Blue Fire Effects Table
June 1935

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Serial No. 12

BLUE FIRE EFFECT TABLES

Cancels Edition of June 1934

DEPARTMENT OF OPERATIONS
NAVAL WAR COLLEGE
Newport, R. I.
June, 1935

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BLUE FIRE EFFECT TABLES

DEPARTMENT OF OPERATIONS
Naval War College
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June, 1935

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No. 1008

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H. D. Cooke

H. D. COOKE
Captain, U.S. Navy
Chief of Staff.

NAVAL WAR COLLEGE
Newport, R.I.
1 June, 1935.

EXPLANATION OF TABLES

1. These tables give the effect of single guns, under normal conditions, in terms of equivalent 14" penetrative hits per three-minute move.

2. To use a table, in the case of the fire of a particular type of gun against a particular class of target ship, -

(1) determine whether shots are penetrative, for which purpose enter the armor penetration table for that gun with arguments:

(a) armor of target ship
(b) target angle, and
(c) range.

(2) select appropriate fire effect for one gun from fire effect tables using as arguments;

(a) size class of target
(b) whether shots are penetrative
(c) kind of spot, and
(d) range.

(3) multiply this figure for the effect of one gun by the number of guns firing. The result is the aggregate normal fire effect of the battery with no allowance yet made for deck penetration.

3. Where a single set of figures are shown they apply to both plane spot and top spot.

4. When in fire, against armored vessels, with guns of 6" or larger caliber, there is either (1) deck penetration only, or (2) both side and deck penetration, the normal value of penetrative fire effect as given in the tables will be multiplied by the appropriate figure from the subjoined table:

Gun	Target size	Penetration	
		Deck	Deck and Side
12" plus	Large	1.2	1.3
12" plus	Int., Small	1.1	1.2
7"5 - 10"	Any	1.1	1.2
6"	Int., Small	1.1	1.2

No increase for deck penetration will be allowed for fire against unarmored vessels or for fire with guns smaller than 6".

5. Penetration of the deck of any CV, CA, CL or CM having no deck armor is considered as occuring at ranges 2000 yards less than would be the case if it had 1 inch deck armor.

6. Fire Effect Diagrams have been constructed from the Fire Effect Tables giving the normal effect of BLUE ships upon RED and ORANGE ships of similar type and vice versa. These diagrams can be conveniently used in place of the Fire Effect Tables where applicable.

GUN DATA

The following data on BLUE guns is based on the latest information available.

Where two ranges are given, the first is the theoretical range - table range; the second, the figure used at the War College as representing the estimated practical range in thousands of yards.

Caliber	Weight of Projectile	M.V.	Maximum Elevation	Maximum Range Tables	Maximum Range Practical
16"/45	2100	2600	30°	34400	33
14"/50	1400	2800	30°	35800	34
			15°	24000	23
14"/45	1400	2700	30°	34500	33
			15°	23100	22
12"/50	870	2900	(a) 30°	33800	33
			15°	23600	23
8"/55	260	3000	40°	35200	(b) 34
				31800	(c) 30
6"/53	105	3000	(d) 30°	22850	22
			(e) 20°	18700	18
6"/47	105	2800	(f) 20°	19600	19
			(g) 40°	27000	26
5"/51	50	3150	20°	17200	17
5"/50	50	3000	20°	16700	16
5"/38	54	2600	85° A.A.	18200	17
			(h) 35°	17400	16
5"/25	50	2250	85° A.A.	15000	14
4"/50	33	2900	15°	13100	13
3"/50	13	2700	85° A.A.	11500	10
			15°	8700	8
3"/23	13	1650	85° A.A.	7800	7
			15°	6000	6
1"1	1	2000	85° A.A.	6000	5

(a) Data for possible future increased elevation.
(b) Guns of CAs.
(c) Guns of CVs 2 and 3.
(d) Turret guns of CLs 4-13 and SSs.
(e) Other 6"/53 guns of CLs 4-13.
(f) Guns of PGs 50-51.
(g) Guns of CLs 40-43, 46-48.
(h) DDs 356-363, 381, 383 with twin mounts.

FIRE EFFECT TABLE - BLUE 16"/45

Muzzle Velocity 2600 f.s.
Weight of Projectile 2100 lbs.

Maximum Range 33

LIMITING RANGES FOR ARMOR PENETRATION
(N.F.G. DWG. No. 305-F)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
3"	---	---	---	---
4"	---	---	---	---
5"	---	---	---	---
5"75	---	---	---	30
6"	---	---	---	29
7"	---	---	---	27
8"	---	---	31	22
9"	---	32	27	19
10"	30	29	23	15
11"	27	26	21	13
12"	25	23	18	X
13"	23	21	16	X
13"5	22	20	15	X
14"	21	19	X	X
15"	19	17	X	X
16"	18	X	X	X

DECK ARMOR

Thickness	Range
1"00	4
1"25	6
1"50	8
2"00	12
2"25	14
2"40	15
2"75	17
3"00	18
3"65	21
3"68	21
3"75	22
4"00	23
4"13	23
4"39	24
4"57	25
4"82	26
5"18	27
6"25	31

Penetration of INCLINED ARMOR

12"	21	20	16	X

Inclined 10°

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

Limiting ranges for penetration of deck armor are inner, or minimum, ranges at which penetration will occur.

LARGE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	5.930		3.925	
2	5.770		3.821	
3	4.760		3.141	
4	3.675		2.431	
5	2.845		1.880	
6	2.232		1.478	
7	1.785		1.180	
8	1.448		.956	
9	1.201		.795	
10	1.011		.668	
11	.866		.573	
12	.744		.493	
13	.635		.421	
14	.544		.360	
15	.466		.309	
16	.403		.268	
17	.356		.236	
18	.317		.210	
19	.283		.186	
20	.253		.168	
21	.218	.227	.145	.150
22	.186	.205	.124	.136
23	.157	.186	.104	.123
24	.130	.169	.086	.112
25	.103	.155	.068	.102
26	.078	.142	.051	.094
27	.054	.130	.036	.086
28	.034	.120	.023	.080
29	.019	.111	.013	.073
30	.008	.103	.006	.068
31	.000	.096	.000	.062
32		.089		.058
33		.083		.054

INTERMEDIATE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	5.929		4.760	
2	5.524		4.455	
3	3.882		3.120	
4	2.640		2.123	
5	1.971		1.583	
6	1.525		1.224	
7	1.200		.964	
8	.980		.780	
9	.828		.665	
10	.704		.565	
11	.598		.480	
12	.508		.408	
13	.434		.348	
14	.369		.296	
15	.315		.252	
16	.271		.218	
17	.233		.186	
18	.207		.166	
19	.185		.150	
20	.168		.135	
21	.144	.152	.114	.121
22	.122	.136	.098	.109
23	.102	.121	.082	.098
24	.082	.110	.066	.088
25	.063	.099	.050	.080
26	.044	.091	.034	.072
27	.029	.083	.023	.067
28	.016	.076	.012	.062
29	.007	.070	.006	.057
30	.000	.066	.000	.053
31		.062		.050
32		.058		.047
33		.054		.043

SMALL TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	5.930		5.010	
2	5.318		4.494	
3	3.205		2.710	
4	2.063		1.742	
5	1.523		1.286	
6	1.198		1.000	
7	.941		.796	
8	.762		.660	
9	.644		.544	
10	.546		.461	
11	.468		.395	
12	.398		.337	
13	.341		.288	
14	.296		.251	
15	.253		.214	
16	.215		.182	
17	.184		.156	
18	.164		.138	
19	.145		.123	
20	.130		.110	
21	.112	.117	.093	.098
22	.096	.107	.081	.090
23	.079	.097	.067	.082
24	.062	.088	.053	.075
25	.046	.081	.039	.069
26	.030	.075	.025	.062
27	.017	.069	.014	.058
28	.007	.064	.006	.054
29	.000	.059	.000	.050
30		.055		.046
31		.050		.042
32		.046		.038
33		.042		.035

PENETRATIVE

	DESTROYER TARGET		SUBMARINE TARGET	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	5.929		1.650	
2	3.178		.789	
3	1.672		.451	
4	1.107		.290	
5	.815		.210	
6	.620		.157	
7	.489		.120	
8	.406		.093	
9	.334		.072	
10	.277		.057	
11	.228		.047	
12	.190		.039	
13	.156		.032	
14	.128		.027	
15	.104		.022	
16	.085		.017	.018
17	.069		.014	.015
18	.061		.011	.013
19	.053		.009	.012
20	.045		.008	.010
21	.039	.041	.007	.009
22	.034	.038	.005	.009
23	.027	.034	.004	.008
24	.020	.032	.003	.008
25	.014	.030	.001	.007
26	.008	.028	.000	.007
27	.003	.026		.007
28	.000	.024		.006
29		.022		.006
30		.020		
31		.018		
32		.016		
33		.014		

FIRE EFFECT TABLE - BLUE 14"/50

Muzzle Velocity	2800 f.s.
Weight of Projectile	1400 lbs.

Maximum Range 34

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. NO. 304-P)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
3"	---	---	---	---
4"	---	---	---	---
5"	---	---	---	29
5".75	---	---	---	26
6"	---	---	---	25
7"	---	---	28	21
8"	31	29	24	18
9"	27	26	22	16
10"	24	23	20	X
11"	23	21	X	X
12"	21	19	X	X
13"	19	18	X	X
13".5	19	X	X	X
14"	18	X	X	X
15"	17	X	X	X
16"	16	X	X	X

DECK ARMOR

Thickness	Range
1".00	7
1".25	9
1".50	11
2".00	15
2".25	16
2".40	18
2".75	20
3".00	21
3".65	25
3".68	25
3".75	25
4".00	26
4".13	27
4".39	28
4".57	29
4".82	30
5".18	31
6".25	34

Penetration of INCLINED ARMOR

12"	18	17	X	X	Inclined 10°

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

Limiting ranges for penetration of deck armor are inner, or minimum, ranges at which penetration will occur.

LARGE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	4.180		2.299	
2	4.140		2.279	
3	3.360		1.848	
4	2.660		1.462	
5	2.020		1.111	
6	1.560		.858	
7	1.220		.671	
8	.980		.539	
9	.806		.443	
10	.670		.368	
11	.560		.308	
12	.465		.256	
13	.395		.217	
14	.330		.182	
15	.278		.153	
16	.235		.129	
17	.204		.110	
18	.179		.099	
19	.158		.087	
20	.139		.076	
21	.116	.121	.064	.067
22	.096	.106	.053	.058
23	.080	.094	.044	.052
24	.065	.084	.035	.046
25	.051	.076	.028	.042
26	.038	.070	.021	.038
27	.026	.064	.014	.035
28	.016	.058	.009	.032
29	.009	.054	.005	.030
30	.004	.050	.002	.027
31	.000	.046	.000	.025
32		.043		.024
33		.040		.022
34		.038		.021

INTERMEDIATE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	4.180		2.926	
2	3.960		2.772	
3	2.760		1.931	
4	1.910		1.337	
5	1.430		1.001	
6	1.090		.763	
7	.845		.591	
8	.670		.469	
9	.545		.382	
10	.455		.318	
11	.380		.266	
12	.320		.224	
13	.270		.189	
14	.230		.161	
15	.191		.134	
16	.157		.110	
17	.130		.091	
18	.114		.080	
19	.100		.070	
20	.087		.061	
21	.073	.077	.051	.054
22	.061	.068	.043	.048
23	.050	.060	.035	.042
24	.041	.055	.029	.039
25	.032	.051	.023	.036
26	.023	.047	.016	.033
27	.015	.043	.010	.030
28	.008	.039	.005	.027
29	.004	.036	.003	.025
30	.000	.033	.000	.023
31		.030		.021
32		.028		.020
33		.025		.018
34		.023		.016

SMALL TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	4.180		3.135	
2	3.800		2.850	
3	2.280		1.710	
4	1.480		1.100	
5	1.090		.825	
6	.840		.638	
7	.650		.488	
8	.520		.390	
9	.425		.319	
10	.350		.262	
11	.295		.221	
12	.250		.188	
13	.210		.158	
14	.180		.135	
15	.152		.114	
16	.129		.097	
17	.110		.083	
18	.096		.072	
19	.085		.064	
20	.075		.056	
21	.062	.065	.047	.049
22	.051	.057	.038	.043
23	.041	.050	.031	.038
24	.032	.045	.024	.034
25	.023	.041	.018	.031
26	.015	.038	.012	.029
27	.009	.035	.007	.026
28	.004	.032	.003	.024
29	.000	.030	.000	.022
30		.027		.020
31		.024		.018
32		.022		.017
33		.021		.016
34		.019		.014

PENETRATIVE

	DESTROYER TARGET		SUBMARINE TARGET	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	4.180		1.800	
2	2.500		.820	
3	1.290		.455	
4	.860		.279	
5	.610		.196	
6	.450		.144	
7	.350		.107	
8	.280		.080	
9	.230		.059	
10	.190		.046	
11	.152		.037	
12	.123		.030	
13	.099		.025	
14	.080		.020	
15	.064		.016	
16	.051		.012	.013
17	.041		.010	.011
18	.034		.009	.010
19	.029		.007	.008
20	.025		.005	.007
21	.020	.021	.004	.007
22	.017	.019	.003	.006
23	.012	.016	.002	.005
24	.009	.014	.002	.005
25	.006	.013	.001	.005
26	.003	.012	.000	.004
27	.001	.011		.004
28	.000	.010		.004
29		.009		.004
30		.008		.004
31		.008		
32		.007		
33		.007		
34		.006		

FIRE EFFECT TABLE - BLUE 14"/45

Muzzle Velocity 2700 f.s.
Weight of projectile 1400 lbs.

Maximum Range, TEXAS and NEW YORK	22
Maximum Range all others	33

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. No. 303-P)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
3"	---	---	---	---
4"	---	---	---	---
5"	---	---	---	27
5"75	---	---	---	23
6"	---	---	---	22
7"	---	---	29	19
8"	30	29	25	16
9"	27	26	21	X
10"	24	23	18	X
11"	22	20	16	X
12"	20	18	X	X
13"	18	16	X	X
13"5	17	15	X	X
14"	16	14	X	X
15"	15	X	X	X
16"	13	X	X	X

DECK ARMOR

Thickness	Range
1"00	7
1"25	9
1"50	10
2"00	14
2"25	16
2"40	17
2"75	19
3"00	20
3"65	24
3"68	24
3"75	24
4"00	26
4"13	26
4"39	27
4"57	28
4"82	29
5"18	30
6"25	X

Penetration of INCLINED ARMOR

12"	17	16	X	X

Inclined 10°

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

Limiting ranges for penetration of deck armor are inner, or minimum, ranges at which penetration will occur.

LARGE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	4.180		2.299	
2	4.110		2.261	
3	3.310		1.820	
4	2.530		1.391	
5	1.920		1.056	
6	1.470		.809	
7	1.160		.638	
8	.938		.516	
9	.761		.419	
10	.627		.345	
11	.527		.290	
12	.442		.243	
13	.374		.206	
14	.314		.173	
15	.264		.145	
16	.222		.122	
17	.188		.103	
18	.165		.091	
19	.145		.080	
20	.129		.071	
21	.110	.115	.061	.063
22	.094	.103	.052	.057
23	.078	.092	.043	.051
24	.064	.083	.035	.045
25	.050	.075	.027	.041
26	.037	.068	.020	.037
27	.025	.062	.014	.034
28	.016	.057	.009	.031
29	.009	.052	.005	.029
30	.004	.048	.002	.026
31	.000	.044	.000	.024
32		.041		.023
33		.038		.021

INTERMEDIATE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	4.180		2.926	
2	3.940		2.758	
3	2.710		1.899	
4	1.845		1.291	
5	1.362		.954	
6	1.040		.728	
7	.807		.564	
8	.643		.450	
9	.518		.362	
10	.426		.298	
11	.359		.251	
12	.300		.210	
13	.255		.179	
14	.213		.149	
15	.179		.125	
16	.149		.104	
17	.126		.088	
18	.110		.077	
19	.096		.067	
20	.085		.060	
21	.071	.075	.050	.053
22	.060	.067	.042	.047
23	.050	.061	.034	.041
24	.041	.055	.028	.038
25	.031	.049	.021	.034
26	.021	.044	.015	.031
27	.014	.040	.010	.028
28	.007	.036	.005	.025
29	.003	.034	.002	.024
30	.000	.031	.000	.022
31		.029		.020
32		.026		.018
33		.024		.017

SMALL TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	4.180		3.135	
2	3.775		2.830	
3	2.250		1.688	
4	1.415		1.060	
5	1.058		.794	
6	.798		.598	
7	.618		.464	
8	.496		.372	
9	.404		.303	
10	.333		.250	
11	.280		.210	
12	.234		.175	
13	.198		.148	
14	.166		.125	
15	.140		.105	
16	.118		.089	
17	.100		.075	
18	.088		.066	
19	.078		.059	
20	.069		.052	
21	.058	.061	.044	.046
22	.048	.054	.036	.040
23	.039	.048	.029	.036
24	.031	.044	.023	.033
25	.022	.039	.017	.029
26	.014	.035	.011	.026
27	.008	.032	.007	.024
28	.004	.029	.003	.022
29	.000	.027	.000	.020
30		.025		.019
31		.024		.018
32		.022		.017
33		.021		.016

PENETRATIVE

	DESTROYER TARGET		SUBMARINE TARGET	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	4.180		1.610	
2	2.343		.747	
3	1.201		.419	
4	.799		.259	
5	.569		.184	
6	.422		.133	
7	.329		.101	
8	.265		.076	
9	.215		.058	
10	.171		.045	
11	.139		.036	
12	.114		.029	
13	.092		.025	
14	.075		.020	
15	.060		.016	
16	.048		.012	.013
17	.038		.010	.011
18	.032		.009	.009
19	.027		.007	.008
20	.023		.005	.007
21	.019	.020	.004	.006
22	.016	.018	.003	.006
23	.012	.016	.002	.005
24	.009	.014	.002	.005
25	.006	.013	.001	.005
26	.003	.012	.000	.004
27	.001	.011		.004
28	.000	.010		.004
29		.009		.004
30		.008		.004
31		.007		
32		.007		
33		.006		

FIRE EFFECT TABLE - BLUE 12"/50

Muzzle Velocity 2900 f.s.
Weight of projectile 870 lbs.

Maximum Range 23.

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. NO. 301-P)

Penetration of VERTICAL ARMOR at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
3"	---	---	---	30
4"	---	---	32	24
5"	---	32	28	20
5"75	31	30	25	18
6"	30	29	24	18
7"	27	25	22	15
8"	23	22	19	X
9"	21	20	16	X
10"	19	17	X	X
11"	17	X	X	X
12"	16	X	X	X
13"	14	X	X	X
13"5	13	X	X	X
14"	X	X	X	X

DECK ARMOR

Thickness	Range
1"00	10
1"25	12
1"50	14
2"00	17
2"25	19
2"40	20
2"75	22
3"00	24
3"65	27
3"68	27
3"75	28
4"00	29
4"13	29
4"39	30
4"57	31
4"82	31
5"18	33
6"25	X

Penetration of INCLINED ARMOR

12"	13	X	X	X

Inclined 10°

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are <u>outer</u>, or <u>maximum</u>, ranges at which penetration will occur.

Limiting ranges for penetration of deck armor are <u>inner</u>, or <u>minimum</u>, ranges at which penetration will occur.

LARGE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	2.724		1.257	
2	2.712		1.251	
3	2.262		1.043	
4	1.813		.838	
5	1.365		.631	
6	1.054		.487	
7	.832		.384	
8	.676		.312	
9	.546		.252	
10	.449		.207	
11	.371		.171	
12	.312		.144	
13	.263		.122	
14	.221		.102	
15	.186		.086	
16	.155		.072	
17	.132		.060	
18	.114		.053	
19	.101		.047	
20	.089		.041	
21	.076	.079	.036	.037
22	.065	.071	.030	.033
23	.054	.064	.025	.029

INTERMEDIATE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	2.724		1.676	
2	2.600		1.600	
3	1.860		1.144	
4	1.327		.816	
5	.968		.596	
6	.735		.452	
7	.572		.352	
8	.461		.284	
9	.377		.232	
10	.305		.188	
11	.247		.152	
12	.208		.128	
13	.175		.108	
14	.150		.082	
15	.127		.078	
16	.108		.066	
17	.091		.056	
18	.078		.048	
19	.067		.041	
20	.058		.036	
21	.048	.051	.029	.031
22	.040	.045	.025	.028
23	.034	.041	.021	.025

SMALL TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	2.724		1.802	
2	2.496		1.571	
3	1.540		1.018	
4	1.014		.671	
5	.754		.499	
6	.572		.379	
7	.442		.292	
8	.351		.232	
9	.286		.189	
10	.234		.154	
11	.195		.129	
12	.163		.108	
13	.136		.090	
14	.117		.077	
15	.100		.066	
16	.085		.056	
17	.072		.047	
18	.061		.040	
19	.053		.035	
20	.047		.031	
21	.040	.042	.027	.028
22	.033	.037	.022	.025
23	.028	.034	.018	.022

PENETRATIVE

	DESTROYER TARGET		SUBMARINE TARGET	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	2.724		1.769	
2	1.924		.862	
3	.858		.422	
4	.578		.255	
5	.416		.185	
6	.312		.132	
7	.240		.097	
8	.195		.075	
9	.156		.055	
10	.123		.042	
11	.099		.033	
12	.081		.026	
13	.064		.022	
14	.052		.018	
15	.042		.015	
16	.033		.012	
17	.027		.009	.010
18	.022		.007	.008
19	.019		.006	.007
20	.016		.005	.006
21	.013	.014	.004	.006
22	.011	.012	.003	.005
23	.009	.011	.002	.005

FIRE EFFECT TABLE - BLUE 8"/55

Muzzle Velocity 3000 f.s.
Weight of projectile 260 lbs.

Maximum Range, Guns of CAs	34
Maximum Range, Guns of CV 2, 3	30

Note: CAs use Common Projectile of 4.50 Cal.
CVs use AP Projectile of 3.52 Cal.

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. No. 257-P)

Penetration of VERTICAL ARMOR at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	---
1".5	---	---	---	---
2"	---	---	---	26
2".5	---	---	26	21
3"	26	26	22	18
4"	21	20	17	14
5"	17	16	14	11
5".75	15	14	12	X
6"	15	14	12	X
7"	13	12	X	X
8"	11	X	X	X
9"	10	X	X	X
10"	X	X	X	X

DECK ARMOR

Thickness	Range
1".00	13
1".25	16
1".50	18
2".00	21
2".25	23
2".40	23
2".75	26
3".00	27
3".65	30
3".68	30
3".75	30
4".00	X

Penetration of INCLINED ARMOR

12"	X	X	X	X

Inclined 10°

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are <u>outer</u>, or <u>maximum</u>, ranges at which penetration will occur.

Limiting ranges for penetration of deck armor are <u>inner</u>, or <u>minimum</u>, ranges at which penetration will occur.

LARGE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.600		.491	
2	1.575		.485	
3	1.340		.413	
4	1.087		.334	
5	.855		.263	
6	.661		.203	
7	.508		.157	
8	.392		.120	
9	.308		.095	
10	.248		.076	
11	.200		.062	
12	.164		.049	
13	.135		.041	
14	.111		.034	
15	.092		.028	
16	.075	.078	.023	.024
17	.061	.065	.019	.020
18	.049	.054	.015	.017
19	.038	.045	.012	.014
20	.030	.039	.009	.012
21	.023	.033	.007	.010
22	.017	.028	.005	.008
23	.012	.024	.003	.007
24	.007	.020	.002	.006
25	.003	.018	.001	.005
26	.001	.016	.001	.005
27	.000	.014	.000	.004
28		.012		.004
29		.010		.003
30		.009		.003
31		.008		.002
32		.007		.002
33		.006		.001
34		.005		.001

INTERMEDIATE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.600		.737	
2	1.525		.700	
3	1.102		.508	
4	.795		.367	
5	.606		.280	
6	.461		.213	
7	.348		.161	
8	.266		.122	
9	.211		.097	
10	.169		.078	
11	.137		.063	
12	.111		.050	
13	.092		.042	
14	.076		.035	
15	.063		.029	
16	.049	.052	.023	.024
17	.041	.044	.019	.020
18	.033	.036	.015	.016
19	.025	.030	.012	.013
20	.019	.024	.009	.011
21	.014	.020	.007	.009
22	.010	.017	.005	.008
23	.007	.015	.003	.007
24	.005	.013	.002	.007
25	.003	.012	.001	.006
26	.001	.010	.001	.005
27	.000	.009	.000	.004
28		.008		.003
29		.007		.003
30		.006		.003
31		.005		.003
32		.005		.002
33		.004		.001
34		.004		.001

SMALL TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.600		.818	
2	1.450		.743	
3	.910		.466	
4	.609		.312	
5	.470		.240	
6	.357		.183	
7	.268		.137	
8	.207		.106	
9	.163		.084	
10	.132		.067	
11	.105		.054	
12	.086		.044	
13	.071		.036	
14	.059		.030	
15	.049		.025	
16	.039	.040	.020	.021
17	.032	.034	.016	.017
18	.025	.028	.013	.015
19	.019	.024	.010	.013
20	.015	.020	.008	.011
21	.011	.017	.006	.009
22	.007	.014	.004	.007
23	.005	.012	.002	.006
24	.003	.010	.001	.005
25	.001	.008	.001	.005
26	.000	.007	.000	.004
27		.006		.003
28		.006		.003
29		.005		.003
30		.005		.003
31		.004		.002
32		.003		.002
33		.003		.001
34		.002		.001

PENETRATIVE

	DESTROYER TARGET		SUBMARINE TARGET	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.600		1.915	
2	1.092		.912	
3	.588		.474	
4	.356		.292	
5	.236		.196	
6	.172		.139	
7	.135		.101	
8	.109		.073	
9	.088		.058	
10	.070		.045	
11	.054		.034	
12	.042		.025	.025
13	.033		.018	.020
14	.026		.014	.016
15	.021		.011	.013
16	.016	.017	.008	.010
17	.012	.013	.006	.008
18	.009	.011	.004	.006
19	.007	.009	.003	.005
20	.005	.007	.002	.005
21	.003	.006	.001	.004
22	.002	.005	.001	.003
23	.001	.005	.000	.003
24	.001	.004		.002
25	.000	.003		.002
26		.003		.001
27		.002		.001
28		.002		.001
29		.001		.001
30		.001		.001
31		.001		.000
32		.001		
33		.001		
34		.001		

FIRE EFFECT TABLE - BLUE 6"/53

Muzzle Velocity 3000 f.s.
Weight of projectile 105 lbs.

Maximum Range CLs 4-13, Turrets: 22
(Length of Proj. Broadside: 18
3.80 Cal).

Maximum Range SSs 22
(Length of Proj. 4.50 cal.)

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. NO. 307-P)

(Minor Caliber Characteristics)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	---
1".5	16	15	14	11
2"	13	13	11	9
2".5	11	10	9	8
3"	9	8	7	6
4"	6	6	5	X
5"	4	4	3	X
5".75	3	3	2	X
6"	X	X	X	X

DECK ARMOR

Thickness	Range
1".00	18
1".25	19
1".50	21
2".00	X

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are <u>outer</u>, or <u>maximum</u>, ranges at which penetration will occur.

Limiting ranges for penetration of deck armor are <u>inner</u>, or <u>minimum</u>, ranges at which penetration will occur.

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. No.297-P)
MAJOR CAL. CHARACTERISTICS

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	23
1".5	---	26	23	18
2"	24	23	20	16
2".5	21	20	17	13
3"	17	16	14	11
4"	14	13	11	X
5"	11	10	X	X
5".75	10	9	X	X
6"	9	X	X	X
7"	X	X	X	X

DECK ARMOR

Thickness	Range
1".00	16
1".25	18
1".50	20
2".00	24
2".25	25
2".40	27
2".75	X

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are <u>outer</u>, or <u>maximum</u>, ranges at which penetration will occur.

Limiting ranges for penetration of deck armor are <u>inner</u>, or <u>minimum</u>, ranges at which penetration will occur.

LARGE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.791		.442	
2	1.771		.437	
3	1.431		.350	
4	1.109		.273	
5	.824		.203	
6	.601		.148	
7	.438		.108	
8	.317		.077	
9	.241		.059	
10	.189		.047	
11	.150		.037	
12	.115	.119	.028	.029
13	.087	.093	.021	.023
14	.066	.074	.016	.018
15	.049	.058	.012	.015
16	.036	.047	.009	.012
17	.026	.038	.007	.009
18	.018	.031	.005	.007
19	.013	.025	.003	.006
20	.008	.020	.002	.005
21	.005	.016	.001	.004
22	.002	.013	.001	.003

INTERMEDIATE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.790		.680	
2	1.700		.647	
3	1.170		.446	
4	.808		.308	
5	.586		.222	
6	.421		.160	
7	.302		.115	
8	.221		.082	
9	.164		.062	
10	.129		.049	
11	.102		.039	
12	.079	.080	.030	.031
13	.059	.063	.022	.024
14	.044	.050	.017	.019
15	.033	.039	.013	.015
16	.025	.032	.009	.012
17	.018	.026	.007	.010
18	.012	.021	.005	.008
19	.008	.016	.003	.006
20	.005	.013	.002	.005
21	.003	.011	.001	.004
22	.002	.009	.001	.003

SMALL TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.795		.789	
2	1.630		.717	
3	.975		.429	
4	.625		.275	
5	.453		.199	
6	.324		.143	
7	.232		.102	
8	.168		.074	
9	.129		.056	
10	.100		.044	
11	.080		.035	
12	.060	.063	.027	.028
13	.045	.049	.020	.022
14	.034	.039	.015	.017
15	.025	.031	.011	.014
16	.018	.025	.008	.011
17	.013	.020	.006	.009
18	.009	.016	.003	.007
19	.006	.013	.002	.006
20	.004	.011	.001	.005
21	.002	.009	.000	.004
22	.001	.007		.003

PENETRATIVE

	DESTROYER TARGET		SUBMARINE TARGET	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.796		2.965	
2	1.126		1.340	
3	.567		.681	
4	.332		.406	
5	.212		.265	
6	.153		.178	
7	.117		.126	
8	.090		.090	
9	.068		.066	.067
10	.053		.048	.050
11	.039		.035	.038
12	.029	.030	.024	.028
13	.020	.023	.016	.019
14	.015	.017	.010	.014
15	.010	.013	.007	.011
16	.007	.010	.005	.008
17	.005	.008	.003	.006
18	.003	.006	.002	.005
19	.002	.005	.001	.004
20	.001	.004	.000	.003
21	.000	.003		.002
22		.002		.002

FIRE EFFECT TABLE - BLUE 6"/47

Muzzle Velocity 2800 f.s.
Weight of projectile 150 lbs.

Maximum Range PGs 50-51 19
Maximum Range CLs 40-43, 46-48 26

Note: This is a new gun based upon assumed data.

LIMITING RANGES FOR ARMOR PENETRATION
(Bu.Ord. Sk. No. 73985)

Major cal. characteristics.

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	26	22
1".5	---	24	22	18
2"	22	21	19	15
2".5	19	18	16	12
3"	16	15	13	10
4"	12	12	10	X
5"	10	9	X	X
5".75	8	8	X	X
6"	8	X	X	X
7"	X	X	X	X

DECK ARMOR

Thickness	Range
1".00	15
1".25	17
1".50	19
2".00	22
2".25	24
2".40	25
2".75	X

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

Limiting ranges for penetration of deck armor are inner or minimum, ranges at which penetration will occur.

LARGE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	2.239		.553	
2	2.214		.546	
3	1.789		.437	
4	1.386		.340	
5	1.030		.254	
6	.751		.185	
7	.548		.135	
8	.396		.096	
9	.301		.074	
10	.236		.059	
11	.186		.046	
12	.144	.149	.035	.036
13	.109	.116	.026	.029
14	.083	.093	.020	.023
15	.061	.073	.015	.019
16	.045	.059	.011	.015
17	.032	.047	.009	.011
18	.023	.039	.006	.009
19	.016	.031	.004	.007
20	.010	.025	.003	.006
21	.006	.020	.001	.005
22	.003	.016	.001	.004
23	.001	.014	.000	.004
24	.000	.011		.003
25		.009		.001
26		.007		.001

INTERMEDIATE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	2.240		.850	
2	2.120		.809	
3	1.462		.558	
4	1.010		.385	
5	.732		.278	
6	.526		.200	
7	.377		.144	
8	.276		.103	
9	.205		.078	
10	.161		.061	
11	.128		.049	
12	.099	.100	.038	.039
13	.074	.079	.028	.030
14	.055	.062	.021	.024
15	.041	.049	.016	.019
16	.031	.040	.011	.015
17	.023	.032	.009	.013
18	.015	.026	.006	.010
19	.010	.020	.004	.008
20	.006	.016	.002	.006
21	.004	.014	.001	.005
22	.002	.011	.001	.004
23	.001	.009	.000	.003
24	.000	.008		.002
25		.006		.001
26		.005		.001

SMALL TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	2.245		.987	
2	2.038		.896	
3	1.218		.536	
4	.782		.344	
5	.566		.249	
6	.405		.179	
7	.290		.128	
8	.210		.093	
9	.161		.070	
10	.125		.055	
11	.100		.044	
12	.075	.079	.034	.035
13	.056	.061	.025	.028
14	.043	.049	.019	.021
15	.031	.039	.014	.018
16	.023	.031	.010	.014
17	.016	.025	.007	.011
18	.011	.020	.004	.009
19	.008	.016	.003	.008
20	.005	.014	.001	.006
21	.003	.011	.000	.005
22	.001	.008		.004
23	.000	.006		.003
24		.005		.002
25		.004		.001
26		.002		.001

PENETRATIVE

	DESTROYER TARGET		SUBMARINE TARGET	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	2.245		3.708	
2	1.408		1.675	
3	.709		.852	
4	.415		.504	
5	.265		.332	
6	.191		.225	
7	.146		.158	
8	.113		.113	
9	.085		.083	.084
10	.066		.060	.063
11	.049		.044	.048
12	.036	.038	.030	.035
13	.025	.029	.020	.024
14	.019	.021	.013	.018
15	.013	.016	.009	.014
16	.009	.013	.006	.010
17	.006	.010	.004	.008
18	.004	.008	.002	.006
19	.002	.006	.001	.005
20	.001	.005	.000	.004
21	.000	.004		.003
22		.002		.002
23		.001		.001
24		.001		.001
25		.001		.001
26		.000		.000

FIRE EFFECT TABLE - BLUE 5"/51

Muzzle Velocity 3150 f.s.
Weight of Projectile 50 lbs.

Maximum Range 17

FIRE EFFECT TABLE - BLUE 5"/50

Muzzle Velocity 3000 f.s.
Weight of Projectile 50 lbs.

Maximum Range 16

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. NO. 291-P)

(Minor Caliber Characteristics)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	13	9
1".5	12	12	10	8
2"	8	7	X	X
3"	X	X	X	X

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. NO. 291-P)

(Minor Caliber Characteristics)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	13	9
1".5	12	12	10	8
2"	8	7	X	X
3"	X	X	X	X

(---) No limit within maximum range of gun.
(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

PENETRATIVE

TOP SPOT

Range	Large Target	Int. Target	Small Target	Destroyer Target	Submarine Target
1	1.193	1.193	1.193	1.193	2.884
2	1.171	1.126	1.068	.724	1.287
3	.908	.747	.617	.340	.630
4	.664	.485	.371	.198	.375
5	.439	.312	.241	.126	.234
6	.301	.211	.163	.078	.150
7	.215	.148	.115	.055	.097
8	.154	.108	.083	.039	.067
9	.119	.081	.063	.029	.050
10	.094	.064	.049	.021	.037
11	.073	.050	.039	.016	.026
12	.057	.038	.030	.011	.019
13	.041	.027	.022	.008	.014
14	.029	.020	.016	.005	.010
15	.022	.014	.012	.004	.007
16	.015	.010	.008	.002	.005
17	.010	.007	.005	.001	.003

NON-PENETRATIVE

TOT SPOT

Range	Large Target	Int. Target	Small Target
1	.269	.403	.477
2	.263	.380	.430
3	.205	.252	.247
4	.149	.163	.148
5	.099	.105	.096
6	.068	.072	.065
7	.049	.050	.046
8	.034	.036	.034
9	.027	.028	.025
10	.021	.021	.020
11	.017	.017	.016
12	.013	.013	.012
13	.009	.009	.009
14	.007	.007	.006
15	.005	.005	.004
16	.004	.004	.003
17	.002	.002	.002

FIRE EFFECT TABLE - BLUE 5"/38 A.A.

Muzzle Velocity 2600 f.s.
Weight of projectile 54 lbs.

Maximum Range 17

FIRE EFFECT TABLE - BLUE 5"/38

Muzzle Velocity 2600 f.s.
Weight of projectile 54 lbs.

Maximum Range 16

(DDs 356-363, 381 and 383 with twin mounts and 35° elevation).

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. NO. 257-F)

(Minor Caliber Characteristics)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	15	14	11	9
1".5	9	8	7	6
2"	7	6	6	4
3"	4	3	3	X
4"	1	X	X	X
5"	X	X	X	X

(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

LARGE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.193		.269	
2	1.171		.263	
3	.908		.205	
4	.664		.149	
5	.439		.099	
6	.301		.068	
7	.215		.049	
8	.154		.034	
9	.119	.123	.027	.028
10	.094	.101	.021	.023
11	.073	.082	.017	.019
12	.057	.068	.013	.015
13	.041	.053	.009	.012
14	.029	.042	.007	.010
15	.022	.037	.005	.008
16	.015	.030	.003	.006
17	.010	.025	.002	.005

INTERMEDIATE TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.193		.407	
2	1.126		.380	
3	.747		.250	
4	.485		.163	
5	.312		.105	
6	.211		.072	
7	.148		.050	
8	.108		.036	
9	.081	.083	.028	.029
10	.064	.069	.021	.023
11	.050	.056	.017	.019
12	.038	.045	.013	.015
13	.027	.035	.009	.012
14	.020	.029	.007	.010
15	.014	.023	.005	.008
16	.010	.020	.004	.007
17	.007	.018	.002	.005

SMALL TARGET

	PENETRATIVE		NON-PENETRATIVE	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.193		.477	
2	1.068		.430	
3	.617		.247	
4	.371		.148	
5	.241		.096	
6	.163		.065	
7	.115		.046	
8	.083		.034	
9	.063	.066	.025	.026
10	.049	.053	.020	.022
11	.039	.045	.016	.019
12	.030	.037	.012	.015
13	.022	.029	.009	.013
14	.016	.023	.006	.010
15	.012	.020	.004	.008
16	.008	.017	.003	.007
17	.005	.014	.002	.006

PENETRATIVE

	DESTROYER TARGET		SUBMARINE TARGET	
Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.193		2.884	
2	.724		1.287	
3	.340		.630	
4	.198		.375	
5	.126		.234	
6	.078		.150	
7	.055		.097	
8	.039		.067	
9	.029	.031	.050	.051
10	.021	.024	.037	.039
11	.016	.019	.026	.029
12	.011	.015	.019	.022
13	.008	.012	.014	.018
14	.005	.009	.010	.014
15	.004	.008	.007	.011
16	.002	.007	.005	.009
17	.001	.005	.003	.007

FIRE EFFECT TABLE - BLUE 5"/25 AA

Muzzle Velocity 2250 f.s.
Weight of Projectile 50 lbs.

Maximum Range 14

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. NO. 257-P)

(Minor Caliber Characteristics)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	10	9	8	6
1".5	5	5	4	3
2"	4	3	3	2
3"	2	1	X	X
4"	X	X	X	X

(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

PENETRATIVE

TOP SPOT

Range	Large Target	Int. Target	Small Target	Destroyer Target	Submarine Target
1	1.905	1.905	1.905	1.905	4.610
2	1.865	1.794	1.701	1.153	2.050
3	1.442	1.186	.980	.540	1.000
4	1.052	.770	.588	.314	.595
5	.693	.492	.380	.199	.369
6	.473	.331	.256	.122	.236
7	.331	.228	.177	.085	.149
8	.232	.163	.125	.059	.101
9	.162	.114	.086	.040	.068
10	.114	.078	.060	.026	.045
11	.080	.055	.043	.018	.029
12	.056	.037	.029	.011	.019
13	.038	.025	.021	.007	.013
14	.026	.018	.014	.004	.009

NON-PENETRATIVE

TOP SPOT

Range	Large Target	Int. Target	Small Target
1	.430	.642	.762
2	.419	.605	.687
3	.326	.400	.392
4	.236	.258	.235
5	.156	.166	.151
6	.107	.113	.102
7	.075	.076	.071
8	.051	.054	.051
9	.037	.038	.034
10	.026	.026	.024
11	.019	.019	.018
12	.013	.013	.012
13	.008	.008	.008
14	.006	.006	.005

FIRE EFFECT TABLE - BLUE 4"/50

Muzzle Velocity 2900 f.s.
Weight of Projectile 33 lbs.

Maximum Range 13

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. NO. 289-P)

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick-ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	13	12	X	X
1".5	8	8	X	X
2"	X	X	X	X

(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

PENETRATIVE

TOP SPOT

Range	Large Target	Int. Target	Small Target	Destroyer Target	Submarine Target
1	.896	.896	.896	.895	2.313
2	.862	.837	.809	.485	1.050
3	.630	.517	.428	.228	.493
4	.431	.315	.242	.114	.281
5	.282	.200	.155	.071	.179
6	.195	.137	.105	.047	.118
7	.141	.097	.075	.034	.081
8	.105	.071	.056	.024	.060
9	.080	.054	.042	.018	.045
10	.062	.042	.032	.013	.032
11	.046	.032	.025	.010	.022
12	.035	.023	.018	.007	.016
13	.024	.016	.013	.005	.010

NON-PENETRATIVE

TOP SPOT

Range	Large Target	Int. Target	Small Target
1	.209	.314	.373
2	.204	.293	.344
3	.147	.180	.178
4	.101	.110	.101
5	.065	.070	.065
6	.045	.048	.044
7	.033	.034	.031
8	.025	.025	.023
9	.018	.018	.018
10	.015	.015	.014
11	.011	.011	.010
12	.008	.008	.007
13	.006	.006	.005

FIRE EFFECT TABLE - BLUE 3"/50

Muzzle Velocity 2700 f.s.
Weight of projectile 13 lbs.

Maximum Range 8

FIRE EFFECT TABLE - BLUE 3"/50 AA

Muzzle Velocity 2700 f.s.
Weight of projectile 13 lbs.

Maximum Range 10

FIRE EFFECT TABLE - BLUE 3"/23

Muzzle Velocity 1650 f.s.
Weight of projectile 13 lbs.

Maximum Range 6

FIRE EFFECT TABLE - BLUE 3"/23 AA

Muzzle Velocity 1650 f.s.
Weight of projectile 13 lbs.

Maximum Range 7

LIMITING RANGES FOR ARMOR PENETRATION

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thickness	90° or 0°	75° or 15°	60° or 30°	45°
1"	4	4	X	X
1".5	2	X	X	X
2"	X	X	X	X

(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

LIMITING RANGES FOR ARMOR PENETRATION

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick-ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	2	2	X	X
1"5	X	X	X	X

(X) No penetration at any range within maximum range of gun.

Limiting ranges for penetration of vertical armor are outer, or maximum, ranges at which penetration will occur.

PENETRATIVE

TOP SPOT

Range	Large Target	Int. Target	Small Target	Destroyer Target	Submarine Target
1	.636	.636	.636	.572	1.552
2	.529	.508	.487	.206	.737
3	.260	.213	.176	.076	.304
4	.178	.131	.100	.038	.156
5	.125	.088	.068	.022	.098
6	.091	.064	.049	.017	.066
7	.068	.046	.036	.013	.047
8	.053	.036	.026	.009	.035
9	.042	.028	.018	.006	.025
10	.033	.021	.012	.004	.018

NON-PENETRATIVE

TOP SPOT

Range	Large Target	Int. Target	Small Target
1	.111	.175	.207
2	.093	.140	.158
3	.045	.059	.057
4	.031	.036	.032
5	.022	.024	.022
6	.016	.018	.016
7	.012	.013	.012
8	.009	.010	.008
9	.006	.007	.006
10	.004	.005	.004

Rate of Fire

in

Rounds per Move

Range	16"/45	15"/42	14"/50	14"/45	12"/50	8"/55 8"/50	7"5/45	6"/47 6"/50 (new)	6"/53 6"/50 6"/45	5"5/50	5"1/50	5"/38 5"/51 5"/50	5"/25AA	4"7/50 4"7/45AA	4"7/45 4"7/40	4"/50	4"/45AA	3"/50 3"/45 3"/40 3"/25 3"/23
	a = 6	6	6	6	6	6	6	6	6			10	10	10	10	10	10	10
	b = 3	3	3	3	3	3	3	3	3			10	10	10	10	10	10	10
0	4.20	4.20	4.20	4.20	4.20	6.20	7.65	15.00	12.00	13.50	14.25	15.00	24.00	24.00	15.00	15.00	24.00	16.00
2	4.15	4.16	4.16	4.15	4.17	6.13	7.57	14.89	11.90	13.36	14.11	14.82	23.60	23.75	14.85	14.85	23.80	15.80
4	4.10	4.10	4.10	4.10	4.11	6.07	7.45	14.63	11.70	13.16	13.90	14.62	23.20	23.40	14.64	14.64	23.43	15.42
6	4.04	4.01	4.03	4.03	4.05	5.99	7.38	14.44	11.55	12.97	13.67	14.39	22.60	23.00	14.36	14.36	23.00	14.42
8	3.89	3.88	3.92	3.92	3.97	5.89	7.18	13.80	11.03	12.58	13.32	14.12	21.30	22.50	14.06	14.03	22.46	12.33
10	3.72	3.69	3.79	3.76	3.84	5.65	6.81	12.90	10.31	12.06	12.80	13.81	16.80	21.70	13.53	13.40	21.48	9.09
12	3.56	3.51	3.62	3.59	3.64	5.39	6.43	11.94	9.55	11.51	12.04	13.46	13.30	20.20	12.57	12.20	19.55	6.75
14	3.39	3.33	3.45	3.42	3.46	5.14	6.04	10.93	8.74	10.17	10.34	11.60	10.20	16.83	10.50	10.10	16.15	4.66
16	3.23	3.15	3.28	3.26	3.30	4.86	5.65	10.00	8.00	8.95	8.87	9.89		14.06	8.79	8.40	13.40	
18	3.09	2.98	3.12	3.10	3.14	4.60	5.21	9.03	7.22	7.81	7.58	8.40		11.74	7.34			
20	2.94	2.81	2.96	2.95	2.99	4.33	4.89	8.19	6.55	6.71	6.42			9.80	6.13			
22	2.78	2.66	2.81	2.80	2.83	4.07	4.54	7.44	5.95	5.61								
24	2.64	2.50	2.67	2.65	2.68	3.81	4.20	6.73	5.38									
26	2.50	2.36	2.54	2.50	2.55	3.56	3.86	5.95	4.76									
28	2.36	2.22	2.41	2.37	2.42	3.33												
30	2.23	2.09	2.29	2.23	2.30	3.08												
32	2.10	1.98	2.17	2.11	2.18	2.86												
34	2.02	1.84	2.06	1.99		2.61												
36	1.89	1.73																
38	1.79																	