(8) Personnel wearing approved laser eye protection within the LSDZ.

(9) Personnel down range when supporting training on known distance firing ranges, when protection is provided.

b. Authorization of any other personnel within danger zones requires deviation approval per AR 385–63/MCO 3570.1C and paragraph 1–4 of this pamphlet.

Chapter 4
Small Arms

4–1. Firing conditions

a. For the purpose of this pamphlet, small arms are man-portable, individual and crew-served weapon systems of 30 mm or less used primarily against personnel and lightly armored or unarmored equipment. Small arms SDZ diagrams and tables provided in this chapter are the standard for the proper construction of small arms direct fire SDZs with or without exploding projectiles.

b. The cone SDZ may be applied when designing or conducting training on static/known distance style ranges that do not involve fire and movement or fire and maneuver. Figure 4–1 is a cone SDZ for firing small arms direct-fire weapons without exploding projectiles. Figure 4–2 is a cone SDZ for firing small arms direct-fire weapons with exploding projectiles.

c. The batwing SDZ provides for greater containment of all ricochets. For the Army, the batwing will be considered when designing or conducting training on ranges that involve fire and movement, fire and maneuver, flanking fire, and/or when ricochet hazards outside the range boundary may endanger nonparticipating personnel. Decision on use of batwing will be based on level of risk and approval of appropriate command risk acceptance authority in accordance with DA Pam 385–30. For the Marine Corps the batwing will be applied when designing or conducting training on ranges that involve fire and movement, fire and maneuver, flanking fire, and/or when ricochet hazards outside the range boundary may endanger nonparticipating personnel. Figures 4–3 and 4–4 are batwing SDZs for firing small arms direct-fire weapons without exploding projectiles. Figure 4–5 is a batwing SDZ for firing small arms direct-fire weapons with exploding projectiles.

d. When firing small arms with or without exploding projectiles on small arms ranges with known distance and unknown distances involving hand-held and shoulder-fired weapons or weapons firing from ground or vehicle-mounted platforms, the standard 5 degree dispersion area for the SDZ may be reduced to 2 degrees when:

(1) Conducting static (non-fire and movement/maneuver) training on known distance and unknown distance small arms ranges with hand-held or shoulder-fired weapons when firing from fixed or stationary positions.

(2) Training on ranges involving personnel conducting precision fires from stationary positions.

(3) Ground-mounted weapons conducting static (non-fire and movement/maneuver) training on known distance and unknown distance small arms ranges that are mounted on appropriate tripods. The traversing and elevation mechanism for that weapon system will be used for all fires.

(4) Vehicle-mounted weapons conducting static (non-fire and movement/maneuver) training on known distance and unknown distance small arms ranges are mounted on appropriate vehicle mounts. The traversing and elevation mechanism for that weapon system will be used and locked in place for all fires.

(5) Risk management process documentation for the unit conducting training has been approved by the installation RMA (Army), RCO (Marine Corps) or other appropriate approving authority. Training events in which the SDZ dispersion area has been reduced from 5 to 2 degrees will be specifically addressed in the risk management worksheet.

4–2. Surface danger zones

a. Surface danger zone data for small arms is found in tables 4–1 through 4–23. The column “Ricochet Vert Haz” contains data which represent ricochet vertical hazard only.

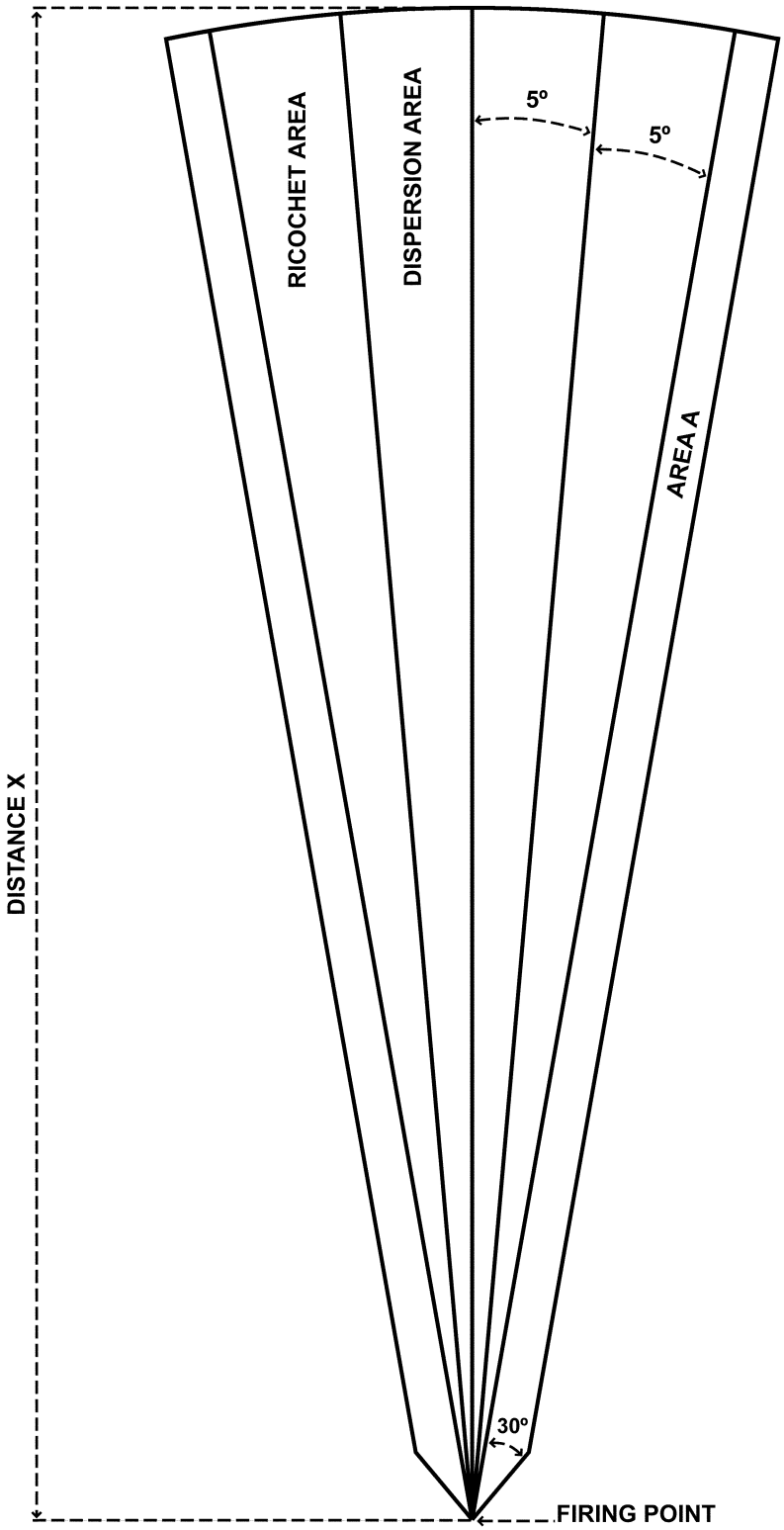

Figure 4–1. Cone surface danger zone for firing small arms direct-fire weapons without exploding projectiles

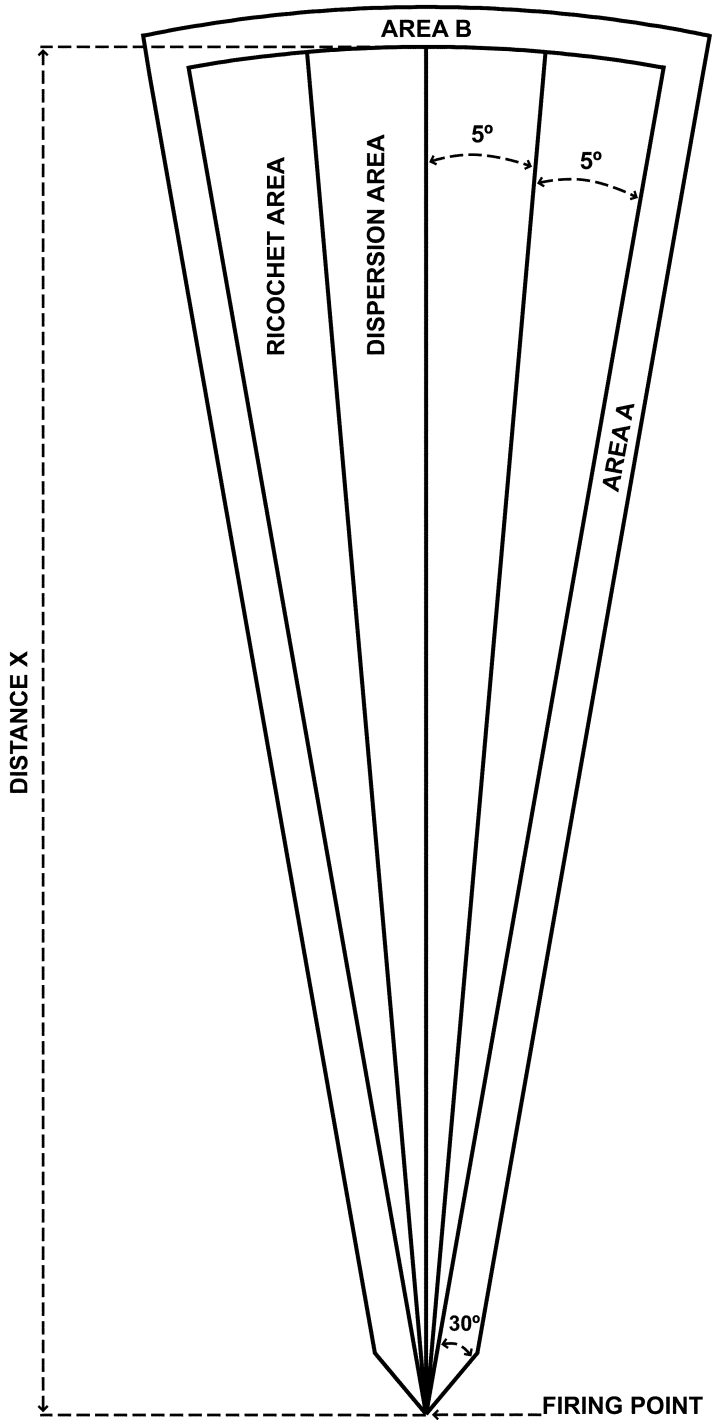

Figure 4–2. Cone surface danger zone for firing small arms direct-fire weapons with exploding projectiles

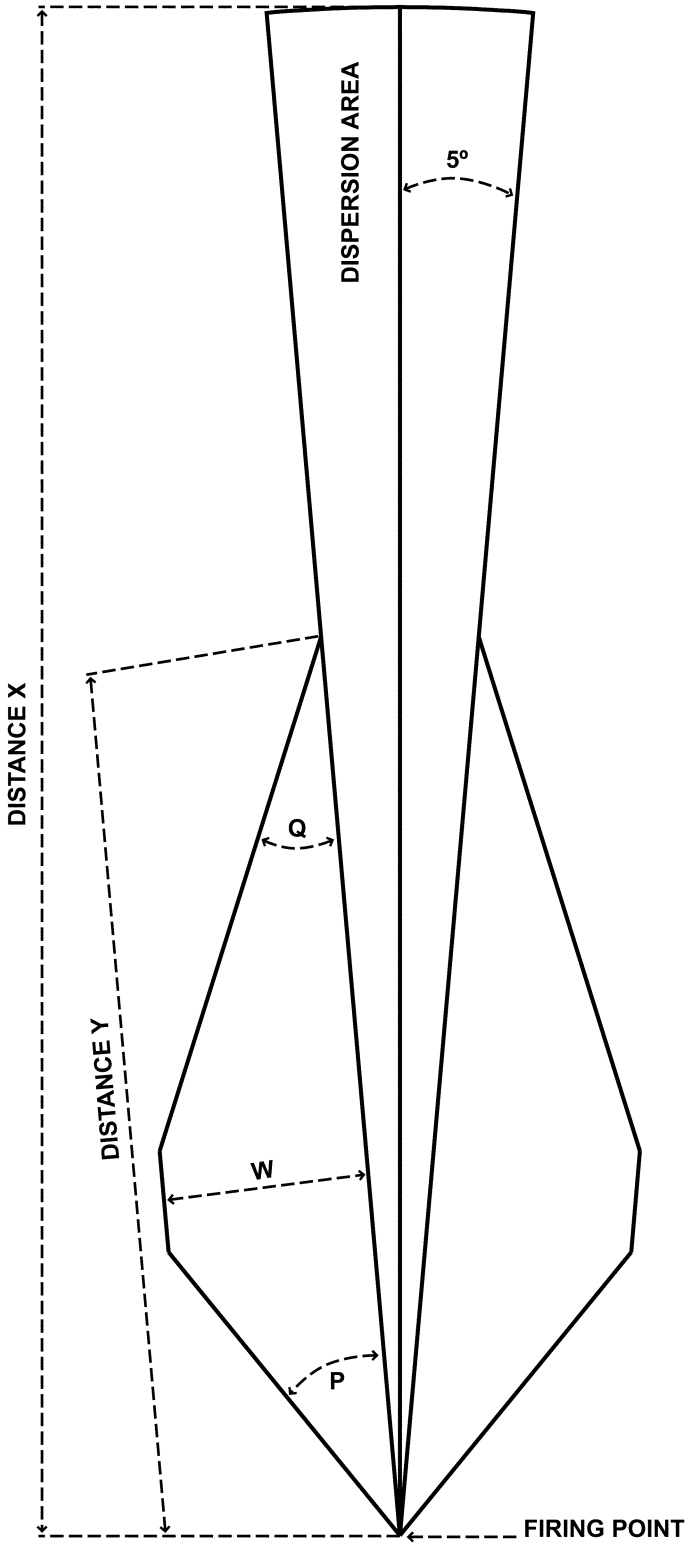

Figure 4–3. Batwing surface danger zone for firing small arms direct-fire weapons without exploding projectiles, except 5.56mm M1037 Short Range Training Ammunition

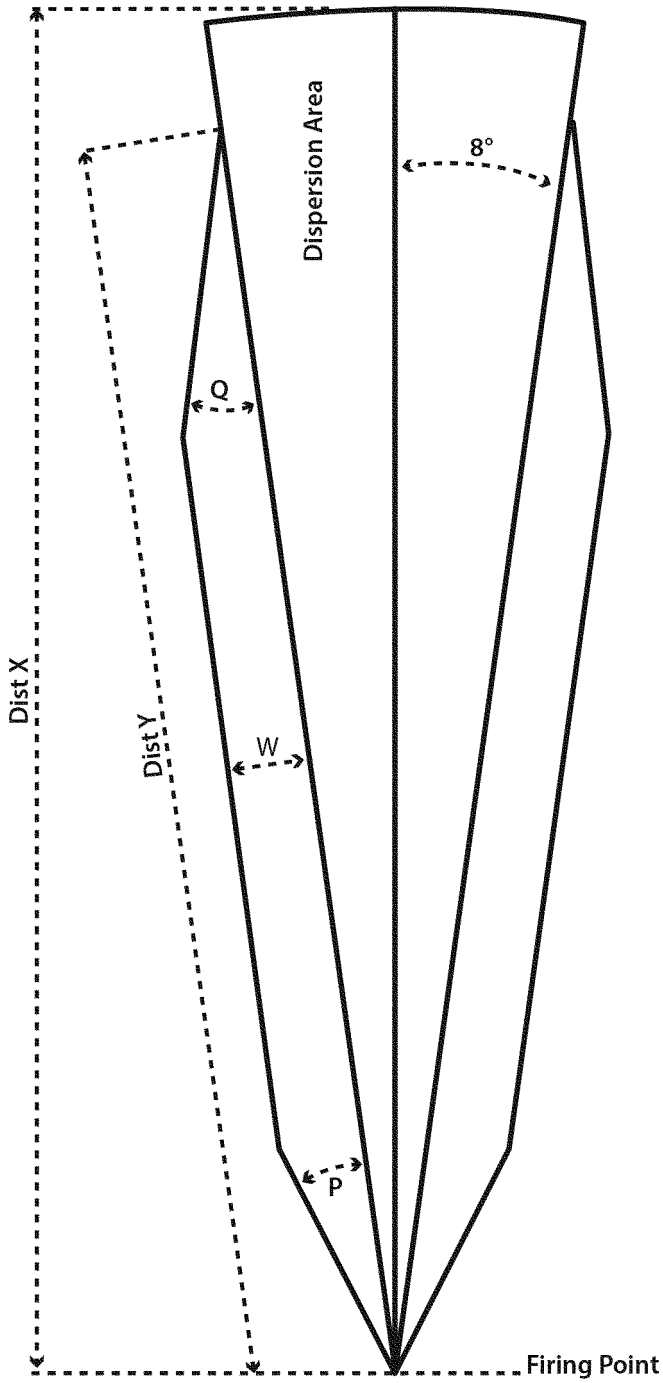

Figure 4–4. Batwing surface danger zone for firing 5.56mm M1037 Short Range Training Ammunition

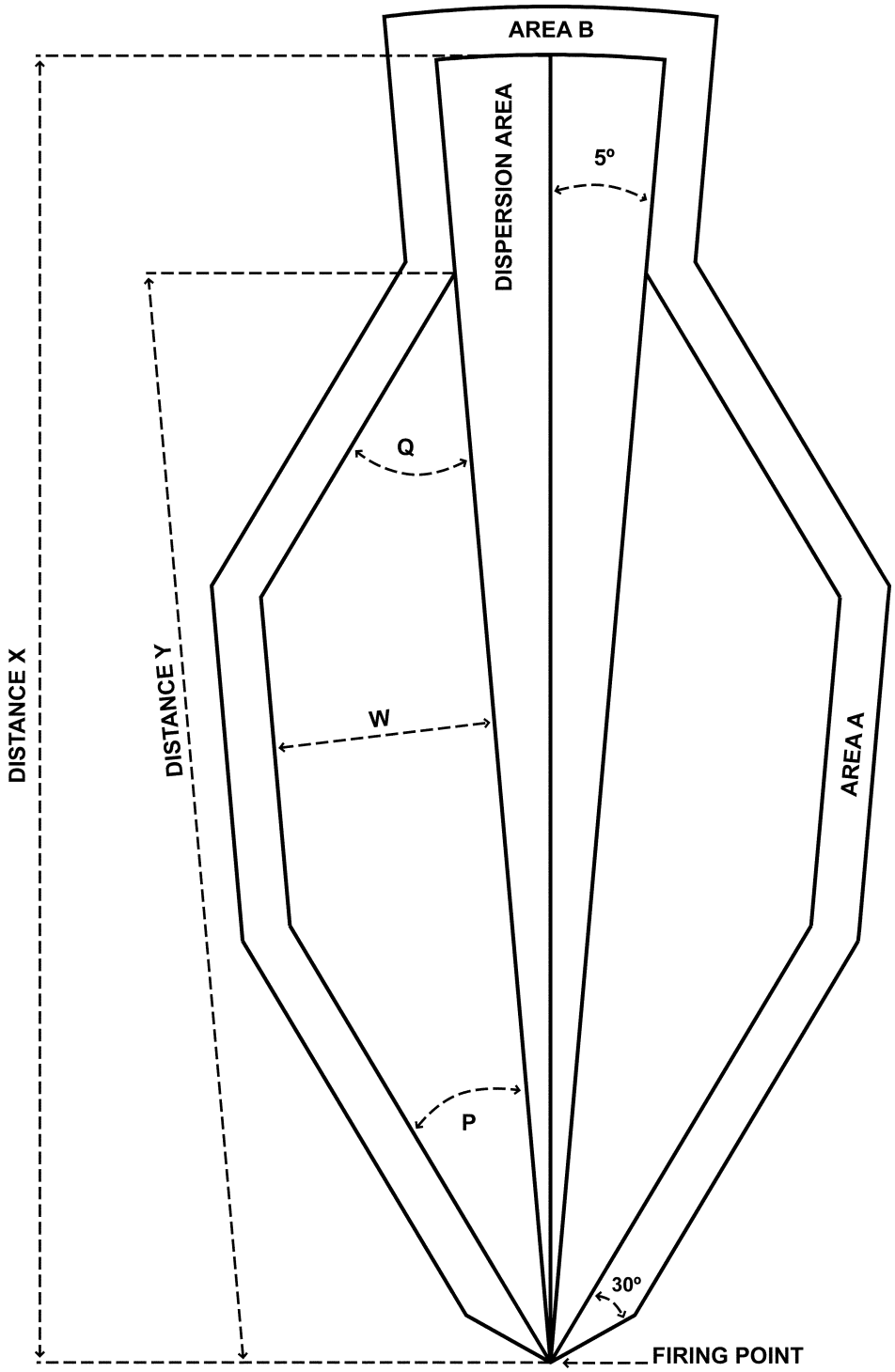

Figure 4–5. Batwing surface danger zone for firing small arms direct-fire weapons with exploding projectiles

b. Figure 4–6 is the SDZ for the M903 saboted light armor penetrator (SLAP), M962 SLAP tracer (SLAP–T), MK 211 armor-piercing-incendiary (API), MK 211–0 API-tracer (API–T) .50 caliber ammunition.

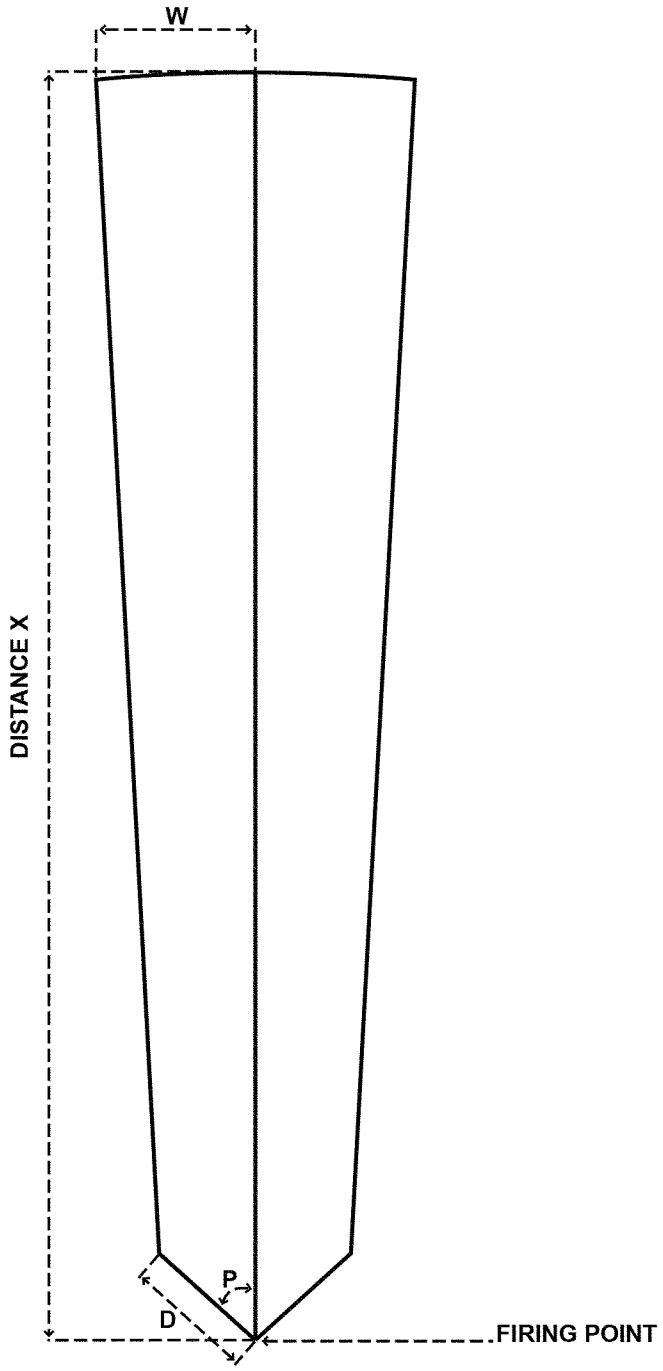

Figure 4–6. Surface danger zone for M903, M962, MK211, and MK 211–0 .50 caliber ammunition

c. Figure 4–7 is the .50 caliber M903 SLAP and M962 SLAP–T sabot discard area.

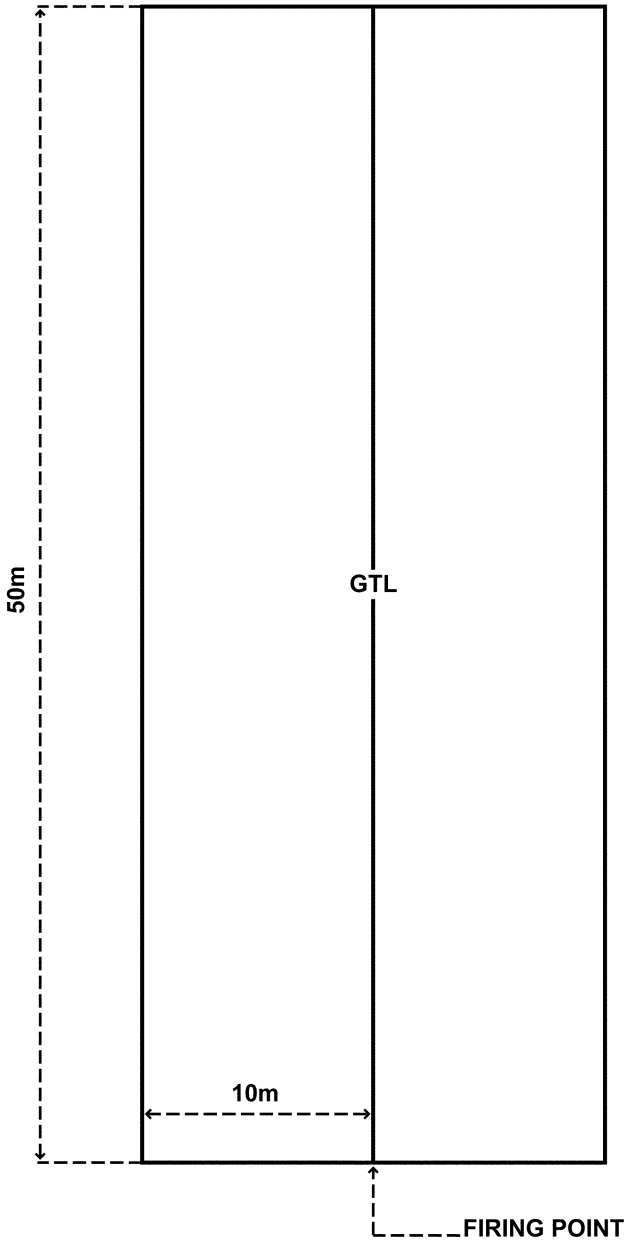

Figure 4–7. Surface danger zone for .50 caliber M903 SLAP and M962 SLAP–T ammunition sabot discard area

d. When firing the 12-gauge shotgun with 7½, 8 and 9 shot, use the SDZ shotfall data provided in figure 4–8. All 12-gauge buckshot, slug, or other shot larger than 7½ shot will use data provided in figures 4–1 and 4–3, and table 4–1.

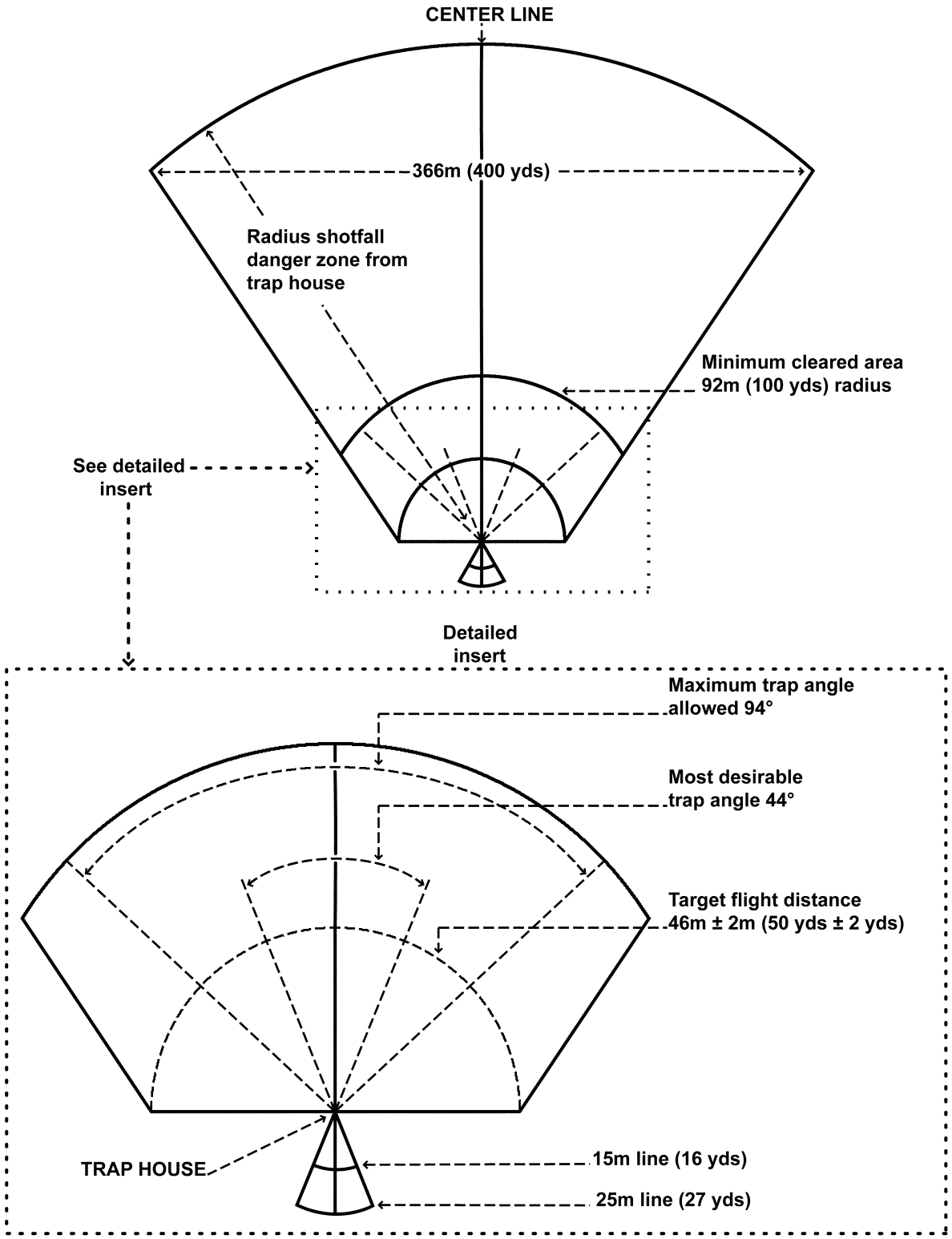

Figure 4–8. Surface danger zone for shotfall

e. Table 4–1 contains SDZ data for 12-gauge ammunition small arms direct-fire weapons.

Table 4–1
Surface danger zone data for 12-gauge ammunition small arms direct-fire weapons

Ammunition 12-gauge	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[1] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
12-gauge slug, shot size larger than 7½	Earth/ Water	1,073	710	125	100	NR	21.96	33.34	136
	Steel/ Concrete	1,073	830	287	100	NR	56.91	40.17	197
12-gauge 7½, 8, and 9 shot	Earth/ Water	275	NR	NR	NR	NR	NR	NR	NR
	Steel/ Concrete	275	NR	NR	NR	NR	NR	NR	NR
12- gauge XM1030 Breaching	Earth/ Water	375	NR	NR	NR	NR	12.50	NR	NR
	Steel/ Concrete	375	NR	NR	NR	NR	12.50	NR	NR

Legend for Table 4-1:
NR=not required
Notes:
[1] Area A applies to cone SDZ only.

f. Table 4–2 contains SDZ data for small arms blank ammunition with BFA.

Table 4–2
Surface danger zone data for all small arms blank ammunition with blank firing adapter

Ammunition Blank	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[1] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
Small arms 5.56mm, 7.62mm, .50 caliber	NR	5	NR	NR	NR	NR	NR	NR	NR

Legend for Table 4-2:
NR=not required
Notes:
[1] The dispersion and ricochet area for all ammunition is 10 degrees.

g. Table 4–3 contains SDZ data for .22 caliber ammunition, small arms direct-fire weapons.

Table 4–3
Surface danger zone data for .22 caliber ammunition small arms direct-fire weapons

Ammunition .22 caliber	Impact media	DistanceX (m)	Distance Y (m)	Distance W (m)	Area A[1] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
Ball LR	Earth/ Water	1,400	1,033	155	100	NR	24.00	15.90	96
	Steel/ Concrete	1,400	1,125	386	100	NR	63.40	30.30	245

Legend for Table 4-3:
NR=not required
Notes:
[1] Area A applies to cone SDZ only.

h. Table 4–4 contains SDZ data for 9mm small arms direct-fire weapons.

Table 4–4
Surface danger zone data for 9mm small arms direct-fire weapons

Ammunition 9mm[1]	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[2] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
Ball M882, M1, Subsonic	Earth/ Water	1,800	1,077	158	100	NR	23.10	15.80	93
	Steel/ Concrete	1,800	1,211	399	100	NR	61.10	30.40	253

Legend for Table 4-4:
NR=not required

Notes:
[1] SDZ data for Special Effects Small Arms Marking System (SESAMS) and CCMCK ammunition is located in chapter 14 of this publication.
[2] Area A applies to cone SDZ only.

i. Table 4–5 contains SDZ information for .38 caliber small arms direct-fire weapons.

Table 4–5
Surface danger zone data for .38 caliber small arms direct-fire weapons

Ammunition .38 caliber	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[1] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
38 caliber Spec Ball M41, .38 Wadcutter	Earth/ Water	1,806	1,110	153	100	NR	22.57	16.07	89
	Steel/ Concrete	1,806	1,258	389	100	NR	60.59	35.36	245

Legend for Table 4-5:
NR=not required

Notes:
[1] Area A applies to cone SDZ only.

j. Table 4–6 contains SDZ information for .45 caliber small arms direct-fire weapons.

Table 4–6
Surface danger zone data for .45 caliber small arms direct-fire weapons

Ammunition .45 caliber	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[1] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
Ball, Tracer, Wad-cutter, Match	Earth/ Water	1,690	1,016	117	100	NR	21.11	16.69	100
	Steel/ Concrete	1,690	1,111	290	100	NR	54.74	30.77	186

Legend for Table 4-6:
NR=not required

Notes:
[1] Area A applies to cone SDZ only.

k. Table 4–7 contains SDZ data for 5.56mm small arms direct-fire weapons.

Table 4–7
Surface danger zone data for 5.56mm small arms direct-fire weapons

Ammunition 5.56mm[1]	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[2] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
M193 Ball	Earth/ Water	3,100	2,004	458	100	NR	35.20	23.10	319
	Steel/ Concrete	3,100	1,666	323	100	NR	19.00	26.90	219
M196 Tracer	Earth/ Water	3,100	2,066	362	100	NR	35.10	26.80	355
	Steel/ Concrete	3,100	2,023	243	100	NR	19.20	22.80	243
M855 Ball	Earth/ Water	3,437	2,029	462	100	NR	34.20	22.40	325
	Steel/ Concrete	3,437	1,810	334	100	NR	18.80	25.20	229
M856 Tracer	Earth/ Water	3,089	1,607	355	100	NR	32.80	23.20	261
	Steel/ Concrete	3,089	1,592	277	100	NR	18.60	21.00	261
4 Ball/1 Tracer F/SAW	Earth/ Water	3,437	2,029	462	100	NR	34.20	22.40	325
	Steel/ Concrete	3,437	1,810	334	100	NR	18.80	25.20	261
M862 Plastic Short Range	Earth/ Water	250	165	24	100	NR	15.40	20.00	16
	Steel/ Concrete	250	136	5	100	NR	3.30	7.30	4

Legend for Table 4-7:
NR=not required

Notes:
[1] SDZ data for CCMCK ammunition located in chapter 14 in this publication.
[2] Area A applies to cone SDZ only.

l. Table 4–8 contains SDZ data for 5.56mm M855A1 enhanced performance round ball ammunition.

Table 4–8
Surface danger zone data for 5.56mm M855A1 enhanced performance round (ball)

Altitude (ft)	Impact media	Distance X[1] (m)	Distance Y (m)	Distance W (m)	Area A[2] (m)	Area B (m)	Angle P[3] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
0	Earth	3,521	3,100	400	100	NR	60	15	295
	Armor	3,521	3,050	360	100	NR	45	14	272
1,000	Earth	3,630	3,200	420	100	NR	60	15	305
	Armor	3,630	3,150	370	100	NR	45	14	280
2,000	Earth	3,743	3,300	430	100	NR	60	15	314
	Armor	3,743	3,250	390	100	NR	45	14	288
3,000	Earth	3,859	3,400	440	100	NR	60	15	324
	Armor	3,859	3,350	400	100	NR	45	14	297
4,000	Earth	3,980	3,500	450	100	NR	60	15	334
	Armor	3,980	3,450	420	100	NR	45	14	306
5,000	Earth	4,105	3,600	460	100	NR	60	15	344
	Armor	4,105	3,550	430	100	NR	45	14	315

Table 4–8
Surface danger zone data for 5.56mm M855A1 enhanced performance round (ball)—Continued

Altitude (ft)	Impact media	Distance X[1] (m)	Distance Y (m)	Distance W (m)	Area A[2] (m)	Area B (m)	Angle P[3] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
6,000	Earth	4,234	3,700	470	100	NR	60	15	354
	Armor	4,234	3,650	440	100	NR	45	14	324
7,000	Earth	4,369	3,800	490	100	NR	60	15	365
	Armor	4,369	3,750	450	100	NR	45	14	333

Legend for Table 4-8:
NR=not required

Notes:
[1] Distance X must increase by 29m per m/sec or 15m per knot of tail wind, measured along the line of fire.
[2] Area A applies to cone SDZ only.
[3] Ricochet Angle P is measured from the dispersion angle. To correct for cross-range winds, the dispersion angle must increase by 0.4 degrees per m/s or 0.2 degrees/knot of cross wind, measured perpendicular to the line of fire.

m. Table 4–9 contains SDZ data for 5.56mm Cartridge, M856A1 Tracer.

Table 4–9
Surface danger zone data for 5.56mm Cartridge, M856A1 Tracer

Altitude (ft)	Impact media	Distance X[1] (m)	Distance Y (m)	Distance W (m)	Angle P[2] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
0	Earth	2,574	1,625	190	58.00	19.00	162
	Armor	2,574	1,900	210	48.00	15.00	171
1,000	Earth	2,657	1,679	197	58.30	19.15	166
	Armor	2,657	1,958	217	48.15	15.15	177
2,000	Earth	2,742	1,733	204	58.60	19.30	171
	Armor	2,742	2,016	224	48.30	15.30	183
3,000	Earth	2,831	1,787	211	58.90	19.45	177
	Armor	2,831	2,074	231	48.45	15.45	188
4,000	Earth	2,924	1,841	218	59.20	19.60	182
	Armor	2,924	2,132	238	48.60	15.60	194
5,000	Earth	3,020	1,895	225	59.50	19.75	189
	Armor	3,020	2,190	245	48.75	15.75	201
6,000	Earth	3,120	1,949	232	59.80	19.90	195
	Armor	3,120	2,248	252	48.90	15.90	207
7,000	Earth	3,224	2,003	239	60.10	20.05	201
	Armor	3,224	2,306	259	49.05	16.05	214

Notes:
[1] Distance X is for firing elevations up to maximum range and considers both free flight and ricochet trajectories. To correct for tail winds, Distance X must increase by 25m per m/s or 13m per knot of tail wind measured along the line of fire.
[2] Angle P is measured from the dispersion angle. To correct for cross range winds, the dispersion angle must increase by 0.45 degree per m/s or 0.23 degree per knot of cross range wind measured perpendicular to the line of fire.

n. Table 4–10 contains SDZ data for 5.56mm Cartridge, MK301 Dim Tracer.

Table 4–10
Surface danger zone data for 5.56mm Cartridge, MK301 Dim Tracer

Altitude (ft)	Impact media	Distance X[1] (m)	Distance Y (m)	Distance W (m)	Angle P[2] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
0	Earth	2,324	1,920	190	51.30	13.75	158
	Armor	2,324	1,655	145	41.70	11.75	100
1,000	Earth	2,396	1,973	196	51.15	13.85	164
	Armor	2,396	1,708	149	41.60	11.85	104
2,000	Earth	2,472	2,026	202	51.00	13.95	170
	Armor	2,472	1,761	153	41.50	11.95	108
3,000	Earth	2,550	2,079	208	50.85	14.05	176
	Armor	2,550	1,814	157	41.40	12.05	112
4,000	Earth	2,632	2,132	214	50.70	14.15	182
	Armor	2,632	1,867	161	41.30	12.15	116
5,000	Earth	2,716	2,185	220	50.55	14.25	188
	Armor	2,716	1,920	165	41.20	12.25	120
6,000	Earth	2,804	2,238	226	50.40	14.35	194
	Armor	2,804	1,973	169	41.10	12.35	124
7,000	Earth	2,896	2,291	232	50.25	14.45	200
	Armor	2,896	2,026	173	41.00	12.45	128

Notes:
[1] To correct for tail winds, Distance X must increase by 24m per m/s or 12.5 meters per knot of tail wind measured along the line of fire.
[2] Ricochet Angle P is measured from the dispersion angle. To correct for cross range winds, the dispersion angle must increase by 0.50 degree per m/s or 0.26 degree per knot of cross range wind measured perpendicular to the line of fire.

o. Table 4–11 contains SDZ data for 5.56mm Cartridge, M1037 Short Range Training Ammunition.

Table 4–11
Surface danger zone data for 5.56mm Cartridge, M1037 Short Range Training Ammunition

Altitude (ft)	Impact media	Distance X[1] (m)	Distance Y (m)	Distance W (m)	Angle P[2] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
0	Earth	370	345	22	16.9	13.0	16
	Armor	370	345	9	6.2	3.9	9
1,000	Earth	381	355	23	16.9	13.3	17
	Armor	381	355	9	6.2	3.9	9
2,000	Earth	393	365	24	16.9	13.6	17
	Armor	393	365	10	6.2	3.9	9
3,000	Earth	405	385	25	17.8	13.8	18
	Armor	405	385	10	6.3	3.9	10
4,000	Earth	418	395	25	18.0	14.0	18
	Armor	418	395	10	6.3	3.9	10
5,000	Earth	431	405	27	18.4	14.2	19
	Armor	431	405	10	6.4	3.9	10
6,000	Earth	445	414	27	18.4	14.5	20
	Armor	445	414	10	6.4	3.9	11
7,000	Earth	459	424	27	18.4	14.8	20

Table 4–11
Surface danger zone data for 5.56mm Cartridge, M1037 Short Range Training Ammunition—Continued

Altitude (ft)	Impact media	Distance X[1] (m)	Distance Y (m)	Distance W (m)	Angle P[2] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
	Armor	459	424	10	6.5	3.9	11

Notes:
[1] To correct for tail winds, Distance X must increase by 10m per m/s or 5m per knot of tail wind measured along the line of fire.
[2] Angle P is measured from the dispersion angle. To correct for cross range winds, the 8 degree dispersion angle must increase by 1.10 degree per m/s or 0.55 degree per knot of cross range wind measured perpendicular to the line of fire.

p. Table 4–12 contains SDZ data for 7.62mm small arms direct-fire weapons.

Table 4–12
Surface danger zone data for 7.62mm small arms direct-fire weapons

Ammunition 7.62mm[1]	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[2] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
M59,M80 Ball, M62	Earth/Water Steel/Concrete	4,100 4,100	4,073 4,053	1,461 861	100 100	NR NR	43.54 20.04	38.90 75.54	706 447
7.62X39 mm A102 intermediate designed for AK series, SKS, RPK	Earth/Water Steel/Concrete	4,100 4,100	4,073 4,053	1,461 861	100 100	NR NR	43.54 20.04	38.90 75.54	706 447
M118 Spec Ball, M85	Earth/Water Steel/Concrete	5,288 5,288	4,800 5,137	1,545 990	100 100	NR NR	43.81 20.17	38.73 41.29	752 490

Legend for Table 4-12:
NR=not required

Notes:
[1] For the 7.62 39mm (AK) the only authorized standard Department of Defense identification code (DODIC) to be used is A102.
[2] Area A applies to cone SDZ only.

q. Table 4–13 contains SDZ data for 7.62mm M993 armor piercing small arms weapons ammunition.

Table 4–13
Surface danger zone data for M993 7.62mm armor piercing

Altitude (ft)	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[1] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
0	Earth Steel	4,100 4,100	4,084 4,084	330 330	100 100	NR NR	33.32 33.32	5.97 5.97	224 224
1,000	Earth Steel	4,195 4,195	4,179 4,179	338 338	100 100	NR NR	33.51 33.51	6.00 6.00	229 229
2,000	Earth Steel	4,290 4,290	4,274 4,274	346 346	100 100	NR NR	33.69 33.69	6.03 6.03	234 234
3,000	Earth Steel	4,385 4,385	4,368 4,368	354 354	100 100	NR NR	33.87 33.87	6.06 6.06	239 239
4,000	Earth Steel	4,480 4,480	4,463 4,463	362 362	100 100	NR NR	34.04 34.04	6.09 6.09	244 244
5,000	Earth Steel	4,575 4,575	4,558 4,558	370 370	100 100	NR NR	34.20 34.20	6.12 6.12	249 249
6,000	Earth Steel	4,670 4,670	4,652 4,652	378 378	100 100	NR NR	34.36 34.36	6.14 6.14	254 254

Table 4–13
Surface danger zone data for M993 7.62mm armor piercing—Continued

Altitude (ft)	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[1] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
7,000	Earth	4,765	4,747	386	100	NR	34.51	6.17	259
	Steel	4,765	4,747	386	100	NR	34.51	6.17	259

Legend for Table 4-13:
NR=not required

Notes:
[1] Area A applies to cone SDZ only.

r. Table 4–14 contains SDZ data for 7.62mm Cartridge, M276 Dim Tracer.

Table 4–14
Surface danger zone data for 7.62mm Cartridge, M276 Dim Tracer

Altitude (ft)	Impact media	Distance X[1] (m)	Distance Y (m)	Angle P[2] (deg)	Angle Q (deg)	Area W (m)	Area A[3] (m)	Area B (m)	Ricochet vertical hazard (m)
0	Armor	2,932	2,192	44.3	11.0	234	100	NR	165
	Earth	2,932	1,118	22.0	15.3	106	100	NR	83
1,000	Armor	3,032	2,242	44.2	10.9	238	100	NR	170
	Earth	3,032	1,238	22.2	15.0	114	100	NR	84
2,000	Armor	3,132	2,342	44.1	10.9	244	100	NR	175
	Earth	3,132	1,242	22.3	14.8	116	100	NR	86
3,000	Armor	3,232	2,392	44.0	10.8	248	100	NR	180
	Earth	3,232	1,287	22.5	14.5	118	100	NR	88
4,000	Armor	3,332	2,492	44.0	10.8	258	100	NR	186
	Earth	3,332	1,330	22.7	14.2	122	100	NR	90
5,000	Armor	3,432	2,542	43.9	10.7	266	100	NR	192
	Earth	3,432	1,382	22.9	13.9	134	100	NR	92
6,000	Armor	3,557	2,642	43.8	10.7	276	100	NR	198
	Earth	3,557	1,436	23.0	13.7	239	100	NR	94
7,000	Armor	3,677	2,742	43.7	10.6	286	100	NR	204
	Earth	3,677	1,485	23.2	13.4	144	100	NR	96

Notes:
[1] To correct for tail wind, Distance X is increased by 36 m per m/sec or 18.5m per knot of tail wind measured along the line of fire.
[2] To correct for cross range winds, the dispersion angle must be increased by 0.30 degree per m/s or 0.16 degree per knot of cross range wind measured perpendicular to the line of fire.
[3] Area A applies to cone SDZ only.

s. Table 4–15 contains SDZ data for M973 Ball and M974 Tracer 7.62mm short range training ammunition. These rounds are designed to be ballistically comparable to 7.62mm M80 Ball and M62 Tracer service ammunition out to 100 m.

Table 4–15
Surface danger zone data for M973 Ball and M974 Tracer 7.62mm short range training ammunition[1,2]

Altitude (ft)	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[3] (m)	Area B (m)	Angle P[4] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
0	Earth Steel	540 540	500 500	105 30	100 100	NR NR	38 10	45 20	178 178
1,000	Earth Steel	565 565	520 520	110 32	100 100	NR NR	38 10	45 20	184 184
2,000	Earth Steel	590 590	540 540	115 34	100 100	NR NR	38 10	45 20	190 190
3,000	Earth Steel	615 615	560 560	120 36	100 100	NR NR	38 10	45 20	196 196
4,000	Earth Steel	640 640	580 580	125 38	100 100	NR NR	38 10	45 20	202 202
5,000	Earth Steel	665 665	600 600	130 40	100 100	NR NR	38 10	45 20	208 208
6,000	Earth Steel	690 690	620 620	135 42	100 100	NR NR	38 10	45 20	214 214
7,000	Earth Steel	715 715	640 640	140 44	100 100	NR NR	38 10	45 20	220 220

Legend for Table 4-15:
NR=not required

Notes:
[1] For SDZ construction use figure 4–3, with the following change: Dispersion, use a dispersion angle of 12 degrees.
[2] Single hearing protection should be worn by all personnel within 24m when M973 Ball and/or M974 Tracer ammunition is being fired.
[3] Area A applies to cone SDZ only.
[4] To correct for cross wind, dispersion angle is increased by 0.8 degree per m/s or 0.4 degree per knot of cross wind, measured perpendicular to the line of fire

t. Table 4–16 contains SDZ data for MK 248 MOD 0 .300 caliber Winchester Magnum small arms direct-fire ammunition.

Table 4–16
Surface danger zone data for MK 248 MOD 0 .300 Winchester Magnum small arms direct-fire ammunition[1]

Altitude (ft)	Impact media	Distance X[2] (m)	Distance Y (m)	Distance W (m)	Area A[3] (m)	Area B (m)	Angle P[4] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
0	Earth Armor	5,919 5,919	4,200 2,300	390 180	100 100	NR NR	40.00 28.00	10.00 12.00	322 128
1,000	Earth Armor	6,078 6,078	4,336 2,358	399 187	100 100	NR NR	40.45 27.75	10.30 12.15	340 138
2,000	Earth Armor	6,242 6,242	4,472 2,416	408 194	100 100	NR NR	40.90 27.50	10.60 12.30	358 150
3,000	Earth Armor	6,411 6,411	4,608 2,474	417 201	100 100	NR NR	41.35 27.25	10.90 12.45	382 160
4,000	Earth Armor	6,584 6,584	4,744 2,532	426 208	100 100	NR NR	41.80 27.00	11.20 12.60	410 165
5,000	Earth Armor	6,763 6,763	4,880 2,590	435 215	100 100	NR NR	42.25 26.75	11.50 12.75	433 180
6,000	Earth Armor	6,947 6,947	5,016 2,648	444 222	100 100	NR NR	42.70 26.50	11.80 12.90	457 194

Table 4–16
Surface danger zone data for MK 248 MOD 0 .300 Winchester Magnum small arms direct-fire ammunition[1]—Continued

Altitude (ft)	Impact media	Distance X[2] (m)	Distance Y (m)	Distance W (m)	Area A[3] (m)	Area B (m)	Angle P[4] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
7,000	Earth Armor	7,137 7,137	5,152 2,706	453 229	100 100	NR NR	43.15 26.25	12.10 13.05	484 208

Legend for Table 4-16:
NR=not required

Notes:
[1] Single hearing protection should be worn by all personnel within 34 m when MK248 MOD 0 ammunition is being fired.
[2] Distance X must increase by 37 m per m/sec or 19 m per knot of tail wind, measured along the line of fire.
[3] Area A applies to cone SDZ only.
[4] Dispersion angle of 5 degrees must increase by 0.28 degree per or 0.15 degree per knot of cross wind, measured perpendicular to the line of fire.

u. Table 4–17 contains surface danger zone data for MK 248 MOD 1 .300 caliber Winchester Magnum small arms direct-fire ammunition.

Table 4–17
Surface danger zone data for MK 248 MOD 1 .300 Winchester Magnum small arms direct-fire ammunition[1]

Altitude (ft)	Impact media	Distance X[2] (m)	Distance Y (m)	Distance W (m)	Area A[3] (m)	Area B (m)	Angle P[4] (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
0	Earth Armor	6,294 6,294	4,600 3,800	390 220	100 100	NR NR	39.00 24.00	14.00 10.00	350 146
1,000	Earth Armor	6,462 6,462	4,675 3,858	402 227	100 100	NR NR	39.15 23.75	14.60 10.15	372 155
2,000	Earth Armor	6,635 6,635	4,750 3,916	414 234	100 100	NR NR	39.30 23.50	15.20 10.30	397 165
3,000	Earth Armor	6,814 6,814	4,825 3,974	426 241	100 100	NR NR	39.45 23.25	15.80 10.45	424 175
4,000	Earth Armor	6,998 6,998	4,900 4,032	438 248	100 100	NR NR	39.60 23.00	16.40 10.60	440 187
5,000	Earth Armor	7,188 7,188	4,975 4,090	450 255	100 100	NR NR	39.75 22.75	17.00 10.75	468 198
6,000	Earth Armor	7,384 7,384	5,050 4,148	462 262	100 100	NR NR	39.90 22.50	17.60 10.90	500 211
7,000	Earth Armor	7,587 7,587	5,125 5,206	474 269	100 100	NR NR	40.05 22.25	18.20 11.05	533 223

Legend for Table 4-17:
NR=not required

Notes:
[1] Single hearing protection should be worn by all personnel within 34 m when MK248 MOD 1 ammunition is being fired.
[2] Distance X must increase by 40 meters m/sec or 21 m per knot of tail wind, measured along the line of fire.
[3] Area A applies to cone SDZ only.
[4] Dispersion angle must increase by 0.28 degree per m/s or 0.15 degree per knot of cross range wind, measured perpendicular to the line of fire.

v. Table 4–18 contains SDZ data for .50 caliber small arms direct-fire ammunition.

Table 4–18
Surface danger zone data for .50 caliber small arms direct-fire

Ammunition .50 caliber	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A[1] (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
M8 API, M2 AP, M20, M1	Earth/ Water	6,100	5,142	1,659	100	NR	40.80	69.60	904
	Steel/ Concrete	6,100	4,300	718	100	NR	16.30	33.10	462
M33 Ball, M2 Ball, M17, M10, M17, Spotter Tracer	Earth/ Water	6,500	5,211	1,652	100	NR	38.19	63.35	901
	Steel/ Concrete	6,500	4,147	714	100	NR	16.03	44.13	478
M858 Ball Plastic, M860 Tracer Plastic	Earth/ Water	700	398	20	100	NR	4.28	9.16	41
	Steel/ Concrete	700	415	53	100	NR	11.65	21.14	41

Legend for Table 4-18:
AP=armor piercing
API=armor-piercing incendiary
NR=not required

Notes:
[1] Area A applies to cone SDZ only.

w. Table 4–19 contains SDZ data for M903 .50 caliber SLAP small arms direct-fire ammunition.

Table 4–19
Surface danger zone data for M903 .50 caliber saboted light armor penetrator

Altitude (ft)	Impact media	Distance X (m)	Distance W (m)	Distance D (m)	Area A (m)	Area B (m	Angle P (deg)	Ricochet vertical hazard (m)
0	Sand/Steel	8,625	1,130	1,074	NR	NR	47.34	1,130
1,000	Sand/Steel	8,885	1,155	1,101	NR	NR	47.34	1,155
2,000	Sand/Steel	9,145	1,180	1,128	NR	NR	47.38	1,180
3,000	Sand/Steel	9,405	1,205	1,155	NR	NR	47.39	1,205
4,000	Sand/Steel	9,665	1,230	1,182	NR	NR	47.40	1,230
5,000	Sand/Steel	9,925	1,255	1,209	NR	NR	47.42	1,255
6,000	Sand/Steel	10,185	1,280	1,236	NR	NR	47.43	1,280
7,000	Sand/Steel	10,445	1,305	1,263	NR	NR	47.44	1,305

x. Table 4–20 contains SDZ data for M962 .50 caliber SLAP–T small arms direct-fire ammunition.

Table 4–20
Surface danger zone data for M962 .50 caliber saboted light armor penetrator-T

Altitude (ft)	Impact media	Distance X (m)	Distance W (m)	Distance D (m)	Area A (m)	Area B (m)	Angle P (deg)	Ricochet vertical hazard (m)
0	Sand/Steel	9,560	1,240	1,001	NR	NR	48.00	1,240
1,000	Sand/Steel	9,870	1,270	1,025	NR	NR	48.00	1,270
2,000	Sand/Steel	10,180	1,300	1,049	NR	NR	48.01	1,300
3,000	Sand/Steel	10,490	1,330	1,073	NR	NR	48.02	1,330
4,000	Sand/Steel	10,800	1,360	1,098	NR	NR	48.03	1,360
5,000	Sand/Steel	11,110	1,390	1,122	NR	NR	48.04	1,390
6,000	Sand/Steel	11,420	1,420	1,146	NR	NR	48.04	1,420
7,000	Sand/Steel	11,730	1,450	1,170	NR	NR	48.04	1,450

y. Table 4–21 contains SDZ data for .50 caliber MK211, MK211–0/API–T small arms direct-fire ammunition.

Table 4–21
Surface danger zone data for .50 caliber MK211, MK211–0/API–T

Altitude (ft)	Impact media	Distance X (m)	Distance W (m)	Distance D (m)	Area A (m)	Area B (m)	Angle P (deg)	Ricochet vertical hazard (m)
0	Sand/Steel	7,955	1,075	530	NR	NR	49.48	1,075
1,000	Sand/Steel	8,104	1,100	528	NR	NR	50.26	1,100
2,000	Sand/Steel	8,325	1,125	526	NR	NR	51.02	1,125
3,000	Sand/Steel	8,515	1,150	524	NR	NR	51.76	1,150
4,000	Sand/Steel	8,700	1,175	522	NR	NR	52.49	1,175
5,000	Sand/Steel	8,885	1,200	520	NR	NR	53.20	1,200
6,000	Sand/Steel	9,075	1,225	518	NR	NR	53.89	1,225
7,000	Sand/Steel	9,260	1,250	516	NR	NR	54.56	1,250

z. Table 4–22 contains SDZ data for 20 mm small arms direct-fire weapons.

Table 4–22
Surface danger zone data for 20 mm small arms direct-fire weapons

Ammunition 20 mm	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
M55A2 TP	Earth	4,500	3,780	733	100[1]	NR	25.74	33.20	357
	Water	4,500	3,500	737	100[1]	NR	26.16	36.66	350
	Steel	4,500	4,053	1,025	100[1]	NR	38.14	36.82	585
	Concrete	4,500	3,750	969	100[1]	NR	34.12	37.78	509
M220 TP–T	Earth	3,940	3,340	581	100[1]	NR	25.83	22.83	317
	Water	3,940	3,040	558	100[1]	NR	26.08	30.96	311
	Steel	3,940	3,290	804	100[1]	NR	36.66	47.76	513
	Concrete	3,940	3,260	765	100[1]	NR	34.33	34.09	447
M56A3 HEI	Earth	4,250	3,940	771	156	156	26.89	34.54	403
	Water	4,250	3,980	864	156	156	27.21	40.82	396
	Steel	4,250	4,160	1,219	156	156	38.36	58.05	664

Table 4–22
Surface danger zone data for 20 mm small arms direct-fire weapons—Continued

Ammunition 20 mm	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
	Concrete	4,250	4,240	1,189	156	156	34.65	43.79	577
M246 HEITSD	Earth	4,230	3,537	685	156	156	26.73	39.83	360
	Water	4,230	3,316	716	156	156	25.81	35.87	354
	Steel	4,230	3,937	991	156	156	38.63	38.58	590
	Concrete	4,230	3,758	952	156	156	34.99	50.31	531

Legend for Table 4-22:
HEI=higher explosive incendiary
HEITSD=high explosive incendiary tracer self-destruct
NR=not required
TP=training practice
TP–T=training practice-tracer

Notes:
[1] Area A applies to cone SDZ only.

aa. Table 4–23 contains SDZ data for 30 mm small arms direct-fire weapons.

Table 4–23
Surface danger zone data for 30 mm small arms direct-fire weapons

Ammunition 30 mm	Impact media	Distance X (m)	Distance Y (m)	Distance W (m)	Area A (m)	Area B (m)	Angle P (deg)	Angle Q (deg)	Ricochet vertical hazard (m)
M788 TP	Earth	4,020	3,116	636	100[1]	NR	24.93	40.37	311
	Water	4,020	3,252	730	100[1]	NR	25.19	28.65	298
	Steel	4,020	3,631	1,023	100[1]	NR	36.78	33.18	524
	Concrete	4,020	3,600	874	100[1]	NR	30.66	35.59	451
M789 HEDP	Earth	4,122	3,305	654	275	275	25.37	39.65	318
	Water	4,122	3,263	746	275	275	24.71	34.53	302
	Steel	4,122	3,947	1,058	275	275	36.26	39.59	534
	Concrete	4,122	3,684	886	275	275	31.56	42.14	460

Legend for Table 4-23:
HEDP=high-explosive dual-purpose
NR=not required

Notes:
[1] Area A applies to cone SDZ only.

4–3. Small caliber dummy, drill, and inert ammunition

The dummy, drill, and inert (DDI) cartridges are designed to aid in easy identification of inert ammunition to prevent injury caused by any mix-up with live service ammunition during training. The DDI are completely nickel plated with the 9mm DDI having two holes drilled in the cartridge case, while the 5.56, 7.62, and .50 caliber DDI have fluted cartridge cases to aid tactile identification in darkness. For the Army, the nickel plated DDI will be the only DDI inert small caliber cartridges authorized for classroom training and weapon cycling functioning for weapon maintenance, or other situations when inert cartridges are needed.

Chapter 5
Grenades and Grenade Launchers

5–1. Hand grenades

a. High explosive loaded type grenades. These contain explosive charges that detonate after a short delay (3 to 5