Introduction to Range Safety and Surface Danger Zones

Overview of AR 385-63/MCO 3570.1B and DA PAM 385-63
Range Safety Regulations and Guidelines

AR 385-63
MCO 3570.1B

Regulatory Policy Guidance

Published as Joint Army Regulation/Marine Corps Order

DA PAM 385-63

Technical Guidance
A deviation is a departure from the requirements in DA PAM 385-63 and the policy in AR 385-63/MCO 3570.1B, Range Safety.
Granting of Deviations

Deviations may be granted based on critical mission requirements which conflict with regular standards in accordance with AR 385-63/MCO 3570.1B
Deviations are limited to the following:

- Reducing SDZ dimensions when terrain, artificial barriers, or other compensating factors make smaller SDZs safe
- Modifying prescribed firing procedures to increase training realism
- Allowing personnel who are not directly participating in the training within the SDZ
SDZs That Extend Beyond The Installation Boundary

Deviations applied to SDZs that extend beyond installation boundaries must be based on the following:

- Ability to contain projectiles, hazardous fragments, laser beams, and both vertical and horizontal ricochet within the installation boundaries and areas under military control

- Probability of hazardous fragment escapement must not be greater than 1:1,000,000 (10^{-6})
Request for Deviation

- Description of the specific condition requiring the deviation
- Statement as to why a deviation is necessary and impact on training if not granted
- Description of the existing conditions and anticipated hazards, subsequent hazard analysis, and risk analysis
- Control measures taken to eliminate hazards and/or minimize risk and residual risk level
Chapter 1. Introduction

Deviations

Range Safety Program Guidelines

Guidelines for Range Safety Certification Programs

Range Safety Responsibilities of:

- Installation Commander
- Installation Safety Manager
- Installation Range Control Officer
- Battalion/Squadron Commander
- Unit Commander
- Officer in Charge (OIC)
- Range Safety Officer (RSO)
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Chapter 5. Targets

- Restricting access to impact areas
- Posting warning signs and markers
- Controlling other range usage
- Coordinating use of special use airspace
- Coordinating use of navigable waterways
- Safety requirements for indoor firing ranges
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- Positioning and issuing ammunition and explosives (A&E)
- Qualification and restriction of A&E
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- UXO (dud) and misfire procedures and reporting
- Disposition of A&E involved in malfunctions and accidents
- Destruction of UXO (dud)
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- Chemical agents
- Riot control agents (RCA)
- Smoke
- Smoke pots
- Oil smoke candles
Safety Considerations

- Establish a minimum safe distance for friendly troops for protection from downwind vapor hazards.
- Use of Riot Control Agents (RCAs) in training is limited to CS, CSX, CS-1, CS-2, and CR. All other RCAs are prohibited for training use.
  - CSX, CS-1, CS-2, and CR no longer in training inventory.
- Establish minimum safe distances to heavily traveled installation roads, railroad right of ways, airfields, or inhabited areas when using RCAs.
- Personnel will carry a protective mask when participating in exercises that use smoke.
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- Range usage
- Force-on-force tactical exercises
LASER

- LASER - Light Amplification by Stimulated Emission of Radiation
- A laser is a device that amplifies light
Laser Hazards

- Lasers produce light beams of varying intensity
- Categorized in accordance with the emitted power
- Class 1 represents the weakest laser
- Power gets progressively higher through Class 4

<table>
<thead>
<tr>
<th>Class 1</th>
<th>Emit no harmful radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2</td>
<td>Emit visible laser beam; extended viewing is hazardous</td>
</tr>
<tr>
<td>Class 3</td>
<td>Direct beam viewing is hazardous</td>
</tr>
<tr>
<td>Class 4</td>
<td>Fire or skin hazard or a diffuse reflection hazard</td>
</tr>
</tbody>
</table>
Laser Range Safety

- Fundamental concept is to prevent direct or collateral injury or damage resulting from laser use.
- Definitive guidance for laser operations, characteristics, and general procedures are found in MIL-HDBK-828A and Joint Pub 3-09.
- Tactical lasers are treated as direct-fire weapons. Precautions associated with direct-fire weapons shall be applied to all lasers operated on military ranges.
Surface Danger Zones (SDZs)

The ground and airspace designated within the training complex (to include associated safety areas) for vertical and lateral containment of projectiles, fragments, debris, and components resulting from the firing, launching, or detonation of weapons systems to include explosives and demolitions.
Safety of Personnel and Property

The purpose of an SDZ is to designate areas that protect personnel and property from the following dangers:

- Projectile Impacts
- Dispersion
- Ricochets
- Fragmentation and Debris
- Backblast
- Hazardous Overpressure and Noise
SDZ Incorporating Danger Areas

- Fragmentation, Debris
- Ricochets
- Projectile Impacts, Dispersion of Rounds
- Backblast, Overpressure, Noise Hazards
Designated Areas

An SDZ clearly delineates:

- Where personnel may operate, move, and engage targets
- Limits of fire
- Areas for target placement
- What type of protection must be afforded personnel in specific areas
- Areas off-limits to personnel
Factors Affecting SDZ Dimensions

- Type of Weapon/Weapon System
- Type of Ammunition
- Target Impact Media
- Terrain
- Altitude
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Appendix C. Surface Danger Zone Design

• Prescribes Safety Precautions
• Details SDZ Requirements
Distance X

Determined by weapon/weapon system and type of ammunition being fired/launched

Distance X -- The maximum distance a projectile (to include guided missiles and rockets) will travel when fired or launched at a given quadrant elevation with a given charge or propulsion system.
### DA PAM 385-63 Table B-1

**SDZs for direct-fire weapons without explosive projectiles**

<table>
<thead>
<tr>
<th>Caliber</th>
<th>Impact Media</th>
<th>Distance X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shotgun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M9 Pistol</td>
<td>Earth/Water</td>
<td>1073</td>
</tr>
<tr>
<td>MP5 Machinegun</td>
<td>Steel/Concrete</td>
<td>1073</td>
</tr>
<tr>
<td>.45 Pistol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M16 &amp; M4 rifle</td>
<td>Earth/Water</td>
<td>1800</td>
</tr>
<tr>
<td>M249 SAW</td>
<td>Steel/Concrete</td>
<td>1800</td>
</tr>
<tr>
<td>M240 &amp; M60 Machinegun</td>
<td>Earth/Water</td>
<td>3100</td>
</tr>
<tr>
<td>M14 Rifle</td>
<td>Steel/Concrete</td>
<td>3100</td>
</tr>
<tr>
<td>M2 .50 caliber Machinegun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-Gauge Slug</td>
<td>Earth/Water</td>
<td>1073</td>
</tr>
<tr>
<td>9mm M882 Ball</td>
<td>Steel/Concrete</td>
<td>1800</td>
</tr>
<tr>
<td>.45 Caliber, M1911 Pistol/SMG</td>
<td>Earth/Water</td>
<td>1690</td>
</tr>
<tr>
<td>.45 Caliber, M1911 Ball, Plastic</td>
<td>Steel/Concrete</td>
<td>1690</td>
</tr>
<tr>
<td>5.56mm, M193 Ball</td>
<td>Earth/Water</td>
<td>3100</td>
</tr>
<tr>
<td>5.56mm, M196 Tracer</td>
<td>Steel/Concrete</td>
<td>3100</td>
</tr>
<tr>
<td>5.56mm, M855 Ball</td>
<td>Earth/Water</td>
<td>3437</td>
</tr>
<tr>
<td>7.62mm, M80 Ball</td>
<td>Steel/Concrete</td>
<td>4100</td>
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<tr>
<td>.50 Caliber, M858 Ball, Plastic</td>
<td>Earth/Water</td>
<td>700</td>
</tr>
<tr>
<td>.50 Caliber, M860 Tracer, Plastic</td>
<td>Steel/Concrete</td>
<td>700</td>
</tr>
<tr>
<td>.50 Caliber M2 AP</td>
<td>Earth/Water</td>
<td>6100</td>
</tr>
<tr>
<td>.50 Caliber M2 Ball</td>
<td>Steel/Concrete</td>
<td>6500</td>
</tr>
</tbody>
</table>
Trajectory of a Round - M855

Maximum Effective Range (Point Targets) 550m

Maximum Effective Range (Area Targets) 800m

Distance X 3,437m
Examples of SDZs for several different weapons/weapons systems
Basic Cone SDZ
Single firing point, single target

Distance X

Firing Point
Cone SDZ
Multiple firing points, multiple targets
Basic Batwing SDZ
Single firing point, single target
Batwing vs. Cone SDZs

- Batwing SDZs provide for greater containment of all ricochets
- Target impact media affects dimensions of SDZ ricochet area
- Computer simulation models, based on and validated by actual weapon system firing, generate ballistic “footprints” which are the basis for batwing SDZs
Batwing vs. Cone SDZs

- Batwing SDZs should be considered when designing ranges that involve fire and movement, or where ricochet hazards outside the range complex boundary may endanger nonparticipating personnel, or the general public.

- Where batwing SDZs have already been applied or can be employed without significant impact on range operations, the batwing SDZ should be implemented.
Batwing SDZ

- Ballistic footprint represents actual weapon system performance
- Does not include 5° dispersion for human sighting error and inherent weapon system characteristics
- Provide greater containment of ricochets at closer ranges
- Lateral SDZ requirements are generally greater at shorter ranges because of higher projectile velocities.
Batwing SDZ
Single firing point, multiple targets

Distance X

Target Area

Firing Point
Movement Box SDZ
Multiple firing positions, fixed or moving targets
Indirect Fire SDZ - Mortar
Single firing point, single target area

Distance X/Max Range

Firing Point

Target Area

Fragmentation from exploding projectiles
Indirect Fire SDZ - Artillery
Single firing point, single target area

- Fragments, debris, and components from exploding projectiles
- Safe area for overhead fire of unprotected personnel
- Muzzle debris, overpressure, blast, hazardous noise
Special SDZ - TOW

Distance X

Firing Point
Composite SDZ
Combined Arms Live Fire Exercise - CALFEX
Range Safety Questions

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