

NOTICE OF  
CHANGE

MIL-HDBK-1027/3A  
NOTICE 1  
31 DECEMBER 1989

MILITARY HANDBOOK

RANGE FACILITIES AND MISCELLANEOUS TRAINING FACILITIES  
OTHER THAN BUILDINGS

TO ALL HOLDERS OF MIL-HDBK-1027/3A:

1. THE FOLLOWING PAGES OF MIL-HDBK-1027/3A HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
16	6/30/89	16	12/15/89
41	6/30/89	41	12/15/89
97	6/30/89	97	12/15/89

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-HDBK-1027/3A will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military handbook is completely revised or cancelled.

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2.2 Outdoor Small Arms Ranges

2.2.1 Design Guidelines. Small arms range design must prevent injury to personnel or property damage outside the range from misdirected or accidental firing and ricochets; and be so designed as to direct ricochets away from the firing line inside the range. If there is enough distance and land area available, an open range may be sited allowing for surface danger zone appropriate for the weapons intended to be used. See Figures 2 through 2e and Figure 3 for surface danger zones for firing of small arms weapons. These figures are for firing at fixed ground targets, except Figure 2a which shows open range impact area requirements for firing at moving targets. These figures show projectile impact and ricochet areas for soft, dry, loamy soil. Ranges having soil containing rocks or requirements for firing on hard targets will require larger areas. Criteria for such conditions will be obtained during the planning phase for new ranges. Figure A-11 of Appendix A shows surface danger zone requirements for such range conditions. Table 4 shows the maximum range for ammunition listed and should be used in conjunction with Figures 2 through 2e and Figure A-11 of Appendix A.

Table 4

## Maximum Range of Small Arms Ammunition

Caliber	Maximum Range (in meters) for most Powerful Cartridge
.22 long rifle .....	1400
.38 revolver	Ball, M41 .....
	Ball, PGU-12/8 .....
	1600
	1900
.45 pistol .....	1500
.45 submachinegun .....	1600
.357 magnum .....	2160
9 mm pistol .....	1740
9 mm submachinegun .....	1840
.44 magnum .....	2290
.50 machinegun	Ball, M33 .....
	AP, M2 .....
	6500
	6100
shotgun, 12 GA. riot (00 buckshot) .....	600
.30 rifle and machinegun	Ball, M2 .....
	AP, M2 .....
	3100
	4400
.30 carbine .....	2300
5.56 mm rifle	Ball, M193 .....
	3100
7.62 mm rifle and machinegun,	Ball M80 .....
	Match, M118 .....
	4100
	4800

filled concrete block will provide mass. Absorptive acoustical surfacing will reduce the noise level in the range but will have little effect on transmission outside the range. Blown-on acoustical material is not permitted. Conventional acoustical treatment is encouraged behind the firing line. Downrange acoustic treatment must be compatible with the planned lead dust removal process. Do not paint downrange block walls or acoustic tile sound absorbing walls; this significantly degrades the sound absorbing qualities of the materials. Existing ranges may continue use of painted surface.

Wall treatment should be installed in not larger than four foot wide panels to facilitate replacement after damage. Install acoustic wall treatment on furring strips spaced away from the wall. Ventilation duct openings should have noise traps to reduce noise transmission to outside or other occupied building areas. The floor area behind the firing line may be covered with acoustic material that can withstand the chosen lead removal process. While carpet is not recommended, it need not be removed from existing facilities. Airborne noise can be reduced by sealing off air leaks. Doors should be solid core, weather stripped. Provide double doors (air lock arrangement) when connecting directly with another part of a larger building. Double glazing of windows into control rooms will reduce transmission.

2.1.10 Lighting. Provide general downrange lighting for safety and cleanup purposes as well as for general range illumination. The preferred method is a continuous bank of fluorescent lights with supplemental halogen or a combination of lights running the full width of the range. Light intensity at target face should be between 85 to 100 footcandles measured 4 feet (1.22 m) above the floor at the target. The ideal light wavelength is 550 plus or minus 50 nanometers. Range should have dimmer on lighting to satisfy various training requirements of using activities.

2.1.11 Range Design Review. For weapons to be fired, weapons type, ammunition to be fired, and distances of firing line to targets must be determined during the planning phase. Other design considerations include: number of firing points; lighting possibilities; manual and automatic target carrier/turning mechanisms; offices or at least tables for administrative support; shooting benches; clocks and timers; ventilation; ease of lead dust cleanup; spectator safety; acoustics; lead dust control; lead removal from lead dust collectors and bullet traps. A range which adjoins a classroom requires soundproofing. Glass walls separating firing points from waiting areas may be used to reduce noise and lead dangers to spectators or waiting shooters.

During the planning phase, the weapons officer, range officer, range training officer, safety officer, industrial hygienist, and public works engineer should review the design requirement before construction drawings are started. When the station or design agent is unable to proceed with preparation of construction drawings in accordance with the criteria of this design manual, requests for deviation must be addressed to Commander, Naval Facilities Engineering Command, Code 04, 200 Stovall Street, Alexandria, VA 22332-2300. During the design phase, submittal reviews by the appropriate Naval Industrial Hygienist are required in accordance with NAVFACINST 6260.2, Reviews For Health Hazards During Facility Design Process, and may be required by the appropriate Engineering Field Division (EFD) in accordance with EFD-published instructions.

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2.7 Composite Small Arms Ranges. Where site conditions permit, rifle, pistol and machinegun ranges should be located close to each other. If necessary for use, composite ranges may overlap under controlled conditions. Common support facilities may then be located for convenient use by personnel on all ranges (refer to Section 3).

2.8 Shotgun Ranges. Criteria for shotgun ranges shall be as defined in Paras. 2.8.1 through 2.8.3.

2.8.1 Surface Danger Zone, Riot Gun Ranges. For design criteria, see Figure 6-3 of MCO P3570.1A Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat, for firing 12-gauge riot guns using cartridges loaded with 00 buckshot or smaller.

2.8.2 Maximum Range. Refer to Table 4 for riot gun ranges.

2.8.3 Skeet and Trap Ranges. Refer to NAVFAC P-457, Planning and Design of Outdoor Sports Facilities, for electrically operated skeet and trap ranges. Design for 12-gauge, shot size 7-1/2, 8, or 9 standard and reduced loads. In accordance with NRA references, the maximum range for 7-1/2 shot is 740 feet, for 8 shot is 720 feet and for 9 shot is 670 feet. Magnum loads of any size and shot sizes heavier than 7-1/2 are prohibited. This range may be used to teach shotgun marksmanship.

2.9 Combat Marksmanship Course. Design the combat marksmanship course for a five-man team, or as determined during range planning phase.

2.9.1 Targets. Equip the course with electrically controlled pop-up targets, spaced intermittently throughout a course length of approximately 300 yards (274.3 m).

2.9.2 Control Tower. Provide a control tower of adequate height to observe targets and personnel using the course. Equip the tower with a control board to regulate the operation of the targets.

2.9.3 Power. Provide electric power and furnish a subsurface duct to carry electrical wiring from control tower to target manholes.

2.9.4 Target Storage. Provide a storehouse for targets, and manholes to house pop-up targets.

2.10 Protection of Personnel. Refer to Table 5 for protection of personnel against individual hits of small-arms and for required thicknesses of cover. These thicknesses will not provide positive protection against continued burst firing.

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## Section 7: FLAME THROWERS AND GRENADE RANGES

7.1 Flame Throwers. For design criteria, see Figure 14-2 of MCO P3570.1A.

7.2 Grenades. Range design criteria for hand grenades, rifle grenades, grenade launchers, and tank grenade launchers are defined in paras 7.2.1 through 7.2.5.

7.2.1 Burning Type Hand Grenade. When fired in place, at least 10 m distance for quick retreat of firer to avoid incendiary particles and fumes and at least 10 m throwing distance will be provided.

7.2.2 Fragmentation-type and Bursting-type Hand Grenades. Trench or protective barrier equivalent to a screen of sandbags 0.5 m (20 in.) thick will be provided for personnel within 150 m throwing of bursting point of HE-loaded-type hand grenades. Figure 7-1 of MCO P3570.1A shows surface danger zone for designing fragmentation grenade range. Design distances are:

a) At least 100 m between unprotected personnel and bursting point of white phosphorous burning-type M15 and M34 hand-grenade.

b) At least 25 m between unprotected personnel and detonation point of bursting-type riot control M25 hand-grenades.

7.2.3 Rifle Grenades. Rifle grenades are fired from behind protective barrier equivalent to a screen of sandbags 20 in. (0.5 m) thick. At least 200 m between detonation point and unprotected personnel will be provided. Figure 7-3, MCO P3570.1A, shows surface danger zone for designing rifle grenade range.

7.2.4 Grenade Launchers. At least 300 m will be provided between unprotected personnel and grenade detonation point. Figure 7-2 of MCO P3570.1A shows surface danger zone for designing ranges for 40 mm grenade launcher M79 and M203 firing MK19, 40 mm MG (grenade).

7.2.5 Tank Grenade Launchers. Design criteria for range design is established for M176, M226, and M239 grenade launchers in para. 12-7 and Figure 12-5 of MCO P3570.1A.