

Orange Fire Effects Table
June 1935

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Photos By: Christopher Carlson
Taken On: 09 March 2017
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2097
Serial No. 12

ORANGE FIRE EFFECT TABLES

Cancels Edition of June 1934

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DECLASSIFICATION OF WWII RECORDS

DEPARTMENT OF OPERATIONS
NAVAL WAR COLLEGE

Newport, R. I.

June, 1935

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ORANGE FIRE EFFECT TABLES

DEPARTMENT OF OPERATIONS
Naval War College
Newport, R.I.
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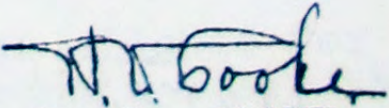
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H. D. COOKE
Captain, U.S. Navy
Chief of Staff.

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 & 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 occurring 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 ORANGE guns is based on the best available information or estimate.

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	Practical
16"/45	2205	2592	30°	33500	32
14"/45	1400	2592	25°	27800	27
			30°(a)	30400	29
			35°(b)	32500	31
8"/50	254	2789	30°	28400	27
			45°(c)	32200	31
6"/50	100	2789	25°	19400	18
			45°(d)	23800	23
5.5/50	84	2789	25°(e)	19200	18
			30°(f)	20700	20
5.1/50	63	2900	25°	19000	18
			85°A.A.	21450	20
4.7/45	45	2772	85°A.A.	19900	19
			25°	15900	15
4.7/40	45	2165	20°	10800	10
3"/40	12.5	2321	20°	6000	5
			85°A.A.	8000	7
3"/25	12.5	1492	85°A.A.	7000	6

(a) In CCs.

(b) In BBs 1-4.

(c) Assuming 70° gun elevation in NYCKO Class.

(d) In BBs.

(e) In all other vessels.

(f) CLs 40-45 and CMS.

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ORANGE 16"/45

FIRE EFFECT TABLE - ORANGE 16"/45

Muzzle Velocity 2592 f.s.
Weight of Projectile 2205 lbs.

Maximum Range 32.

LIMITING RANGES FOR ARMOR PENETRATION
N.P.G. DWG. No. 257-P. Archives No. 1933-79.

For breakup see N.P.G. 305-P.

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
5"	---	---	---	---
6"	---	---	---	31
7"	---	---	---	26
8"	---	---	30	21
9"	---	31	27	18
10"	30	28	23	15
11"	27	25	21	12
12"	25	23	19	X
13"	23	21	17	X
13.5"	22	20	16	X
14"	21	20	X	X
15"	20	18	X	X
16"	19	X	X	X

DECK ARMOR

Thick- ness	Range
1.98	4
1.00	4
1.13	4
1.25	5
1.40	6
1.47	7
1.55	8
1.90	11
1.96	11
2.00	12
2.21	14
3.00	18
3.42	20
3.96	22
4.00	22
4.18	23
4.87	25
6.25	30
7.00	X

Penetration of INCLINED ARMOR

7"	32	31	29	24
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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 TARGETPENETRATIVENON-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

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ORANGE 16"/45

INTERMEDIATE TARGET

PENETRATIVE

NON-PENETRATIVE

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	5.929		4.760	
2	5.524		4.435	
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

SMALL TARGETPENETRATIVENON-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

PENETRATIVEDESTROYER TARGETSUBMARINE 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		

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ORANGE 14"/45

FIRE EFFECT TABLE - ORANGE 14"/45

Muzzle Velocity 2592 f.s.
Weight of Projectile 1400 lbs.

Maximum Range 31

LIMITING RANGES FOR ARMOR PENETRATION
N.P.G. DWG. No. 257-P; Archives No. 1933-79.
For breakup see N.P.G. 303-P.

Penetration of VERTICAL ARMOR
at Target Angles of

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

DECK ARMOR

Thick- ness	Range
1"98	6
1"00	6
1"13	6
1"25	6
1"40	7
1"47	7
1"55	8
1"90	12
1"96	12
2"00	13
2"21	15
3"00	20
3"42	22
3"96	24
4"00	24
4"18	25
4"87	27
6"25	31
7"00	X

Penetration of INCLINED ARMOR

7"	24	23	21	15
----	----	----	----	----

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.

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ORANGE 14"/45

LARGE TARGETPENETRATIVENON-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

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ORANGE 14"/45

INTERMEDIATE TARGETPENETRATIVENON-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

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ORANGE 14"/45SMALL TARGETPENETRATIVENON-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

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ORANGE 14"/45

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		

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ORANGE 8"/50

FIRE EFFECT TABLE - ORANGE 8"/50

Muzzle Velocity 2789 f.s.
Weight of Projectile 254 lbs.

Maximum Range 31

LIMITING RANGES FOR ARMOR PENETRATION

N.P.G. DIG. No. 257-P; Archives
No. 1933-79. For breakup see
N.P.G. 301-P using appropriate ratios
of caliber and plate thickness.

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	---
2"	---	---	---	27
2!49	---	---	28	22
2!60	---	---	27	22
3"	28	27	24	19
3!50	25	24	21	16
4"	22	21	18	14
5"	18	17	14	10
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

Thick- ness	Range
!98	12
1!00	14
1!13	14
1!25	16
1!40	17
1!47	18
1!55	19
1!90	21
1!96	22
2!00	22
2!21	23
3!00	27
3!42	29
3!96	31
4!00	31
4!18	32
4!87	X

Penetration of INCLINED ARMOR

7"	12	11	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.

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ORANGE 8"/50LARGE TARGETPENETRATIVENON-PENETRATIVE

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.600		0.491	
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

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ORANGE 8"/50INTERMEDIATE TARGETPENETRATIVENON-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

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ORANGE 8"/50

1.96

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

PENETRATIVEDESTROYER TARGETSUBMARINE 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

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ORANGE 6"/50
(Except CLs 40-45 & CLMs)

FIRE EFFECT TABLE - ORANGE 6"/50

Muzzle Velocity 2789 f.s.
Weight of Projectile 100 lbs.
Angle of Elevation 25°

Maximum Range 18

LIMITING RANGES FOR ARMOR PENETRATION
(N.P.G. DWG. No. 257-P; Archives No. 1933-79)
For break-up see N.P.G. 296-P

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	---
2"	19	18	16	13
2:49	15	14	13	10
2:60	14	14	13	10
3"	13	13	10	8
3:50	11	10	9	X
4"	10	9	8	X
5"	7	7	X	X
6"	6	X	X	X
7"	X	X	X	X

DECK ARMOR

Thick- ness	Range
0:98	14
1:00	14
1:13	15
1:25	16
1:40	17
1:47	18
1:55	18
1:90	21
1:96	21
2:00	21
2:21	22
3:00	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 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	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

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ORANGE 6"/50
(Except CLs 40-45 & CMs)

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

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

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

FIRE EFFECT TABLE - ORANGE 6"/50 (New)

Muzzle Velocity 2789 f.s.
Weight of Projectile 100 lbs.
Angle of Elevation 45°

Maximum Range 23

Note: This is a new 6"/50 gun having a greater rate of
fire and greater elevation than the old.

LIMITING RANGES FOR ARMOR PENETRATION
N.P.G. DWG. No. 257-P; Archives No. 1933-79
For breakup see N.P.G. 296-P

Penetration of VERTICAL ARMOR
at Target Angles of

DECK ARMOR

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	---
2"	19	18	16	13
2:49	15	14	13	10
2:60	14	14	13	10
3"	13	13	10	8
3:50	11	10	9	X
4"	10	9	8	X
5"	7	7	X	X
6"	6	X	X	X
7"	X	X	X	X

Thick- ness	Range
0:98	14
1:00	14
1:13	15
1:25	16
1:40	17
1:47	18
1:55	18
1:90	21
1:96	21
2:00	21
2:21	22
3:00	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 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.

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ORANGE 6"/50
CLs 40-45; CIs

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

INTERMEDIATE TARGETPENETRATIVENON-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

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ORANGE 6"/50
CLS 40-45; CIs

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

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ORANGE 6"/50
CLS 40-45; CMS

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

FIRE EFFECT TABLE - ORANGE 5!5/50

Muzzle Velocity 2789 f.s.
Weight of Projectile 84 lbs.

Maximum Range BBs 18
Maximum Range all others 20

LIMITING RANGES FOR ARMOR PENETRATION
N.P.G. DWG. No. 257-P. Archives No. 1933-79
For breakup see N.P.G. 296-P.

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	---
2"	17	17	14	10
2!49	14	13	11	8
2!60	13	13	11	7
3"	12	11	9	6
3!50	10	10	8	X
4"	9	8	X	X
5"	7	6	X	X
6"	X	X	X	X

DECK ARMOR

Thick- ness	Range
!98	14
1!00	15
1!13	16
1!25	16
1!40	17
1!47	18
1!55	18
1!90	21
1!96	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 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

Range	<u>PENETRATIVE</u>		<u>NON-PENETRATIVE</u>	
	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.492		.356	
2	1.471		.350	
3	1.170		.278	
4	.887		.211	
5	.632		.151	
6	.451		.108	
7	.327		.079	
8	.236		.056	
9	.180		.043	
10	.142		.034	
11	.112		.027	
12	.086	.094	.021	.022
13	.064	.073	.016	.018
14	.048	.058	.012	.014
15	.036	.048	.009	.011
16	.026	.039	.007	.009
17	.019	.032	.005	.007
18	.013	.026	.004	.006
19	.008	.020	.003	.005
20	.005	.015	.002	.004

INTERMEDIATE TARGETPENETRATIVENON-PENETRATIVE

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.492		.544	
2	1.413		.514	
3	.959		.348	
4	.647		.236	
5	.449		.164	
6	.316		.116	
7	.225		.083	
8	.165		.059	
9	.123		.045	
10	.097		.035	
11	.076		.028	
12	.059	.063	.022	.023
13	.043	.049	.016	.018
14	.032	.040	.012	.015
15	.024	.031	.009	.012
16	.018	.026	.007	.010
17	.013	.022	.005	.008
18	.009	.017	.003	.007
19	.006	.014	.002	.005
20	.003	.012	.001	.003

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ORANGE 5:5/50

SMALL TARGET

PENETRATIVE

NON-PENETRATIVE

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.492		.633	
2	.349		.574	
3	.796		.338	
4	.498		.212	
5	.347		.148	
6	.244		.104	
7	.174		.074	
8	.126		.054	
9	.096		.041	
10	.075		.032	
11	.060		.026	
12	.045	.050	.020	.022
13	.034	.039	.015	.018
14	.025	.031	.011	.014
15	.019	.026	.008	.011
16	.013	.021	.005	.009
17	.009	.017	.004	.008
18	.006	.013	.002	.006
19	.004	.011	.001	.005
20	.002	.008	.000	.003

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ORANGE 545/50

PENETRATIVE

DESTROYER TARGET

SUBMARINE TARGET

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.492		2.925	
2	.925		1.314	
3	.454		.656	
4	.265		.391	
5	.169		.250	
6	.116		.164	
7	.086		.111	
8	.065		.079	
9	.049		.055	.056
10	.037		.043	.046
11	.028		.031	.034
12	.020	.023	.022	.026
13	.014	.018	.015	.019
14	.010	.013	.010	.014
15	.007	.011	.007	.011
16	.005	.008	.005	.009
17	.003	.006	.003	.007
18	.002	.004	.002	.006
19	.001	.003	.001	.004
20	.000	.001	.000	.003

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ORANGE 5"1/50
ORANGE 5"1/50 A.A.

FIRE EFFECT TABLE - ORANGE 5"1/50

Muzzle velocity 2900 f.s.
Weight of Projectile 63 lbs.

Maximum Range 18

FIRE EFFECT TABLE - ORANGE 5"1/50 A.A.

Maximum Range 20

LIMITING RANGES FOR ARMOR PENETRATION

For breakup see N.P.G. 294-P.

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	15
2"	13	12	10	6
2"49	10	9	8	6
2"60	10	9	8	5
3"	8	8	6	X
3"50	7	7	5	X
4"	6	5	4	X
5"	4	4	X	X
6"	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.

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ORANGE 5!1/50
ORANGE 5!1/50 AA

LARGE TARGET

PENETRATIVE

NON-PENETRATIVE

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.269		.305	
2	1.247		.299	
3	.968		.232	
4	.712		.172	
5	.495		.119	
6	.349		.084	
7	.252		.062	
8	.183		.044	
9	.139	.143	.034	.035
10	.109	.117	.027	.029
11	.085	.095	.021	.024
12	.065	.077	.016	.019
13	.048	.062	.012	.016
14	.035	.051	.009	.014
15	.026	.043	.007	.012
16	.019	.037	.005	.010
17	.014	.032	.004	.009
18	.010	.028	.002	.008
19	.007	.025	.001	.007
20	.004	.023	.000	.006

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ORANGE 5.1/50
ORANGE 5.1/50 AA

INTERMEDIATE TARGET

PENETRATIVE

NON-PENETRATIVE

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.269		.459	
2	1.197		.432	
3	.794		.287	
4	.519		.188	
5	.351		.128	
6	.244		.089	
7	.173		.063	
8	.127		.046	
9	.095	.098	.035	.036
10	.074	.080	.027	.029
11	.058	.065	.021	.024
12	.045	.054	.016	.019
13	.033	.043	.012	.016
14	.023	.035	.009	.013
15	.018	.030	.006	.011
16	.013	.026	.005	.010
17	.010	.023	.003	.008
18	.007	.020	.002	.007
19	.005	.018	.001	.006
20	.003	.017	.000	.005

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ORANGE 5#1/50
ORANGE 5#1/50 AA

SMALL TARGET

PENETRATIVE

NON-PENETRATIVE

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.269		.533	
2	1.145		.482	
3	.658		.279	
4	.399		.168	
5	.272		.115	
6	.188		.080	
7	.134		.057	
8	.098		.041	
9	.074	.077	.032	.033
10	.058	.064	.024	.026
11	.045	.053	.019	.022
12	.034	.044	.015	.019
13	.026	.037	.011	.015
14	.019	.031	.008	.013
15	.014	.027	.006	.011
16	.010	.024	.004	.009
17	.007	.022	.003	.008
18	.005	.020	.002	.007
19	.000	.018	.000	.006
20		.016		.005

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ORANGE 5:1/50
ORANGE 5:1/50 AA

PENETRATIVE

DESTROYER TARGET

SUBMARINE TARGET

Range	Top Spot	Plane Spot	Top Spot	Plane Spot
1	1.269		2.739	
2	.768		1.246	
3	.358		.612	
4	.209		.362	
5	.133		.231	
6	.089		.149	
7	.065		.102	
8	.048		.073	
9	.036	.038	.051	.052
10	.027	.030	.039	.042
11	.020	.024	.028	.031
12	.015	.019	.020	.024
13	.010	.015	.014	.018
14	.007	.013	.010	.014
15	.005	.012	.007	.012
16	.003	.010	.005	.010
17	.002	.009	.003	.008
18	.000	.008	.002	.007
19		.007	.001	.006
20		.006	.000	.005

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ORANGE 4!7/45 AA

FIRE EFFECT TABLE - ORANGE 4!7/45 AA

Muzzle Velocity 2772 f.s.
Weight of Projectile 45 lbs.

Maximum Range 19

LIMITING RANGES FOR ARMOR PENETRATION

For breakup see N.P.G. 294-P

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	16	15	14	9
2"	8	7	X	X
2#49	5	5	X	X
2#60	5	4	X	X
3"	4	X	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.

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PENETRATIVETOP SPOT

Range	Large Target	Int. Target	Small Target	Destroyer Target	Submarine Target
1	1.672	1.672	1.672	1.672	4.086
2	1.635	1.568	1.505	.960	1.885
3	1.225	1.000	.833	.419	.899
4	.856	.626	.480	.244	.538
5	.579	.405	.313	.154	.338
6	.394	.275	.213	.098	.214
7	.282	.194	.149	.069	.147
8	.208	.141	.109	.049	.105
9	.158	.107	.084	.036	.076
10	.121	.082	.064	.027	.055
11	.093	.062	.049	.020	.039
12	.071	.048	.037	.015	.027
13	.051	.035	.026	.010	.019
14	.036	.024	.019	.007	.013
15	.025	.017	.013	.005	.009
16	.018	.012	.009	.003	.007
17	.012	.008	.006	.001	.004
18	.007	.005	.004	.001	.003
19	.003	.002	.002	.000	.002

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NON-PENETRATIVETOP SPOT

Range	Large Target	Int. Target	Small Target
1	.406	.597	.692
2	.397	.555	.622
3	.298	.359	.345
4	.208	.223	.199
5	.141	.145	.130
6	.096	.099	.089
7	.068	.070	.062
8	.050	.050	.046
9	.039	.039	.034
10	.029	.029	.027
11	.023	.023	.020
12	.017	.017	.016
13	.013	.013	.011
14	.008	.008	.008
15	.006	.006	.005
16	.004	.004	.004
17	.003	.003	.002
18	.002	.002	.002
19	.001	.001	.001

FIRE EFFECT TABLE - ORANGE 4"7/45

Muzzle Velocity 2772 f.s.
Weight of Projectile 45 lbs.

Maximum Range 15

FIRE EFFECT TABLE - ORANGE 4"7/40

Muzzle Velocity 2165 f.s.
Weight of Projectile 45 lbs.

Maximum Range 10

LIMITING RANGES FOR ARMOR PENETRATION

For breakup see N.P.G. 294-P.

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	16	15	14	9
2"	8	7	X	X
2.49	5	5	X	X
2.60	5	4	X	X
3"	4	X	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.

LIMITING RANGES FOR ARMOR PENETRATION

For breakup see N.P.C. 294-P.

Penetration of VERTICAL ARMOR
at Target Angles of

Armor Thick- ness	90° or 0°	75° or 15°	60° or 30°	45°
1"	---	---	---	X
2"	6	5	X	X
2"49	4	X	X	X
2"60	4	X	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.

PENETRATIVETOP SPOT

Range	Large Target	Int. Target	Small Target	Destroyer Target	Submarine Target
1	1.045	1.045	1.045	1.035	2.552
2	1.022	.980	.940	.599	1.178
3	.766	.628	.520	.262	.567
4	.536	.391	.299	.153	.332
5	.357	.253	.196	.096	.211
6	.246	.172	.132	.061	.134
7	.176	.121	.094	.043	.092
8	.130	.088	.069	.030	.066
9	.098	.067	.052	.023	.047
10	.076	.051	.040	.017	.035
11	.058	.039	.030	.012	.024
12	.044	.030	.023	.009	.017
13	.031	.022	.017	.006	.012
14	.022	.015	.012	.005	.008
15	.016	.011	.008	.003	.006

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ORANGE 47/45
ORANGE 47/40

NON-PENETRATIVE

TOP SPOT

Range	Large Target	Int. Target	Small Target
1	.254	.373	.433
2	.248	.350	.390
3	.186	.225	.219
4	.130	.140	.124
5	.087	.091	.081
6	.060	.061	.055
7	.042	.043	.039
8	.032	.032	.028
9	.024	.024	.022
10	.019	.019	.016
11	.014	.014	.012
12	.010	.010	.010
13	.008	.008	.007
14	.005	.006	.005
15	.004	.004	.004

FIRE EFFECT TABLE - ORANGE 3"/40

Muzzle Velocity 2321 f.s.
Weight of Projectile 12.5 lbs.

Maximum Range 5

FIRE EFFECT TABLE - ORANGE 3"/40 AA

Muzzle Velocity 2321 f.s.
Weight of Projectile 12.5 lbs.

Maximum Range 7

FIRE EFFECT TABLE - ORANGE 3"/25 AA

Muzzle Velocity 1492 f.s.
Weight of Projectile 12.5 lbs.

Maximum Range 6

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"	3	3	2	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.

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ORANGE 3"/40
ORANGE 3"/40 AA
ORANGE 3"/25 AA

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

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ORANGE 3"/40
ORANGE 3"/40 AA
ORANGE 3"/25 AA

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

