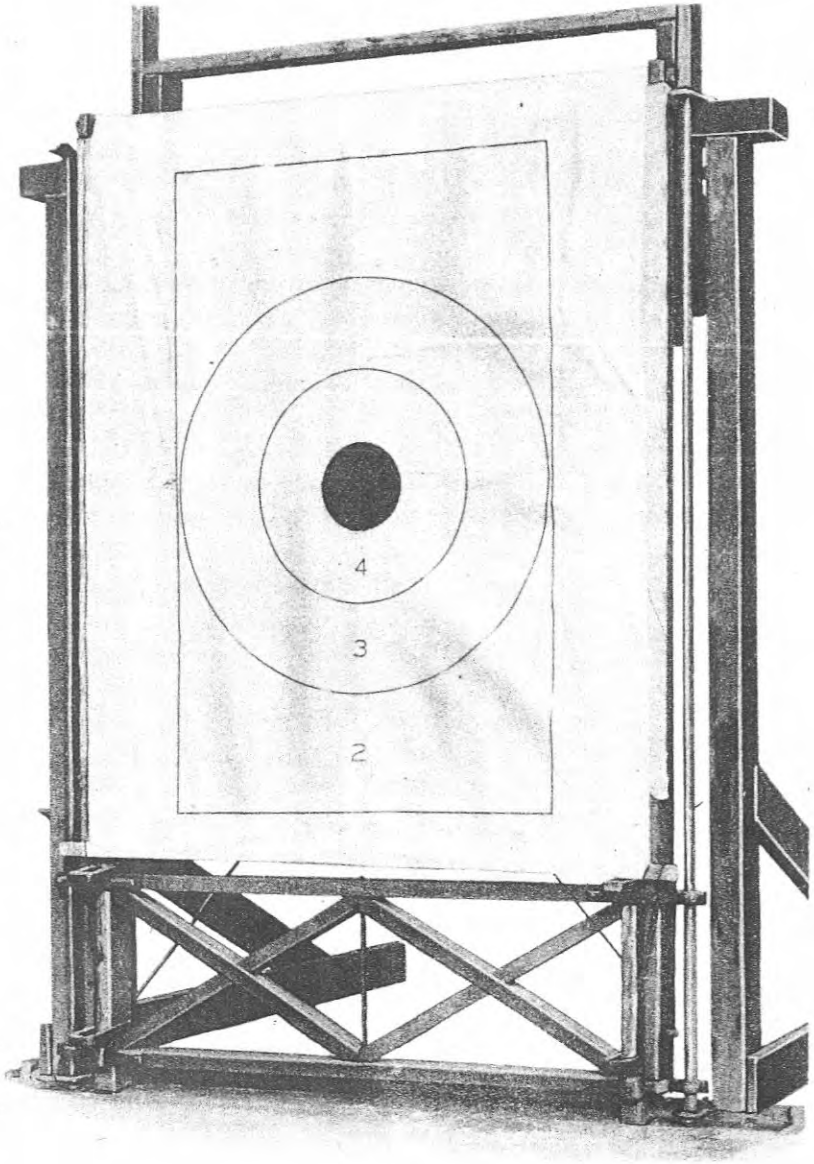


Figure 84 — Target Mou



RA PD 22693

n Storage



RA PD 22694

Figure 84 — Target Mounted on Frame — Front View

15. GAS CHAMBER AND TARGET REPAIR AND RANGE HOUSE.

a. Gas Chamber. See figures 85 to 87, inclusive, for details.

b. Target Repair and Range House. See figures 88 to 89, inclusive, for details.

16. TARGET REPAIR CENTERS.

a. Target repair centers are provided for rifle paper targets A, B, and D, and for pistol paper target L. They are pasted over the paper targets when the paper targets are badly perforated with bullet holes. By using these repair centers, which may be quickly applied with target paste, the paper targets can be continued in service indefinitely. It will be noted that the outer rings or spaces on these repair centers are in segments, permitting ease in matching when applying to the appropriate paper target. Each type of repair center is of buff manila target paper, packed in rolls of 100, each roll wrapped completely and securely in paper, with label suitably printed to describe contents pasted on the outside of the roll.

(1) A-C TARGET REPAIR CENTER. The A-C target repair center is 24⅜ inches high and 24 inches wide; the 4 ring is shown in segments. The bull's-eye is identical with the bull's-eye on the rifle paper target A.

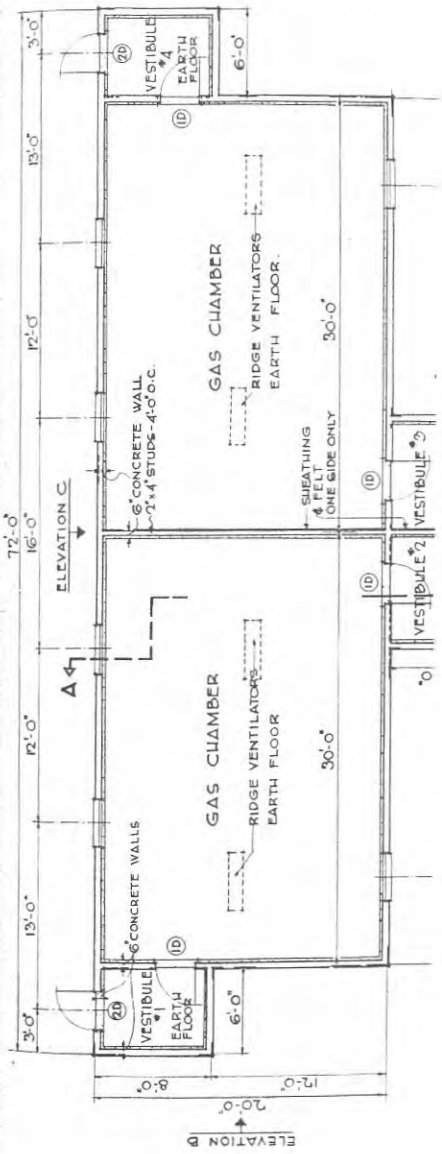
(2) B-C TARGET REPAIR CENTER. The B-C target center is 36½ inches high and 36 inches wide; the 4 ring is shown in segments. The bull's-eye is identical with the bull's-eye on the rifle paper target B.

(3) D-C TARGET REPAIR CENTER. The D-C target repair center is 36 inches high and 36½ inches wide. It includes all the 4 space and the upper corners contain segments of the 3 space. The bull's-eye is identical with the bull's-eye on the rifle paper target D.

(4) L-C TARGET REPAIR CENTER. The L-C target repair center is 24⅜ inches high and 24 inches wide. It includes the bull's-eye and rings 9 to 5 with segments of the 4 ring, and fits pistol paper target L.

17. BAYONET PRACTICE DISK M1.

a. For obtaining accuracy of bayonet thrusts, disks are used on practice dummies. They are made from cardboard, 6 inches in diameter and approximately one-sixteenth inch thick. They are attached to dummies by means of thumb tacks or small nails.



D TRAINING COURSE LAY-OUTS

RGET REPAIR AND RANGE

85 to 87, inclusive, for details.

House. See figures 88 to 89, in-

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ovided for rifle paper targets A, B,
. They are pasted over the paper
badly perforated with bullet holes.
ich may be quickly applied with
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s or spaces on these repair centers
n matching when applying to the
e of repair center is of buff manila
each roll wrapped completely and
ably printed to describe contents

TER. The A-C target repair center
wide; the 4 ring is shown in seg-
vith the bull's-eye on the rifle paper

NTER. The B-C target center is
le; the 4 ring is shown in segments.
bull's-eye on the rifle paper target

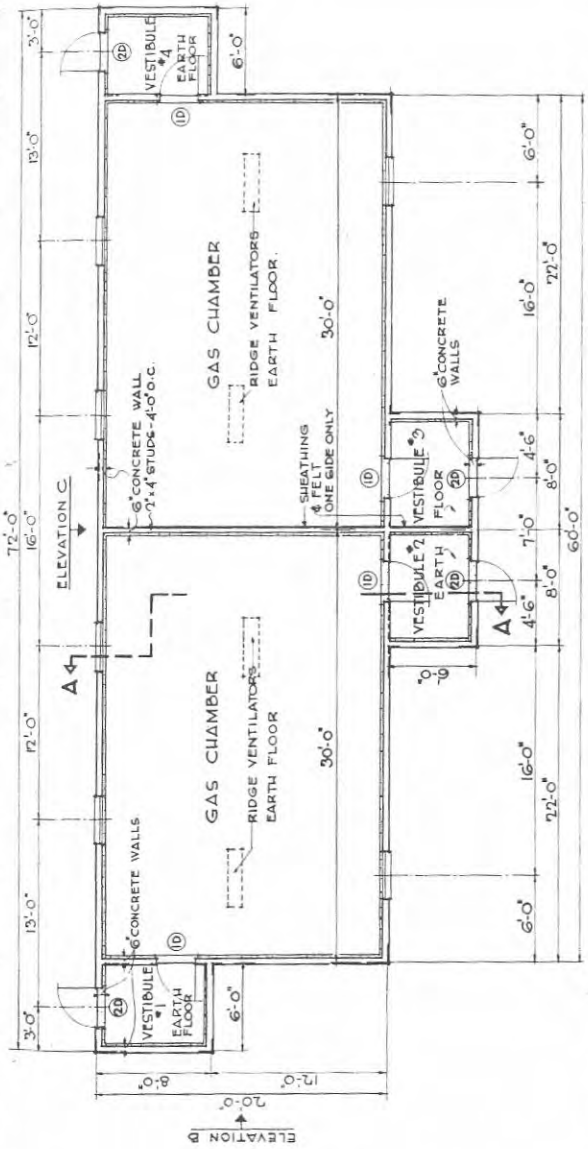
TER. The D-C target repair center
wide. It includes all the 4 space
ents of the 3 space. The bull's-eye
the rifle paper target D.

TER. The L-C target repair center
s wide. It includes the bull's-eye
f the 4 ring, and fits pistol paper

K M1.

bayonet thrusts, disks are used on
ade from cardboard, 6 inches in
ixteenth inch thick. They are at-
numb tacks or small nails.

04



FLOOR PLAN

ELEVATION A

BOTTOM OF CONCRETE WALLS SHOULD NOT BE CARRIED BELOW THE FROST LINE, WHERE SUFFICIENT BEARING CAN BE OBTAINED AT A HIGHER ELEVATION, EXCEPT WHERE CONSIDERABLE HEAVING MAY BE EXPECTED. SOIL BEARING VALUE SHALL BE AT LEAST 3000# PER SQ. FT. IF SOIL BEARING VALUE IS LESS THAN 3000# PER SQ. FT., FOOTINGS SHALL BE RE-DESIGNED BY THE DISTRICT ENGINEER.

DIMENSIONS ARE TO OUTSIDE FACE OF STUDS FOR EXTERIOR WALLS, AND TO CENTER OF STUDS FOR PARTITIONS.

LUMBER SIZES GIVEN ARE NOMINAL SIZES.

PROVIDE ONE 10' LADDER TO HANG ON BRACKETS ON EXTERIOR WALL.

CINDERS OR GRAVEL MAY BE SUBSTITUTED FOR EARTH FLOOR.

RA PD 60991

OCE 1600-150

Figure 85 — Gas Chamber — Plan

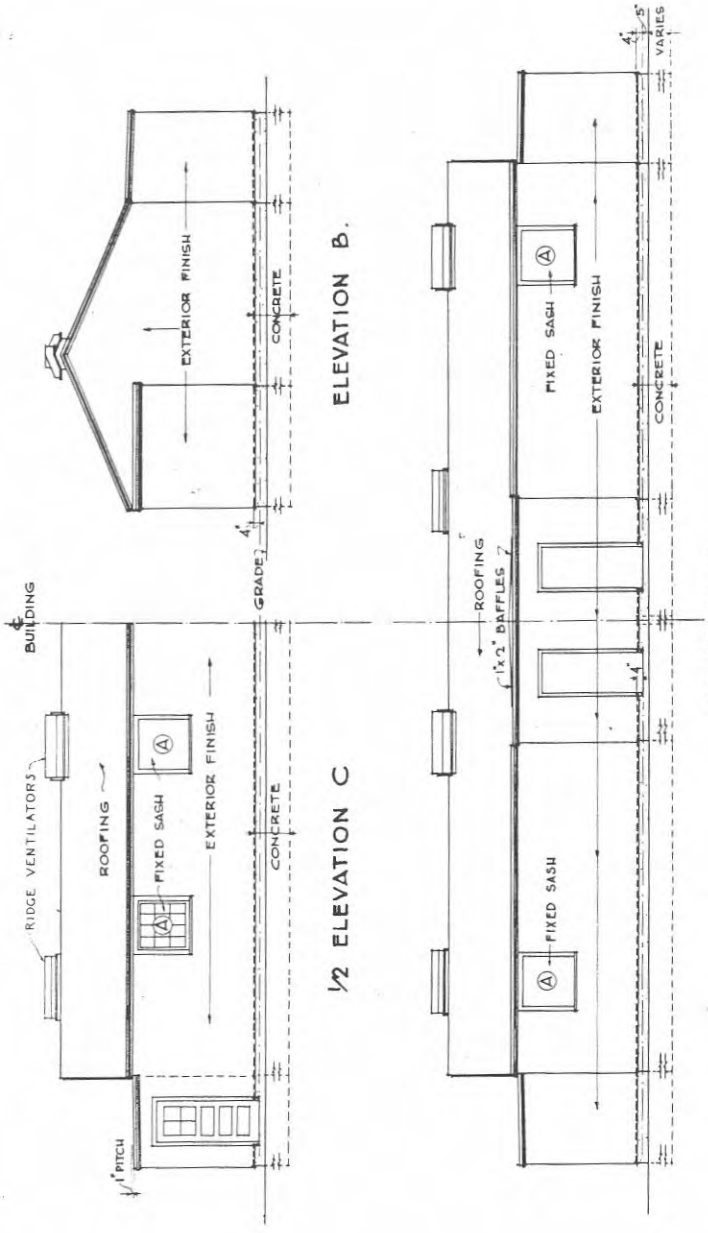
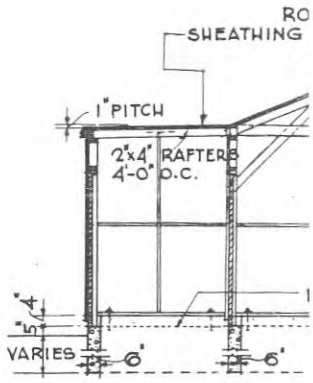


Figure 86 — Gas Chamber — Elevation



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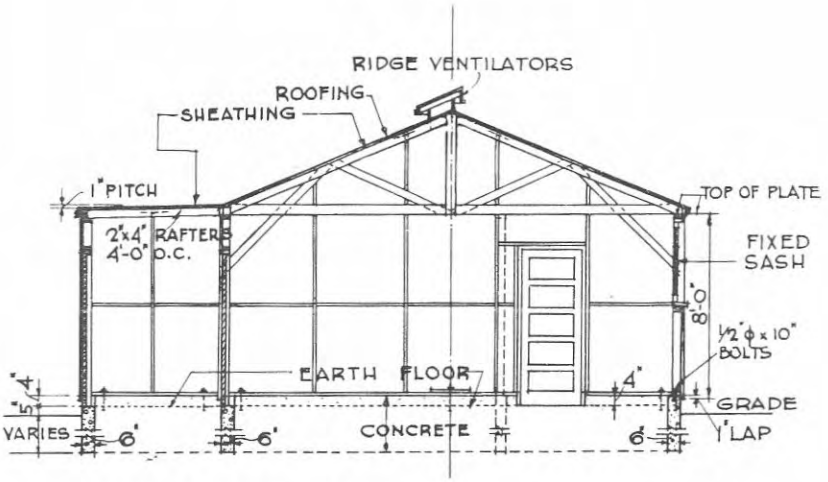
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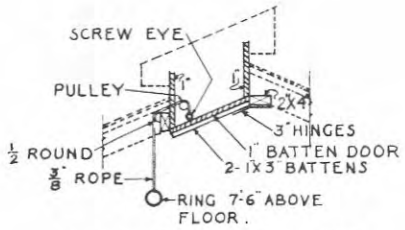
OCE 1600-150

Figure 87 — Gc

TARGETS AND EQUIPMENT FOR CLASS A AND CLASS B RANGES



SECTION A-A

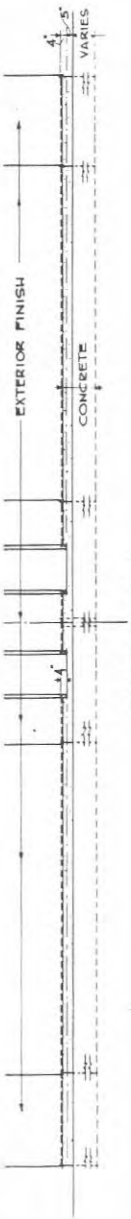


DETAIL OF DOORS UNDER ROOF VENTILATORS

OCE 1600-150 RA PD 60993

Figure 87 — Gas Chamber — Section and Detail

RA PD 60992



ELEVATION A

Figure 86 — Gas Chamber — Elevation

OCE 1600-150

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

18. FLAGS AND STREAMER.

a. To indicate that target ranges are in use and to signal danger, streamers and danger flags are required.

(1) STREAMER. The streamer is of scarlet woolen bunting, 18 feet fly. The halyard end is 5 feet 9⅜ inches wide, bound with olive-drab webbing, with a 1½-inch D-ring with roller sewed on each end. The lower edge of the streamer tapers for its full length to the fly end which is 3 feet wide. Each streamer is provided with one halyard assembly consisting of 30 feet of $\frac{7}{32}$-inch linen sash cord and one No. 5 screw eye. The streamer is hoisted on the mast provided at the commencement of firing and lowered at "cease firing."

(2) DANGER FLAG. The danger flag is of scarlet woolen bunting, 24 inches wide and 36 inches fly, reinforced on one end with olive-drab webbing 1 inch wide. The reinforced piece has a 1-inch D-ring sewed on each end. For use in target pits where one is required per target position, the flag may be fastened to the target staff H. It is used in the target pits to signal misses and is displayed at all times when the targets are not ready. Additional danger flags are located on the outer boundaries of the target range as directed by the commanding officer.

NOTE: *A limited stock of old-style ricochet flags, having a 7½-by 8½-inch scarlet woolen center superimposed on each side of the flag body may be in service. These centers should be ripped off.*

(3) RANGE FLAG. The range flag is of the same dimensions and construction as the danger flag described in step (2), above, but is of white cotton drill. Its primary use is on artillery ranges.

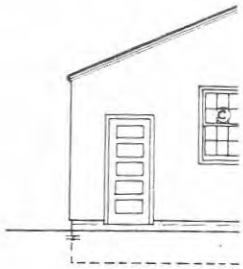
19. FRAMES.

a. Target frames are required for mounting paper targets. They may be used alone or installed as part of a target assembly. Occasionally target frames other than those described below are required and may be improvised or manufactured from materials procured locally.

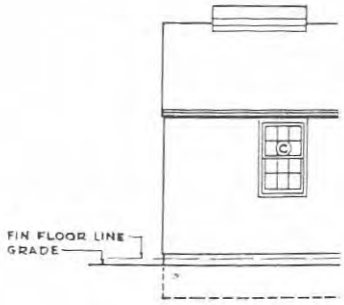
(1) 6- BY 10-FOOT TARGET FRAME. This target frame is part of the combination sliding target, mounting the rifle paper target C. It is also used for mounting the pistol paper target L.

(a) The target frame consists of two horizontal rails, two vertical rails, two target frame supports, and four dowels.

(b) The dowels are of wood and are used to attach the target frame supports to the horizontal rails. The horizontal rails are 10 feet long, 2 inches wide, and 1 inch thick, and are drilled for the dowels 26⅞ inches from the ends. The drilled holes are at an angle

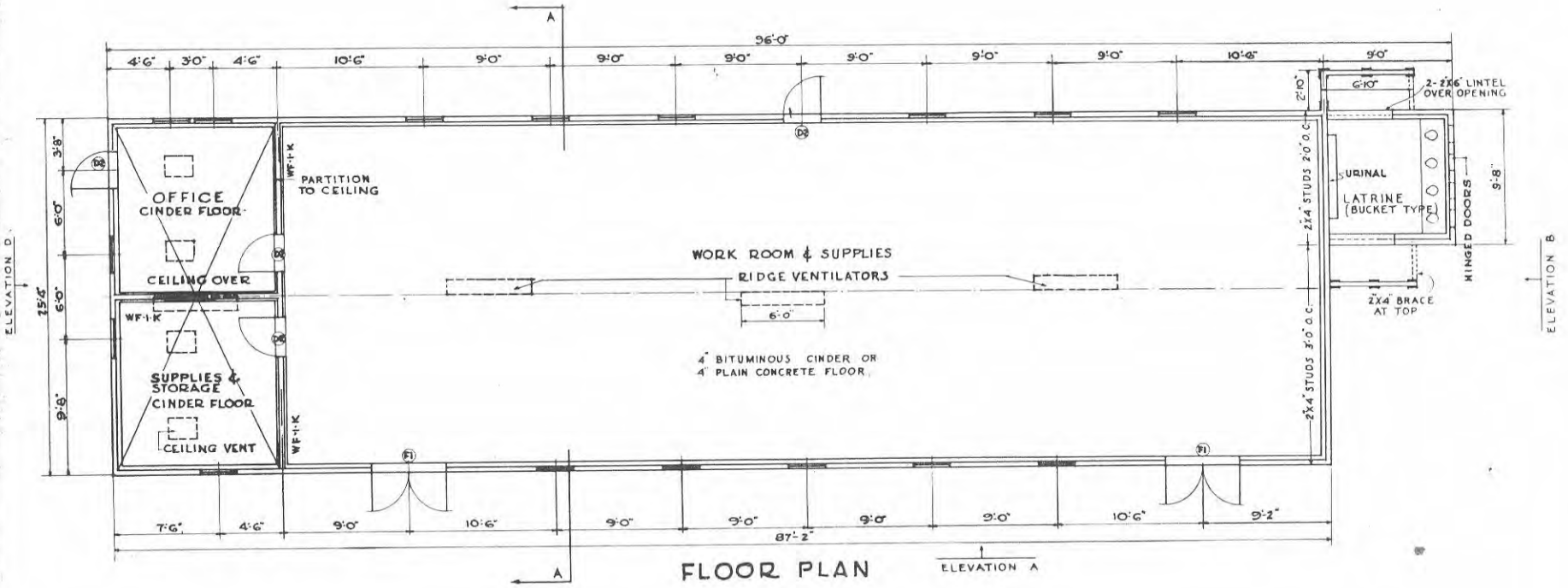


ELEV.



OCE 1600-155

TARGETS AND EQUIPMENT FOR CLASS A AND CLASS B RANGES

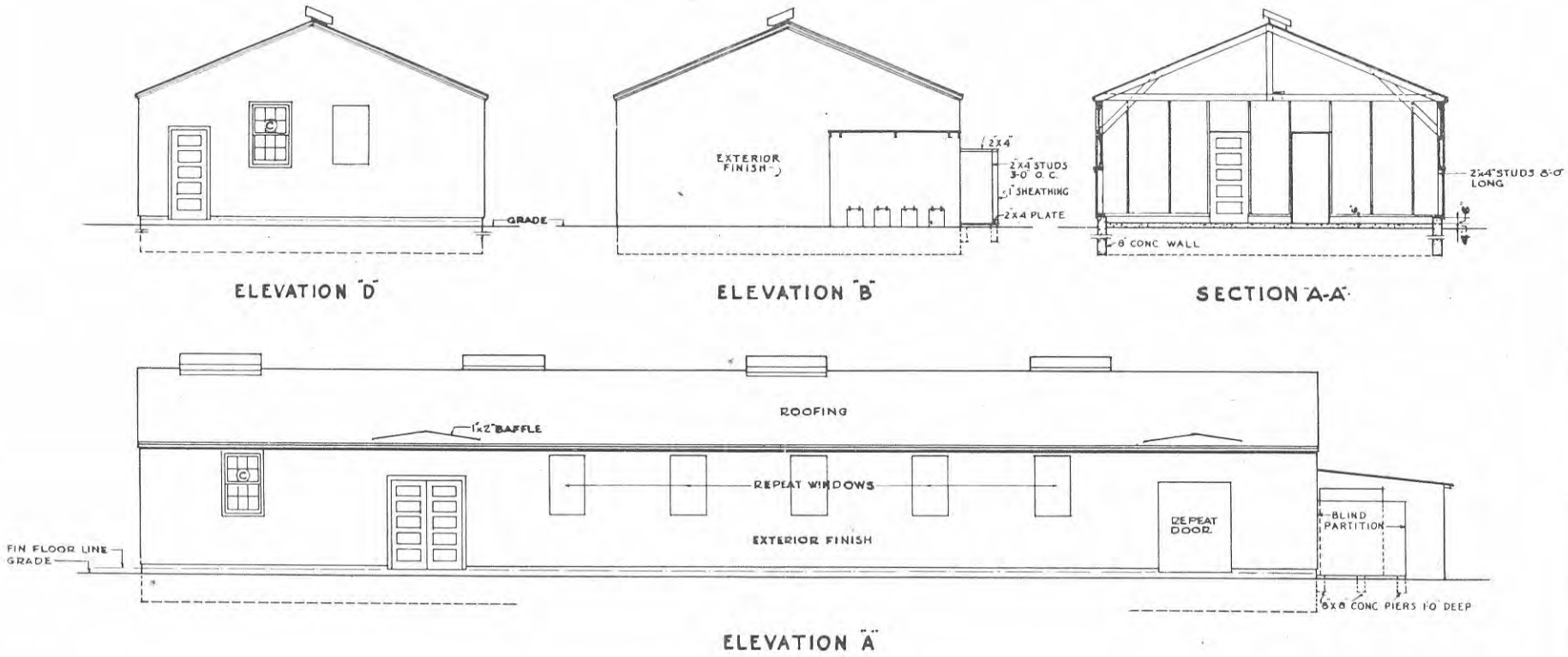


OCE 1600-155

RA PD 60994

Figure 88 — Target Repair and Range House — Plan

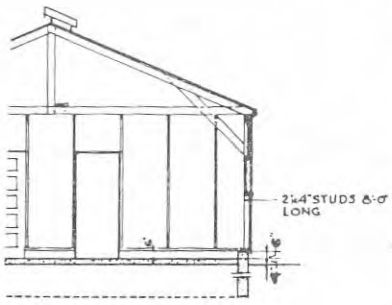
TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS



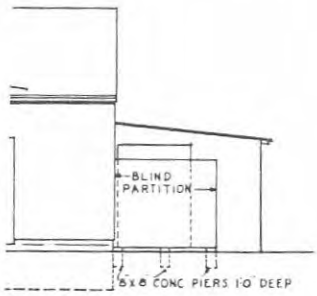
OCE 1600-155

RA PD 60995

Figure 89 — Target Repair and Range House — Elevations and Section



CTION A-A



RA PD 60995

TARGETS AND EQUIPMENT FOR CLASS A AND CLASS B RANGES

of 20 degrees, and correspond to the dowel holes in the target frame support. The vertical rails are mortised and are 6 feet 2½ inches long, 2 inches wide, and 1 inch thick. The target frame supports are 8 feet 9¾ inches long, 3⅝ inches wide, and 1⅝ inches thick. Each support has two grooves which are drilled at a 20-degree angle for the dowels.

(c) To assemble the target frame, lay the two horizontal rails on a bench or horses so they are approximately parallel and 6 feet apart. Fit the target frame supports to the horizontal rails, being careful to have the dowel holes correspond. Drive in the dowels through the horizontal rails and into the target frame supports. The dowels should be flush with the face of the horizontal rails in order that the target cloth may be smoothly installed. Now fit the vertical rails by fitting the tenons on the horizontal rails into the appropriate mortises in the vertical rails.

(d) When the target frame is assembled, it should be covered with target cloth. The cloth supplied is 72-inch wide unbleached cotton sheeting approximately 14 ounces per linear yard. It is supplied in commercial yardage bolts. In covering the target frame with this cloth, it is advisable to have the frame on a bench or horses so that the cloth may be attached without moving the frame. Unroll approximately 7 feet of cloth but do not cut or tear off. Lay the cloth on the frame and have handy at least 60 double-pointed tacks. Tack the free end of the target cloth about midway on one vertical rail and then stretching it tightly, tack it midway on the other vertical rail. Then tack midway on the horizontal rails. Complete the tacking by finishing at diagonal corners, placing the tacks about 6 inches apart and keeping the cloth smooth and taut. Cut the cloth from the bolt so as to have a clean free edge for use on the next frame.

(2) 6- BY 6-FOOT TARGET FRAME. This target frame is part of the combination sliding target, mounting the rifle paper targets A, B, and D. It is also used as the foundation for the paper silhouette tank machine gun target M.

(a) The target frame consists of two vertical rails with an over-all length of 8 feet 11⅝ inches, 3⅝ inches wide, and 1⅝ inches thick, and two horizontal rails which are 6 feet long, 3⅝ inches wide, and 1⅝ inches thick. The ends of the horizontal rails are machined to 1½ inches to form tenons to fit into mortises formed on the vertical rails. Assembling consists of fitting the tenons into the appropriate mortises.

(b) After assembly the frame is covered with target cloth as outlined in a (4) above.

(3) 3- BY 5-FOOT MACHINE GUN TARGET FRAME. This target frame is part of the machine gun rolling target assembly but in addi-

tion to mounting all machine gun paper targets, it is used for mounting automatic rifle and small bore rifle paper targets.

(a) The target frame consists of two target frame sides, two target frame ends, and two target staves.

(b) The sides are 5 feet long, 4 inches wide, and 1 inch thick; the ends are 3 feet long, 4 inches wide, and 1 inch thick. The staves are 45½ inches long, 3½ inches wide, and ¾ inch thick; one end of the stave is machined at an angle for 4½ inches to form a point.

(c) Assembling consists of nailing the ends and staves on the sides, using sixpenny wire nails, then covering with target cloth. The cloth supplied for this frame is 36 inches wide.

(d) Due to the spacing of the stave sockets in the beam of the rolling target, the target frames must be right and left hand. The components of the right frame and left frame are identical, the difference being in the location of the stave on the target frame sides.

(4) MODIFICATION FOR USE ON AIKEN TARGETS. A number of ranges, especially those used by the National Guard, are equipped with the nonstandard Aiken target. The 6- by 6-foot target frames may be used on this target when properly modified in accordance with Ordnance drawing 39-1-106.

(5) STORAGE. Target frames should be stored flat in a dry place. When storing the target frames at the end of the target season, remove the target cloth and salvage it, as the paste used in attaching the paper targets attracts rodents.

(6) METHOD OF APPLYING PAPER TARGETS.

(a) The target frame must be placed on some surface which will prevent the target cloth from sagging when the paper target is pasted on it. A table for this purpose can be constructed easily. The top of the table should be just the size of the inside of the target frame, with an edging around the top but an inch below it, so that when the target frame is placed on the table the cloth will be supported evenly by the table top, and the target frame, setting down over the edge, will be supported by the edging strip.

(b) Using the paste brush provided for the purpose, put the target paste thickly but evenly all over the back of the paper target, then fold the paper target from each end to the center, thus bringing pasted surfaces together, and place the paper target aside for a few minutes. This will allow the paste to soak into the paper target. In the meantime cover the cloth on the target frame with paste, getting the coat on evenly. Now open up the paper target and lay it on the target frame (frame being on the table), getting it started square and brushing out all the wrinkles with a clean paste brush. See that all the edges of the paper target are securely pasted down. When this target dries, it will be perfectly smooth and even.

(7) METHOD OF MAKING PASTE. The quartermaster corps issues target paste for pasting paper targets on target frames but if target paste is not available flour is issued.

(a) If target paste is issued, it needs only to be mixed with water to the proper consistency.

(b) To make paste with flour, proceed as follows: Use an ordinary galvanized iron bucket which holds 12 quarts. In this bucket place 2 quarts of flour and pour in a little cold water gradually, stirring all the time until the flour is all wet and the lumps are broken up, making a rather thin dough. Next, pour in boiling water, stirring rapidly. It is necessary that the water be boiling hot and that the paste be stirred very briskly. Do not fill the bucket entirely to the top with boiling water, as the paste swells as soon as the boiling water is poured in and the stirring started. Do not make more paste than is needed at one time as it sours in a few days. If it gets too thick at any time, it can be thinned with a little cold water. To keep rats from gnawing targets, put a tablespoonful of concentrated lye dissolved in a pint of water in each bucket of paste.

20. COLORING OF AMMUNITION FOR INDENTIFICATION PURPOSES IN SCORING HITS.

a. To provide a method for scoring individual hits when several gunner's phases are fired on the same target, colored ammunition will be used with each gunner using a specific color. The ammunition can be colored in colors of red, green, blue, black, brown, yellow, and orange. The coloring material will be mixed as follows:

(1) Mix thoroughly 1 pound of lithographic ink with 9 pints of turpentine.

(2) Melt 4 pounds of beeswax.

(3) Stir vigorously the mixture of ink and turpentine into the melted beeswax.

(4) Best results can be obtained if the coloring material is allowed to set approximately 3 hours before using.

NOTE: *Do not attempt to reheat the mixture after the ink and turpentine have been mixed into the beeswax.*

(5) The coloring material can be thinned when necessary by adding a small quantity of turpentine.

b. The ammunition will be colored as follows:

(1) Assemble the ammunition in belts of convenient length. Make a tight coil of each belt.

(2) Pour the coloring material into a shallow pan of sufficient size to accommodate the coil of ammunition. The depth of the color-

ing material in the pan should be three-eighths of an inch for cal. .30 ammunition and five-eighths for cal. .50 ammunition.

(3) Tap the projectile end of coiled ammunition on a flat surface to aline the bullets in the coil.

(4) Dip the projectile end of the coiled ammunition into the coloring material. Care must be exercised that the coloring material is applied only to the tapered portion of the projectile.

(5) Stand the coil ammunition, projectile ends down, on a drain surface to allow the excess material to drain off.

(6) Allow the colored ammunition to stand for 6 hours to dry before using.

c. Plain ammunition should not be used along with colored ammunition when the scoring of hits is necessary, as the tracer ammunition used in the plain ammunition belts will leave a red mark on the target.

d. Particular care must be exercised to clean thoroughly the gun and ammunition containers upon the completion of firing.

e. The hits on a target can be identified as follows:

(1) The bullet holes in the target will be edged on the entering side only with a clear tint of the color used. If sleeve-type targets are used and the bullet penetrates the target at two points, each point of penetration will be tinged in the color used on the entering side.

(2) Crease hits will show a more pronounced color marking than penetration hits.

NOTE: *If beeswax is not available, use castor oil in the ratio of about 1 teaspoonful to 1 pint of ink mixture. Some experimentation, however, may be necessary to determine the proper amount of castor oil to use, since atmospheric conditions, which control the drying rate, vary from place to place and in a given place at different times of the year.*

21. MARKERS.

a. General. Target markers are used to signal the value of hits made on targets. They consist of painted sheet steel disks attached to wooden staffs and held in place by carriage bolts, plain washers, and wing nuts. Each staff (except the pistol target marker) has two target marking disks, one right and one left. The right target marking disk is painted white on one side and red on the reverse side; the left target marking disk is painted white with a black cross on one side and black on the reverse side. For uniformity, the disks are assembled on the marking disk staffs with the white and white with black cross, and the red and black, in related positions. The staffs of the two lengths, 9 and 10 feet, are slotted for particular disks

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c. Midrange.
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22. ELECTRIC

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and are painted with metallic red paint. The staffs are packed 20 in a bundle, bound with two strips of band iron.

b. Short Range. The short range target marking disks are 10 inches in diameter and are mounted on a short range marking disk staff 9 feet long. This target marker is used at 200- to 300-yard ranges.

c. Midrange. The midrange target marking disks are 20 inches in diameter and are mounted on a marking disk staff 9 feet long. This target marker is used at 500- and 600-yard ranges.

d. Long Range. The long range target marking disks are 30 inches in diameter and are mounted on a marking disk staff 10 feet long. This target marker is used at 800- and 1,000-yard ranges.

e. Pistol. The pistol target marker has only one disk which is 4 inches in diameter and painted white on one side and black on the reverse side. The disk is mounted on a pistol marking disk staff which is 9 feet long. This target marker is used with pistol paper target L in slow and rapid fire dismounted pistol practice.

22. ELECTRIC AND MANUAL RELEASE SKEET OUTFIT.

a. The skeet outfit and clay pigeons are provided for the use of authorized Air Corps personnel in shotgun practice firing on the ground which will be of value to them in aerial gunnery. In order to conserve skeet targets (clay pigeons), one commercial skeet net is authorized for issue to each Air Corps post or station where the annual consumption of shotgun shells for skeet is 15,000 rounds or more.

b. There are now in use, in various flexible gunnery training installations, several types and makes of skeet and trap shooting equipment. Some of this equipment is electrically operated and some manually or mechanically operated.

c. The electrical release skeet outfit is a commercial article and is supplied in either of three models: 110-volt, single phase, 60-cycle, alternating current; 110-volt, single phase, 25-cycle, alternating current; and 6-volt, 150-ampere-hour, direct current (storage battery).

d. Electrically operated equipment can easily be converted to manually operated units by a few minor changes and replacements. In view of this, electrically operated units now in use will continue in operation until repair or replacement of electrical components is required, at which time the unit will be converted to a manually operated unit. The following listed skeet and trap equipment is classified as commercial standard and procurement limited to these types:

Outfit, skeet, manually operated, Western Master

Outfit, skeet, manually operated, Remington Wonder

Trap, auto-angling, Remington M41

Trap, self angling, Western White Flyer

e. Figures 49 to 51, inclusive, show a detailed lay-out for a skeet range.

23. PASTERS.

a. Two colors of gummed and waterproofed target pasters are supplied, black and buff. The pasters are 1 inch square and are supplied in perforated sheets of 100.

(1) The target pasters are used for covering shot holes in black and in buff areas of paper targets, and for indicating aiming points on and covering shot holes in machine gun and automatic rifle targets. These target pasters are supplied in envelopes, each envelope containing 10,000 pasters.

(2) To use the target pasters, moisten the gummed side and slide it onto the target. An appropriate color of target paster should be pasted over each shot hole before the target is raised for use.

24. SPOTTERS.

a. Target spotters are supplied in three sizes and are used to indicate the location of shot holes on paper targets. The complete target spotter consists of a cardboard disk, white on one side and black on the reverse side. The disk has a $\frac{5}{16}$-inch hole in its center, in which is inserted a target spotter spindle. The spindle is of wood, $3\frac{1}{4}$ inches long, and has a maximum of $\frac{11}{32}$ inch. Disks and spindles are issued separately.

b. 3-inch Target Spotter. The 3-inch target spotter consists of a target spotter disk 3 inches in diameter and a target spotter spindle. It is used for spotting shot holes on rifle paper targets A and D. In slow fire, each shot is spotted as it hits; therefore only one target spotter per target position is required when using paper targets. In spotting rapid fire, 16 shots with the M1 Rifle and 10 shots with the M1903 Rifle are spotted at a time; therefore for rapid fire 16 spotters should be available when firing with the M1 Rifle and 10 spotters when firing with the M1903 Rifle.

c. 5-inch Target Spotter. The 5-inch target spotter consists of a target spotter disk 5 inches in diameter and a target spotter spindle. It is used for spotting shot holes on rifle paper target B. As this target is only used in slow fire where each shot is spotted as it hits, only one target spotter is required per target position.

d. 10-inch Target of a target spotter dis spindle. It is used fo As this target is only it hits, only one target

25. H STAFF.

a. This staff is a for mounting the dan wood, 1 inch by $1\frac{1}{4}$ color. One end of the equally spaced transve 50 staffs and 150 wo component of the H ta

26. STAVES.

a. Target staves ar and are provided in t inches. One end is for in a bundle, bound wit

b. The 24-inch tar Prone F Target M191

c. The $45\frac{1}{2}$-inch t Kneeling E Target M target frame assembly.

d. The 84-inch tar board M Target M191

27. ANTIAIRCRAF

a. The following manship instruction machine gun.

b. 500-inch AA. is printed with black 48 inches wide. It is used as a glider target ing with the rifle and target. The targets ar pletely and securely in contents pasted on out cured and constructed

c. Parachute Tar

d. Balloon Targe ticity and strength. I

d. 10-inch Target Spotter. The 10-inch target spotter consists of a target spotter disk 10 inches in diameter and a target spotter spindle. It is used for spotting shot holes on rifle paper target C. As this target is only used in slow fire where each shot is spotted as it hits, only one target spotter is required per target position.

25. H STAFF.

a. This staff is a component of the H target and is also used for mounting the danger ricochet and range flags. It is made of wood, 1 inch by 1¼ inches by 9 feet, and is painted olive drab in color. One end of the staff is slotted to a depth of 40 inches and has equally spaced transverse tapered holes. Each crate is packed with 50 staffs and 150 wood taper pins. The wood taper pins are a component of the H target.

26. STAVES.

a. Target staves are made of wood, 3½ inches wide, ¾ inch thick, and are provided in three lengths: 24 inches, 45½ inches, and 84 inches. One end is formed into a point. The staves are packed 10 in a bundle, bound with two strips of band iron.

b. The 24-inch target stave is used for mounting the pasteboard Prone F Target M1917.

c. The 45½-inch target stave is used for mounting the pasteboard Kneeling E Target M1917 and also a component of the machine gun target frame assembly.

d. The 84-inch target stave is a component of the Standing Pasteboard M Target M1913 complete.

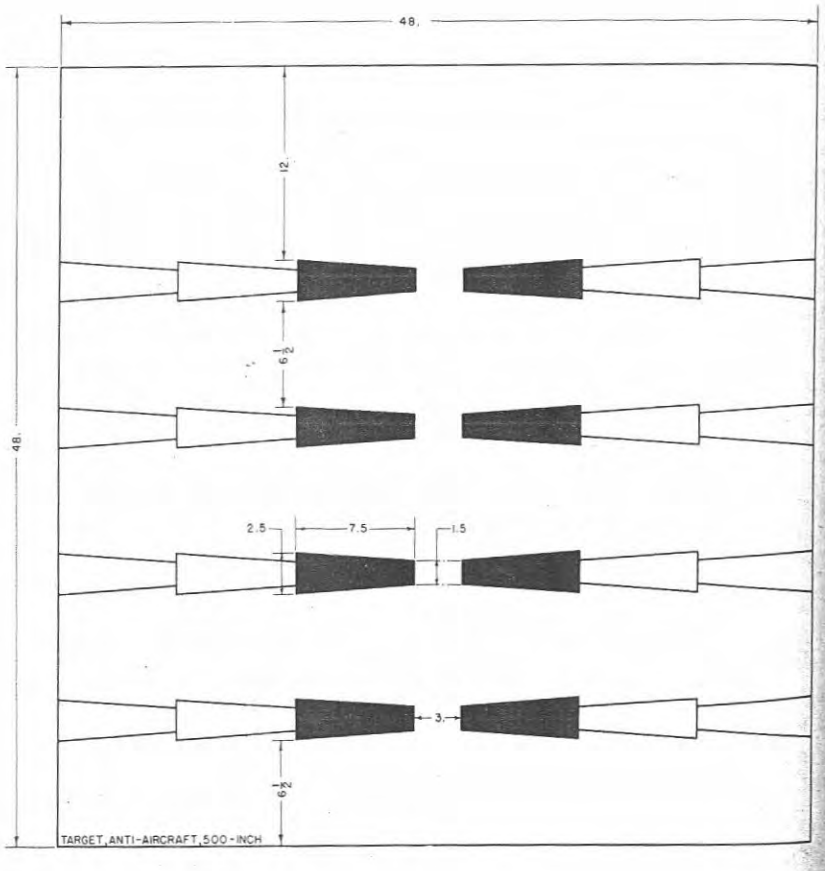
27. ANTIAIRCRAFT TARGETS.

a. The following antiaircraft targets are for antiaircraft marksmanship instruction practice with the rifle, automatic rifle, and machine gun.

b. 500-inch AA. Machine Gun Target (fig. 90). This target is printed with black ink on buff manila paper, 48 inches high and 48 inches wide. It is a nonoverhead instruction target; it is also used as a glider target. Other targets prescribed for antiaircraft firing with the rifle and automatic rifle may be made locally from this target. The targets are packed 50 in a roll, each roll wrapped completely and securely in paper, with label suitably printed to describe contents pasted on outside of roll. The permanent equipment is procured and constructed locally on a 500-inch range.

c. Parachute Target. For details, see figures 91 and 92.

d. Balloon Target M1. This is a rubber balloon of high elasticity and strength. It is spherical in shape when inflated.



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Figure 90 — 500-inch Antiaircraft Target

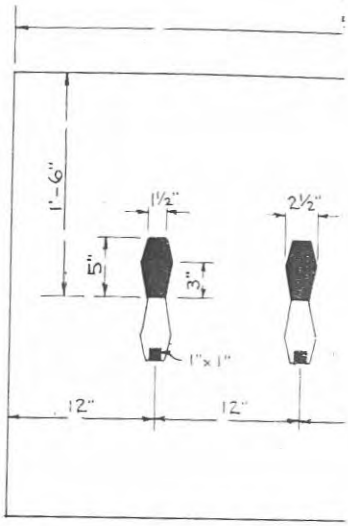


Figure 91 — Aiming

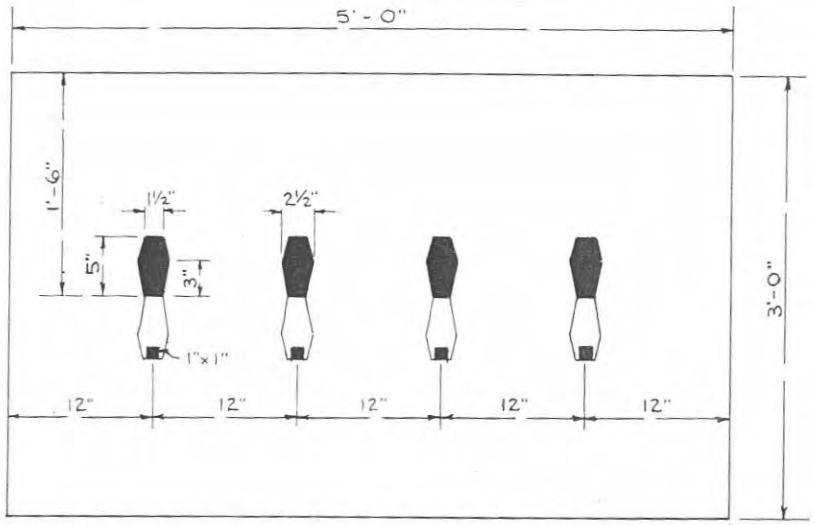
e. Target Rocket Proje details, see TM 9-390.

f. Target Kite Kit M9 (fi

(1) DESCRIPTION.

(a) The kite contained i a maneuverable aerial targe "Eddy" pattern kite of 5-foot of 150 to 200 yards. Because vered across the sky at a vert a lateral course of about 90 de conditions these angles increa extent of operation and contr the sky is about 40 miles pe its lateral speed. Its extent c looped or put through vertica manipulation by the kite oper workout at a moving target i of turrets. In a calm or light an auto or a rail car. At sea the moving ship generating its

(b) Operation is by mean kite from the ends of a contr



RA PD 23927

Figure 91 — Aiming and Leading Parachute Target

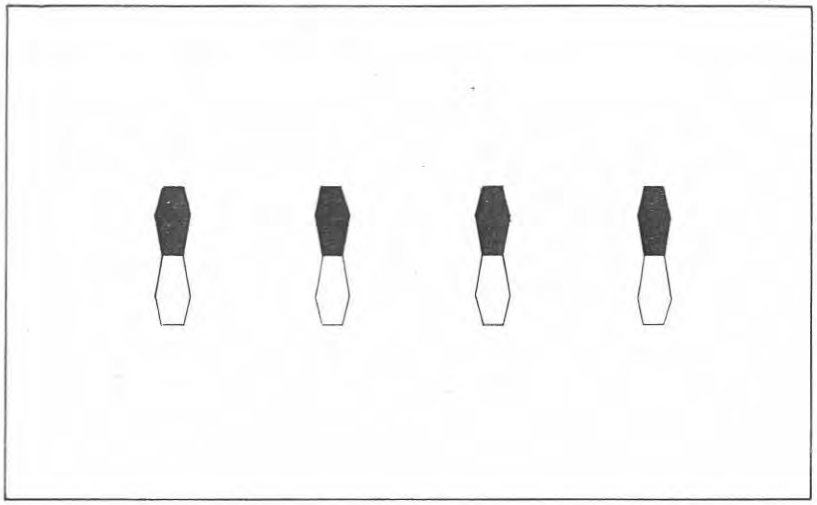
e. Target Rocket Projector M1 and Target Rockets. For details, see TM 9-390.

f. Target Kite Kit M9 (fig. 93).

(1) DESCRIPTION.

(a) The kite contained in the Target Kite Kit M9 functions as a maneuverable aerial target. It is a two-stick, diamond-shaped "Eddy" pattern kite of 5-foot span and is usually flown at a range of 150 to 200 yards. Because of its unique control, it can be maneuvered across the sky at a vertical angle of about 45 degrees and over a lateral course of about 90 degrees, although under the best operating conditions these angles increase. The available wind determines the extent of operation and control. In a 20-knot wind, the speed across the sky is about 40 miles per hour. The kite dives at about twice its lateral speed. Its extent of control is so complete that it can be looped or put through vertical and horizontal figure eights. Skillful manipulation by the kite operator can give a gunner a very thorough workout at a moving target in practicing lead and in manipulation of turrets. In a calm or light wind, the kite may be operated from an auto or a rail car. At sea it may be flown from the deck with the moving ship generating its own wind.

(b) Operation is by means of two lines which extend up to the kite from the ends of a control bar on the reel. Near the kite the

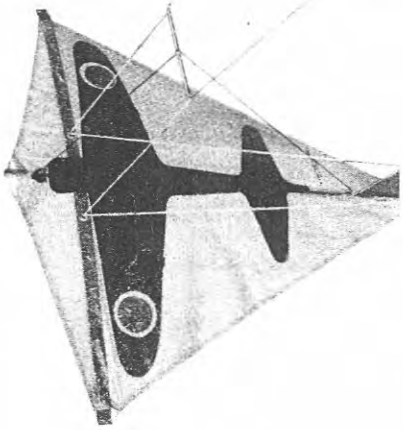


RA PD 23926

Figure 92 — Parachute Instruction Target

two lines connect to the ends of a horizontal bridle stick, from which control cords extend to a rudder at the foot of the kite. Yawing of the control bar by the operator swings the rudder by means of this linkage. When the rudder is kept in line with the vertical axis, the kite is inherently stable. It has no tail. A slight movement of the rudder causes the kite to veer across the sky; a full movement throws the kite into a loop; a full movement followed by a quick alining of controls puts the kite into a dive from which it can be readily recovered by a quick rudder pull, after which the kite climbs back to its ceiling.

(c) The chief components of the reel (fig. 94) are the shaft with two ratchet and pawl mechanisms in the hubs of the winding drums. When the crank handle is turned forward, the pawls engage to turn the drums together but when the crank handle is held fast, either drum may be turned backward independently of the other. This differential action enables the flying lines to be adjusted to equal length at any time; a very necessary item for proper operation of the kite. On each side of the winding drums are brake hubs held fast to the shaft by pins. A brake yoke is hinged above each hub, and can be pressed against them by pulling upward on the front of the yoke. This serves to slow down or stop the rotation of the winding drums. This drum and brake assembly is supported in a frame at the front of which is a bar composed of upper and lower pieces, separated with two pulleys between at the center and two between at each



TARGETS AND EQUIPMENT FOR CLASS A AND CLASS B RANGES

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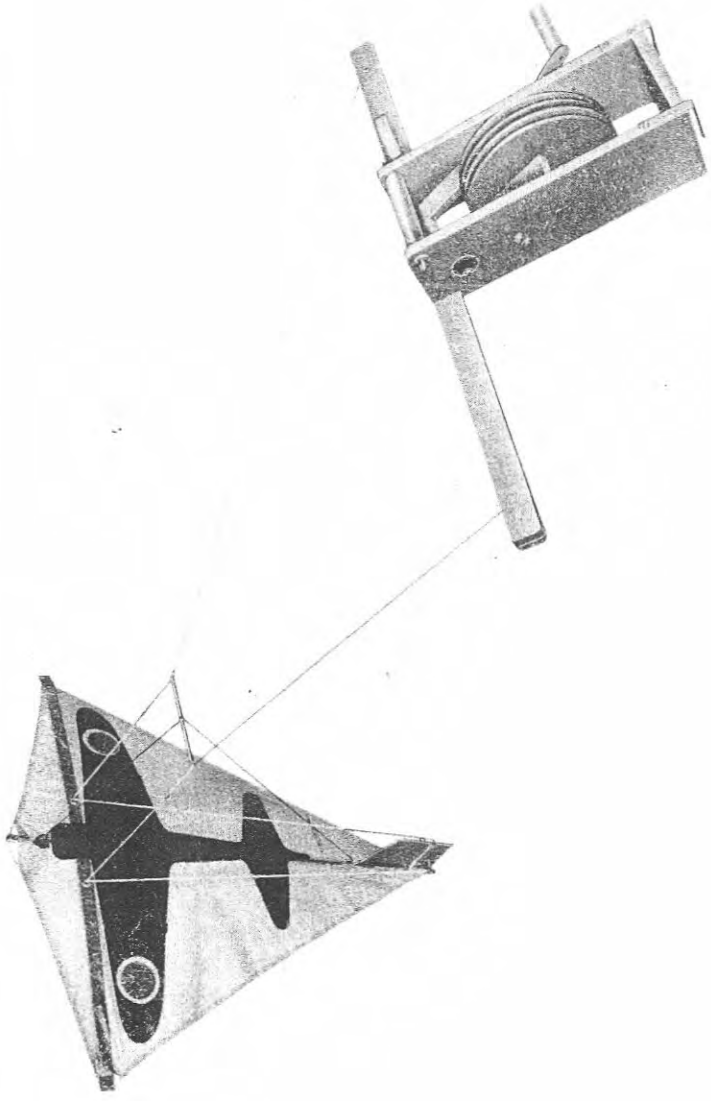


Figure 93 — Target Kite Kit M9

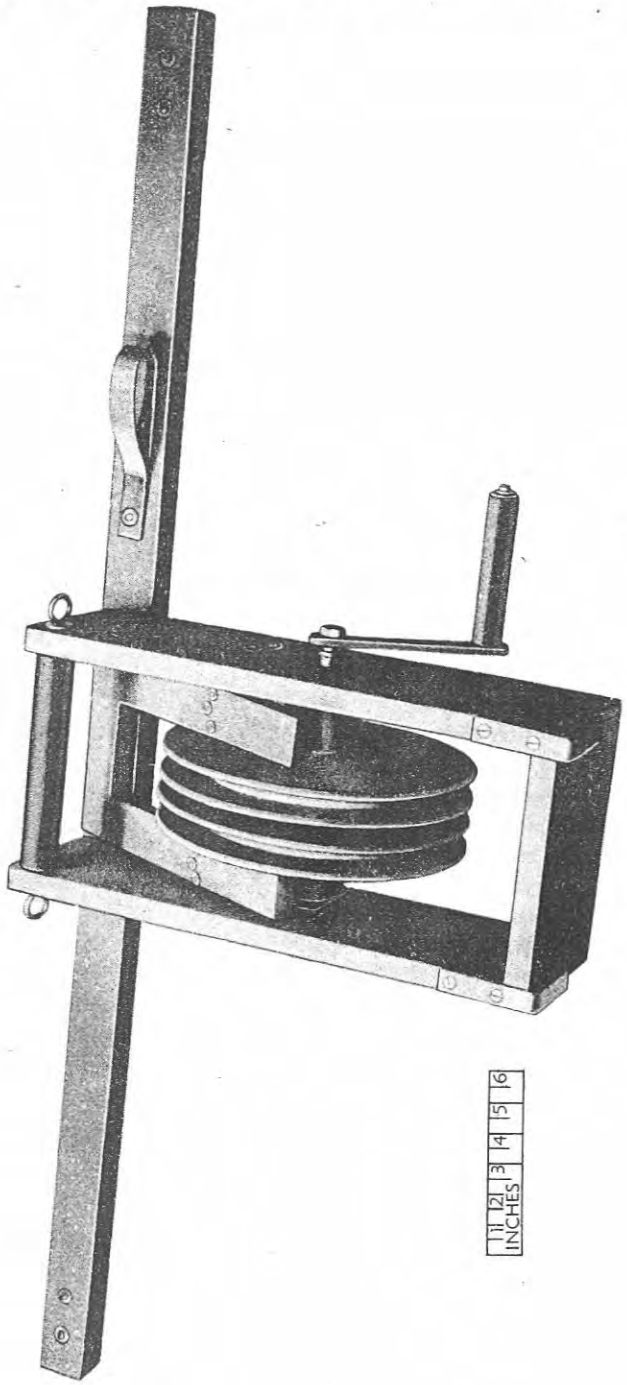


Figure 94 — Reel of Target Kite Kit M9

end. Each of the two flying lines issu goes forward around the inner face of then spanwise and between the outer where it is tied to a snap. There are spacers which serve to keep the two l sufficient distance so that the lines, eve Each reel is equipped with a 2-angle it on the operator's belt. There are tw around the belt at the rear, cross over t over the shoulders to the two screw e Thus the reel is supported in front o free to operate it. A loop on the bar a hold the handle wherever the operator

(d) The necessity for the differen drums becomes apparent when the kit although the reel is designed with na play while cranking, so that the inc shuttle back and forth to avoid pilin even so, there will be unevenness, ofte by yawing the bar. Moreover, the yaw for maneuvering of the kite. Adjust whenever one appears to be more or le a kite is first attached close to the ree ried out for the take-off, and after eac line. The ratchet mechanism allows ment for each drum. There are two First: if the crank handle has been loop, push forward on the top of the w is slack. Second: if the crank handle with the other hand onto the winding and back off on the handle for a portic and wind both in with a forward mo will soon teach the amount of extra w when adjustments are to be made, but wind and a smoothly flying kite, an lengths of lines, first one, then the otl justment. Then, when a critical mon to make a quick adjustment to the lin

(2) ASSEMBLY (fig. 95).

(a) Frame. Place spar with its c with the machine screw, washer, an washer, and wing nut in the uppermos above the fin slot. At each of the (6 in. from center), screw in a twist

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end. Each of the two flying lines issues from its winding drum and goes forward around the inner face of each respective inner pulley, then spanwise and between the outer pulleys to the front of the bar where it is tied to a snap. There are central, intermediate, and end spacers which serve to keep the two laminations of the bar apart a sufficient distance so that the lines, even with knots, may pass freely. Each reel is equipped with a 2-angle piece at the rear for hanging it on the operator's belt. There are two straps which are to be looped around the belt at the rear, cross over the operator's back, and extend over the shoulders to the two screw eyes at the front of the frame. Thus the reel is supported in front of the body and the hands are free to operate it. A loop on the bar at right of the frame is used to hold the handle wherever the operator so desires.

(d) The necessity for the differential action of the two winding drums becomes apparent when the kite is flown. Then it is seen that although the reel is designed with narrow drums, and some lateral play while cranking, so that the incoming and outgoing lines will shuttle back and forth to avoid piling up on one side or the other, even so, there will be unevenness, often too great to be compensated by yawing the bar. Moreover, the yawing action should be used only for maneuvering of the kite. Adjust the length of lines, therefore, whenever one appears to be more or less than the other. Check when a kite is first attached close to the reel, again when it has been carried out for the take-off, and after each running out or winding in of line. The ratchet mechanism allows a third of a revolution adjustment for each drum. There are two methods of using the ratchet. First: if the crank handle has been secured in the retaining strap loop, push forward on the top of the winding drum of whichever line is slack. Second: if the crank handle is being held in the hand, hold with the other hand onto the winding drum of whichever line is slack and back off on the handle for a portion of a turn; then free the drum and wind both in with a forward motion of the crank. Experience will soon teach the amount of extra winding needed for either drum when adjustments are to be made, but, for practicing, choose a steady wind and a smoothly flying kite, and make small changes in the lengths of lines, first one, then the other, using both methods of adjustment. Then, when a critical moment comes and it is necessary to make a quick adjustment to the lines, there will be no false moves.

Figure 94 — Reel of Target Kite Kit M9

(2) ASSEMBLY (fig. 95).

(a) Frame. Place spar with its center on mast and join together with the machine screw, washer, and wing nut. Put the eyebolt, washer, and wing nut in the uppermost hole, and also in the hole just above the fin slot. At each of the two punch marks on the spar (6 in. from center), screw in a twisted screw eye choosing a right-

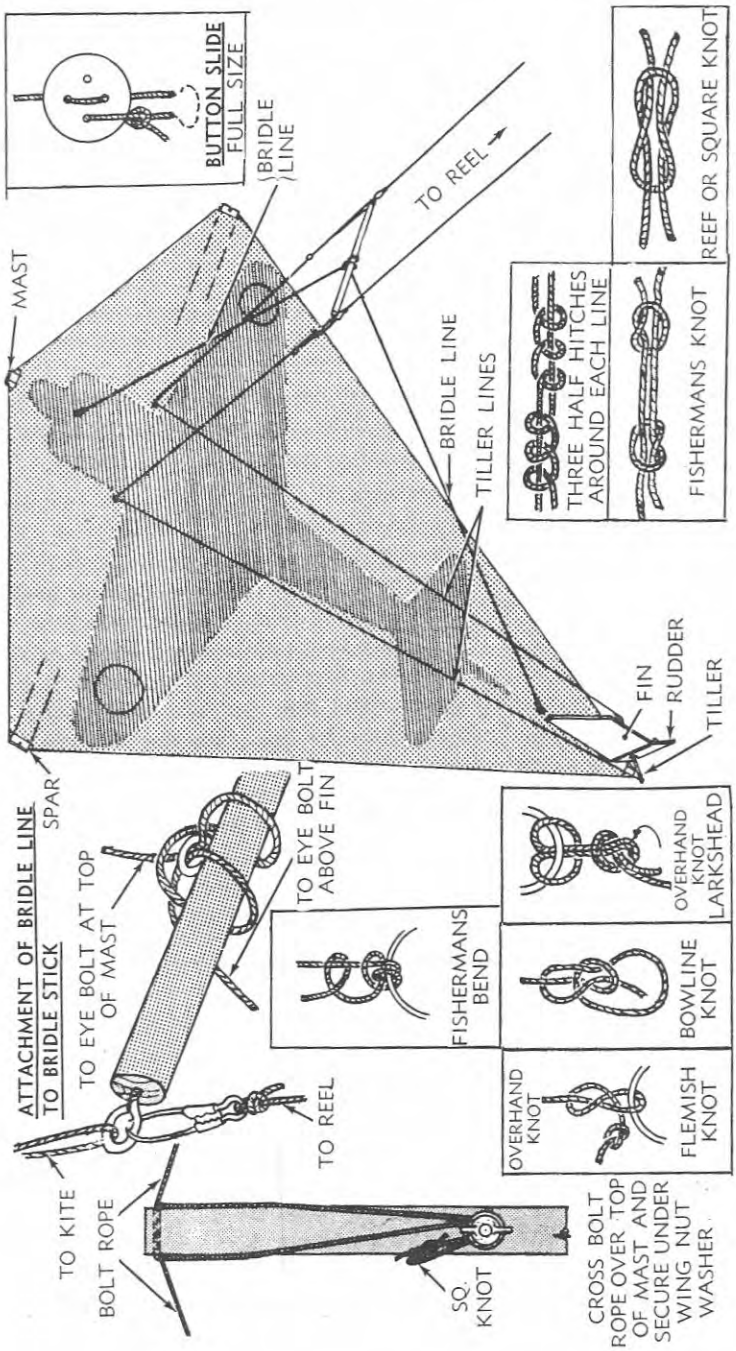


Figure 95 — Connections for Kite

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and left-hand twist for the respective sides, turning so that the end of the eye is away from center, and inserting so that the point barely dents the rear surface of the spar.

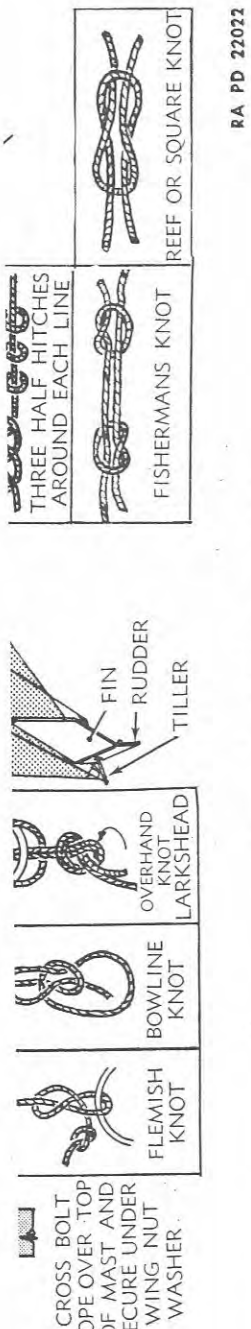
(b) Cover. Using the bodkin, thread an end of the boltrope through the eye and, starting at one side of the top, reeve it through the hem, emerging at the corners and finally bringing it out at the other side of the top. Tie the ends together. Lay the cover over the frame; put each cringle and boltrope loop in its slot; the cringle folded with boltrope in the "V" of the fold. With the base of the mast on the deck, lay the boltrope ends across the top slot in opposite directions and pull taut, being sure the spar is at right angles to the mast and the boltrope is not binding at any point. This serves to keep the sticks and cover in alinement. Wind the ends of the boltrope around the wing nuts (as cleats) and secure either with a half hitch or by loosening one of the wing nuts and clamping under a washer.

(c) Bowing Line. One end of the bowing line is tied into a bowline of 3-inch loop. The other end is passed through two holes of a button slide and tied to a third hole with a Flemish knot. The loop thus formed beyond the button is threaded into the ½-inch deep slot in one end of the spar with the loop carried over the end and secured in the two edge nocks. The bowline is similarly looped over the end. (This attachment of the bowing line can be done on the spar before assembly is started; in fact the production kites are so furnished.) To bow the spar with the bowing line, put one end of the spar on the deck and bear down on the other end, keeping the spar vertical. Pull out the loop which passes around the spar end so as to take up the slack in the bowing line. Next pull the slack out of that loop by pulling down the line which is knotted to the button slide. Finally, slide the button downward. Adjust so that the extent of bow is 6 to 9 inches. The inherent stability of the kite increases with the amount of bow, this acting as a dihedral angle. Avoid straining the spar. Bowing decreases the surface pressure, and is therefore reduced for light winds.

(d) Fin and Rudder. Fit the fin lug into its slot; insert the machine screw into its hole and secure with the wing nut. Holding the rudder with its hinge straps between those of the fin, insert the pintle through them and into the mast. Make sure that the fabric under the rudder is snug and flat and does not interfere with the free swinging of the rudder.

(e) Bridle. The screw eyes at ends of bridle stick (and tiller) are to be turned so that the continuous part of the eye lies in the direction of the greatest pull. At each end of the bridle line, tie a snap. The "Fisherman's Bend" is the best knot for this tie. Thirty inches from an end of the bridle line, bend a small loop and pass it

NG COURSE LAY-OUTS



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Figure 95 — Connections for Kite

through the screw eye in center of the bridle stick; pull through about an inch; then, holding both ends of the bridle together, pass them through the loop forming a "Lark's Head" connection. Check the position of this connection by snapping the ends of the bridle to their fastening points on the mast; the short end to the top eyebolt, the longer end to the lower eyebolt. Now carry the bridle stick over to a corner of the kite at the spar end so that the bridle line is taut, both ends, and lies flat to the cover; the screw eye at center should come to the center of the end of the spar. If not, adjust the Lark's Head connection until it does.

(f) Tiller Control Lines. Tie a snap to one end of each tiller line, using the Flemish knot stoppered with an overhand knot in the end of the line. Pass the other end of each tiller line through two holes of a button, then through a screw eye at end of bridle stick and tie to the third hole of the button. Noting which line is port and which starboard, attach the snap to the respective sides of the tiller; then fit the center of the tiller lines into screw eyes, being sure that they go through without kinking and lie in the direction of their controlling movement.

(g) Flying Lines. It is imperative for proper performance of the kite that the flying lines be of a material which will not stretch appreciably, preferably linen or linen hemp, and that the two lines be measured to exactly the same length. Tie the ground end of the line to the hubs of the reel, using a stoppered Flemish knot; wind in the line. At the kite end of each line, tie a snap by taking the final 2 feet of the line, doubling it twice upon itself, and threading the double loop of the 6-inch quadrupled section into the eye of the snap; spread over the snap and pull taut to form a Lark's Head. Tie the four strands together with an overhand knot. This reinforced tie is necessary to prevent chafing and to cushion the knot at this critical point.

(h) Reel. To attach the flying lines to the reel, it will facilitate winding if each of the lengths of line can be on a separate spool. Two, 200-yard lengths are usually supplied though the drums will hold 300 each. Thread each line through the respective outer pulleys toward the rear of the bar; push forward through the gap between the intermediate spacers; thread between the center spacer and the inner pulley, and carry around the reel. Tie the end in an overhand knot (for a stopper); then tie a Flemish knot or slip knot around the main part, and pull the knot down to the surface of the winding drum's inner disk. Be sure that each line end is brought around the disk in the same direction and that the knots are tied firmly. Pull several times against each knot so that it binds tightly. Procure a wide belt, attach the strip loops to it at the rear section and, after fastening it around the waist, pick up the reel and fit the angles at the rear over the belt.

Bring the shoulder straps across, up and over the shoulders, and clip the snaps at the ends to the eyes at the front handle. Have an assistant hold the two spools of line and put some tension on them as the line is wound on the reel. As the lines near the end, be careful not to pull the ends through the pulleys; trim them evenly. Take 2 feet of the end of the line, double it upon itself twice, and thread this quadruple bend into the eye of a snap. Carry the loop over the end of the snap and pull into a Lark's Head knot. To be sure that operation of the reel is comfortable to the individual, see that the belt is worn snugly and at proper height, and that the over-shoulder straps are of such length as to elevate the front end of the reel at an angle of about 20 to 30 degrees, so that the angle of the flying lines will issue freely from the pulleys toward the kite. The right hand now rests on the crank handle, and the left hand on the cross handle at front of the frame. From this hand the fingers can easily reach down to grasp the crosspiece of the brake yoke, and bring it up to bear on the brake drums. This brake is useful not only in slowing the running out of the flying lines as the kite ascends, but can often be used to hold the lines taut to test their evenness while either drum is being compensated to take up slack. The brake should always be used to arrest the revolving reel. Grabbing the rotating handle puts a strain on the reel and kite.

(3) FLYING THE KITE (fig. 96).

(a) Conditions. Choose a large open area for flights. The presence of hills, buildings, trees, and other ground irregularities produces bumps and swirls in the air which conditions influence the behavior of the kite. Wind should be strong and steady. A light wind makes the kite "lazy." Too strong a wind intensifies the control, requiring greater skill for recovering from aerobatics. It also exerts such pressure on the kite as to reduce its ability to arc laterally into the wind.

(b) Take-off. After adjusting the kite, hook the flying lines to the ends of the bridle stick. If the reel is used, have an assistant carry the kite about a hundred feet leeward. If the flying bar with fixed lines is used instead of the reel, it will be necessary to carry the kite out to the full extent of the line on the bar. Having arrived at the take-off distance, the assistant should hold the kite inclined slightly forward while the operator yaws the flying bar back and forth and checks the free and full action of the rudder. Make sure that the two flying lines are even and clean. Now, holding the reel level so that the rudder is neutral, call to the assistant "Up." As he heaves the kite straight upward, lean back or take a few backward steps or a few turns in on the reel and the kite will rise. Hold the brake or handle while the kite gains altitude; then ease off on the brake and let the kite pull itself out to the range desired.

TARGETS, TARGET MATERIAL, AND TRAINING COURSE LAY-OUTS

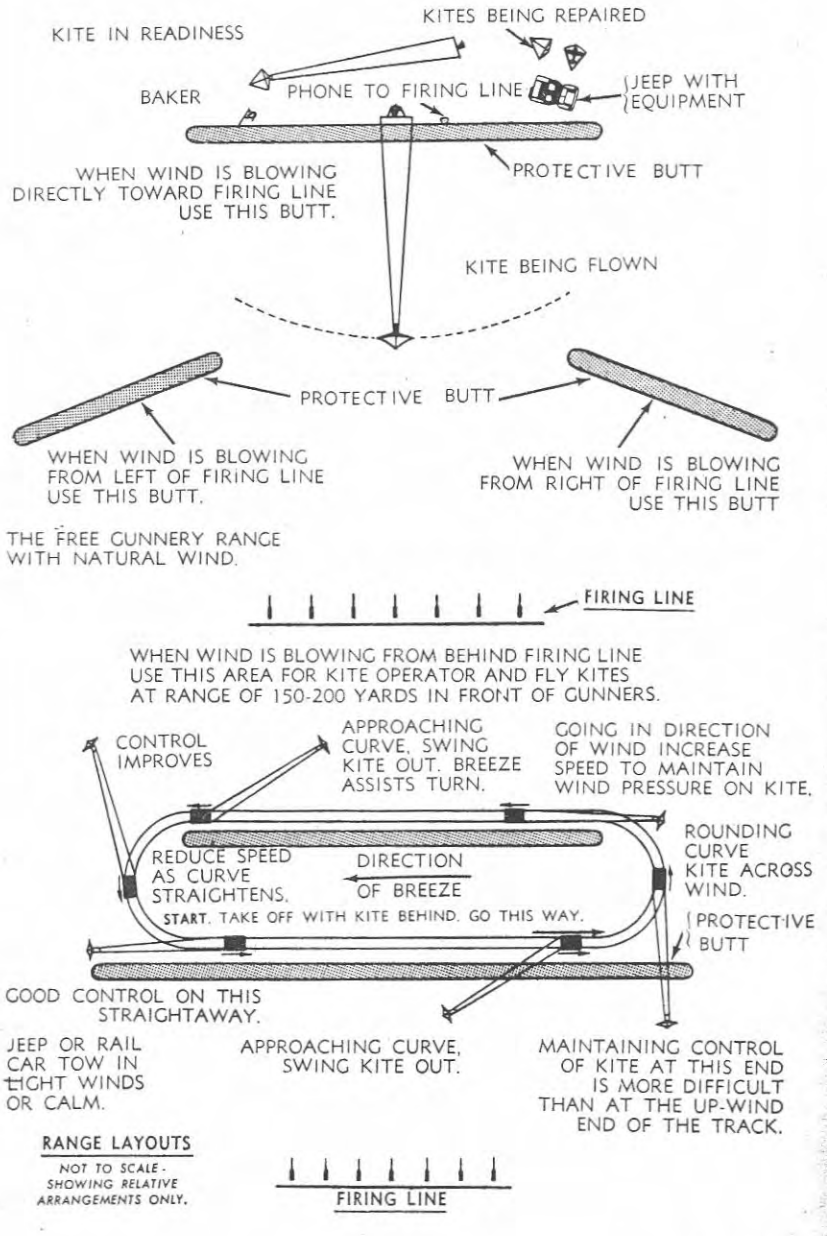


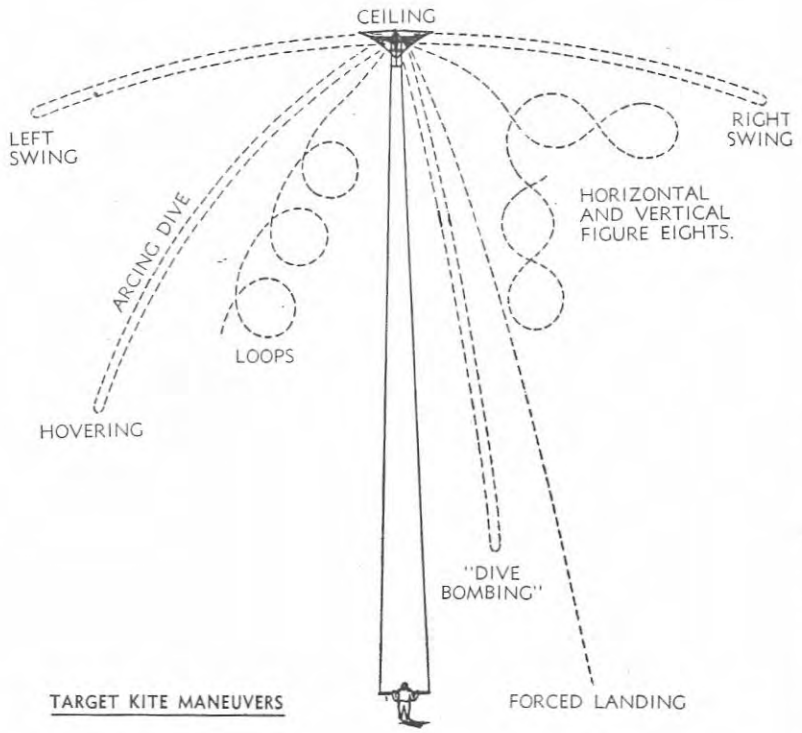
Figure 96 — Range for Kite

TARGETS AND EQUIPMENT FOR CLASS A AND CLASS B RANGES

(c) Attitude of Kite in Flight (fig. 97). Observe how the kite behaves. When first launched at a short range, it climbs high; but the weight of the full length of its line will pull it down somewhat so that its face is more squarely to the wind. In this attitude its control is more positive. Although every effort is made to have the kites of standard construction and similar performance, some of them may have individual characteristics. Checking of the items for adjustment will minimize these variations. If, however, the kite should porpoise or luff vertically, an adjustment of the bridle is necessary. Bring the kite down and loosen the Lark's Head connection on the bridle stick; lengthen the upper end of the bridle line so that when the screw eye is held at the side of the kite, it will be slightly below the spar. An adjustment of the bridle point above the spar would be required if the kite flew too low, or had too wide an angle of attack. A high bridle adjustment is also advisable in a very strong wind, to reduce the pressure on the face and to increase the soaring effect. Usually, however, bridling to the point even with the corner of the kite is the standard connection. After any alteration of the bridle line is made, it is necessary to adjust the control lines also.

(d) Control Across the Sky. With the kite flying steadily and exerting a firm pull on the lines, try some maneuvers. Yaw the flying bar slowly a few inches to the left. The kite will lean in the corresponding direction and move across the sky to the left. Next, bring the bar back to neutral; the kite will come erect and move back to center. Now try a movement to the right and recover. Practice these while feeling out the response of the kite. As you learn the kite's ability and improve its control, increase the extent and rapidity of your movements. If the kite leans too far and starts to lose altitude, give it reverse control quickly and it will recover. Continue to increase the lateral control until you can veer the kite back and forth over an arc of at least 45 degrees each side of center, but keep it from nosing down into a dive. The limit of lateral swing is reached when the kite lays way over into the wind, can go no further, and slowly begins to slide downward. Then slack off and let it come back to neutral.

(e) Loops. When the sideways control has been mastered, try a loop. Let the kite climb to its zenith; always have plenty of sky under the kite when looping because conditions may cause it to make a larger circle than anticipated. With the kite flying steadily at center, yaw the flying bar a full quick pull to the left; the kite will nose over leftward and circle down; keep the bar yawed and the kite will continue on around and up, but as it nears the top, bring the bar back to neutral. There is now a full twist in the line but this does not alter the method of control and but slightly affects the ease; in fact, the control remains about the same even with five or six twists in



TARGET KITE MANEUVERS

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Figure 97 — Maneuvers of Kite

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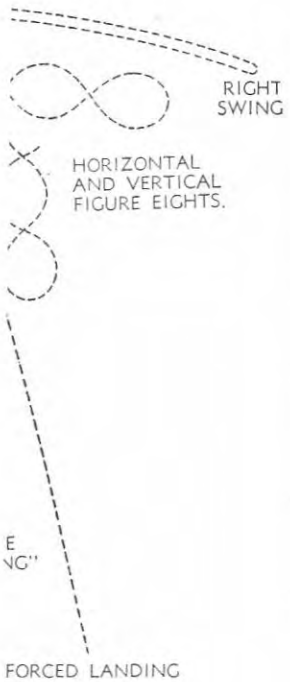
(f) Figure Eights. T
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the line. Try a right loop next. As you loop it one way or the other, keep a mental count of the twists so the line can readily be unwound to neutral by means of reverse loops. After making a number of tight loops, try circles of larger diameter in each direction. These require a smoother feel of control and a better estimate of distance. In light winds when the kite may seem a bit reluctant to nose over, rock it backward in the reverse direction from the loop you intend to make; then pull it over into the loop.

(f) Figure Eights. This maneuver develops exactness of coordination and ability to recover the kite from various positions. In describing the aerobatics of the kite, it is helpful to imagine a huge vertical clock face on the sky in the plane and area where the kite is flying. For a leftward figure eight, the kite starts at "12 o'clock"; yaw the flying bar to the left as though to let the kite begin a loop but as it gets to "7 o'clock"; give the bar reverse control and hold the kite in a right loop for a full circle; as it reaches the top of that loop, give an easy left control and finish the right half of the top loop, neutralizing the controls as the kite reaches "1 o'clock." It will be found that any reverse or recovery movement should be started just before the kite finishes the previous evolution; this makes the action smoother and avoids any loss of control. Practice both right and left figure eights and both vertical and horizontal figure eights until you are adept at reversing the controls.

(g) Dive Bombing. The most spectacular maneuver by this kite is its vertical dive and recovery, imitating the descent of a dive bomber. To perform it, have the kite at "12 o'clock" and yaw the flying bar as for a loop; but as the kite reaches "2 o'clock," quickly move the control to neutral and hold the kite inverted. It dives very fast, so you have but a few seconds before you must pull the controls for a recovery. Inasmuch as the controls are reversed and the speed makes them more sensitive, agility is required to hold the kite in a straight course. Before it gets too low, give the flying bar a firm yaw to recover, not too abruptly because the kite is under a strain and should not be snapped out. You will observe that the opposite end of the flying bar must be pulled in order to recover from a right or left dive without twisting the line. However, when the kite is rushing downward, in your first trials of this maneuver, do not stop to debate which way to pull the bar; pull it either way or there will be a crash landing instead of a kite. Limit the first dives to long "S's" with plenty of sky underneath. Observe how the kite responds—whether it recovers better to one side or the other, as it usually does; then try to see how small a curve you can bring it up in. These tests will show you how low the kite can dive before you must recover. Meanwhile you will be learning how to make it dive straight instead of wavering. Another type of dive is a long downward arc in which



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of Kite

the kite dives toward some imaginary objective a hundred feet or so either side of the center.

(h) Hovering. In swinging the kite across the sky, you learned that it finally reached a location where the side pressure on the slanted kite which had sailed it over to its extreme corner was neutralized by the wind pressure coming toward the kite. At that extreme the kite wavered. It would try to get free and race back to center, or tended to nose into a dive, while you tried to force it over a few more degrees into the wind. In a somewhat similar balancing of forces, the kite can be made to hover at different heights or lateral angles by adroitly keeping it over on its beam sufficiently to prevent its regaining the proper rising attitude but not far enough over as to go into a dive. In regaining altitude after a hovering stand, it is important that you ease off the flying bar from the side at which you are holding the kite; otherwise, you would pull it over into an outside loop with probably insufficient altitude for a pull-out.

(i) Slow Descent. By laying the kite over on its beam a trifle further than is used when veering across the sky, but not far enough to go into a dive, you can spill enough wind from the kite to reduce its lift, making it slide off sideways and downward rather slowly.

(j) Forced Landing. Successful performance of this maneuver without a crack-up calls for the best skill in this catalog of tricks. It comprises setting the kite down on the ground at its distance of flying line. The sequence starts with an arcing dive and merges into a hovering close to the earth. Here the wind is more bumpy than at higher levels and you must make recoveries quickly; you must anticipate how the kite is going to buck, and meet it with a reverse control before the dip gets well started. In this manner, bring the kite closer and closer to the earth and finally as it is about to touch, let out the reel, or run quickly forward or, if using the flying bar, let go so that the kite will fall back on the ground. This maneuver is particularly useful when, after "cease firing," you are lowering the kite to count bullet holes.

(k) Landing the Kite. The forced landing method previously described may be used, particularly when some minor adjustment is to be made. Another way of landing the kite with the line out is to wind in the kite until it is about 50 feet overhead. From there it can be force-landed, brought down to the hands of an assistant, or swooped down, letting out some line as it nears the earth so as to neutralize the wind pressure. Under steady wind conditions, the kite can be reeled right down into the operator's hand, or set down without damage a few feet away.

(4) ADJUSTMENTS. Before each flight, after each hard landing, and whenever a kite fails to perform correctly, check for the follow-

ing: the wing nuts tight; spar at right angles to mast; boltrope taut and tied; fabric of cover even each side and top and bottom, without looseness, unevenness, or pockets; bowing line secure at ends, with the extent of bow in accord with prevailing wing (distance between spar and bowing line usually about 8 in.; light winds about 3 in. but never more than 9 in. in heaviest winds); pintle secure; control lines adjusted. To do so, lay the kite on the deck, face up, pull up on the bridle stick so as to tilt up the lower end, and place the toe of your foot on the upper point of the kite to hold it. This attitude facilitates alining of the controls. Hold the bridle stick so that both ends of the bridle are tight; note the passing of the control lines through the screw eyes and be sure they are not kinked. Now tilt the bridle stick so as to pull the rudder in direct line with the fin; then adjust the button slides until the bridle stick is horizontal and parallel to the deck with the rudder neutral. Finally, slack off the button slides slightly so that there is less tension on the control lines than on the bridle, thus making the rudder operate more easily. A very important item to maintain in adjustment is the length of the two flying lines. The manufacturer should deliver them the same length; but after being used, one may stretch somewhat. Uneven winding may alter the lengths. Knotting after breakage will reduce the length. To compensate for the inequality, turn one of the winding drums.

(5) MAINTENANCE AND REPAIR.

(a) Types of Damage. The most vulnerable point is the machine screw at the cross axis. If this is hit or a bullet should start a split near it so as to smash out this piece, the kite comes down. The mast is more vulnerable to hits than the spar. The width of the latter withstands several holes; .30 calibers may go through without splintering the sticks, but .50's usually smash whatever they hit. When either caliber tears out a piece of hardware, control of the kite is often lost, although with either or both tiller lines shot out, the kite still flies but loses its maneuverability. With a lower bridle line severed, the kite will float flat rather helplessly and the only thing the operator can do is either leave it aloft until the gunners shoot it down or haul it in. Severing either of the flying lines lays the kite on its side and it floats down. Breaking the bridle stick puts the kite into a spin and it whirls down. A bullet slicing the edge of the cover so as to sever the boltrope destroys the taut periphery of the kite, making the kite sloppy in action. At times when the kite is hit while lying over at an angle to the gunners, the bullet will split a long gash through the fabric, and the wind spilling through that gash destroys the balance of the kite. The kite will withstand numerous clean holes through the fabric or in the plywood of the fin and rudder, but a hinge-breaking hit or tiller breakage will cause loss of control, winding the kite down in a spin.

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(For explanation of symbols, see FM 21-6.)