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Auth: Army Field Forces Board Mr. 4

By: ^{Fort Bliss, Texas} Date: 10 NOV 1950
^{COL E. WOODSON, JR.}
^{AGO, USA}

DAMAGE TABLES

SEACOAST ARTILLERY AGAINST NAVAL VESSELS

PREPARED UNDER THE DIRECTION OF THE COMMANDING GENERAL,
ARMY GROUND FORCES, BY THE COAST ARTILLERY BOARD,
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DAMAGE TABLES
SEACOAST ARTILLERY AGAINST NAVAL VESSELS

1. Introduction.

a. This discussion concerns the computation and use of damage tables. Damage tables are a tabulation of the theoretical number of shots required to destroy different types of vessels under various circumstances. They are used principally to investigate the destructive power of long range seacoast artillery against armored naval vessels.

b. Damage tables do not take into consideration the destructive effect of hits on the superstructure of ships. Hits of this category may cause considerable, and even disabling, damage to the superstructure, fire control systems and communication systems of modern ships.

c. Seacoast artillery guns cannot defeat the armor of a ship under all conditions. Explosive projectiles that completely penetrate the armor and detonate in the vitals of a ship are of more destructive value than hits that explode on the outside. It is necessary, therefore, first to investigate armor attack to determine under what conditions armor can be defeated.

2. Armor and armor piercing projectiles.

a. Types of armor. There are two main types of armor used for the protection of modern fighting ships, face-hardened armor and non-face-hardened armor. Each is designed to resist the type of attack to which it will be subjected.

(1) Face-hardened armor, called Class A armor, is installed upright to form side wall protection to naval vessels. This armor is designed particularly to resist the penetration of projectiles which strike at small angles from the normal to the plate. It must have a hard surface capable of deforming the projectile at impact and a tough back to absorb the shock of the blow.

(2) Non-face-hardened armor, called Class B armor, is applied horizontally for protection of the deck and the tops of important

installations. It is used mainly where the line of impact of the projectile is at a large angle from the normal to the plate, and it is intended to dish or give upon impact and deflect the projectile.

b. Armor piercing projectiles are made from the finest quality of high carbon, nickel-chrome steel. They are designed especially to penetrate modern naval armor so that the maximum damage will be caused by the explosion of the projectile.

3. Armor attack.

a. Governing factors. Many factors affect the armor piercing ability of a projectile. Among these are the obliquity of the line of impact, the type of armor, and the weight, diameter and velocity at impact of the projectile.

b. Obliquity.

(1) General. The angle of obliquity is the angle between the line of impact and the line normal to the face of the plate at the point of impact. It will be assumed in this discussion that Class A armor is exactly vertical at all times and that Class B armor is exactly horizontal at all times; any roll or list of the ship is ignored.

(2) Target angle. The target angle is the acute angle between the vertical plane containing the gun-target line and a vertical plane parallel to the longitudinal axis of the ship. In the present damage tables, target angles are grouped for convenience into three sectors: 0° to 30° , 30° to 60° , and 60° to 90° . Computations for each sector are made by using the mid-angle of the sector; the mid-angle will henceforth be called the target angle.

(3) Obliquity formulas. Let

$$\theta = \text{angle of obliquity}$$

$$\omega' = \text{angle of fall as listed in firing tables}$$

$$T = \text{target angle}$$

Then it can be proved that the angle of obliquity is given by the appropriate one of the following formulas:

- (a) For an end section (Class A armor) - $\cos \theta = \cos \omega' \cos T$
- (b) For a side section (Class A armor) - $\cos \theta = \cos \omega' \sin T$
- (c) For the deck (Class B armor) - $\theta = 90^\circ - \omega'$

d. Penetration is the depth of entry of the projectile into the armor as measured perpendicular to the surface. Perforation is complete penetration of the armor plate. The formula for penetration used in this discussion is

$$t = \left[\frac{.5}{\frac{w}{1022 d} \frac{v}{.75 K M_0}} \right]^{10}$$

where t = penetration in inches

w = weight of the projectile in pounds

v = velocity of the projectile at impact in feet

per second (obtained from the firing tables)

d = diameter or caliber of the projectile in inches

$K M_0$ = an armor factor K times an angle multiplier M_0 .

K serves as a measure of the efficiency of the armor;

M_0 adjusts for the obliquity. Both of these factors are obtained by experiment. Figure 1 is a graph of the values of $K M_0$ against values of θ . This is based on the most recent information available to the Ordnance Department.

e. Limiting obliquity. Numerous experimental firings against Class A armor one-half or more calibers thick (i.e., one-half as thick as the diameter of the projectile) have shown that, when the obliquity becomes as great as approximately thirty degrees, most of the projectiles are broken up. Hence, regardless of the formula given in subparagraph 3 g, above, hits upon Class A armor one-half or more calibers thick will not be considered perforative if θ exceeds thirty degrees.

f. Method of calculation of penetration. The penetration formula in subparagraph 3 g, above, is used to determine the ranges at which the armor under investigation will be perforated. The values given in Table

A are assumed for the thickness of armor on modern naval vessels. The general procedure is to search by 5000-yard increments in range until two ranges are found, one of which gives less and the other more penetration than the assumed thickness of armor. The range at which the exact thickness of armor will be perforated is then found by linear interpolation. (The exception of subparagraph 3 d must be noted.) In cases where it seems desirable, the increments of range mentioned above can be taken as smaller than 5,000 yards, and this has been done in several of the present damage tables.

4. Zone of immunity.

a. Definition. The thickness of Class A armor that a given projectile will penetrate decreases as the angle of fall increases. On the other hand, for Class B armor, the thickness of armor that will be penetrated increases as the angle of fall increases. It is impractical to install sufficient armor to make a vessel immune to perforation by gun fire under all conditions. However, modern naval vessels are provided with enough armor to create a zone in range where guns most likely to be encountered will not produce perforative shots. This zone is called the zone of immunity. The lower limit of the zone of immunity is the maximum range at which Class A armor will be perforated and the upper limit is the minimum range at which Class B armor will be perforated. Outside the zone of immunity either Class A or Class B armor or both will be perforated. In the zone of immunity neither Class A armor nor Class B armor will be perforated. For some projectiles against some vessels there is no zone of immunity; this occurs if the maximum range for Class A perforation is greater than the minimum range for Class B perforation.

b. Method of determination. The zone of immunity is determined from the calculations described in subparagraph 3 e, above.

5. Fire effect values of hits.

a. In discussing fire effect, it is necessary first to assign a destructive value to each type of hit. As a basis for comparison of different types of hits, the value of a Class A perforative hit from a

12-inch gun is arbitrarily taken as 1.00. On the basis of this assumption and empirical evidence obtained mostly from the results of engagements between British and German vessels during the years 1914-1918, Table B gives the fire effect values of hits from various seacoast guns. The low angle fire column under Class B is to be used for all angles of elevation less than the elevation corresponding to the maximum range of the gun, except in the case of mortars.

b. On the basis of empirical evidence obtained mostly from the Battle of Jutland, Table C gives the total fire effect value necessary to destroy different types of vessels.

c. Table B and Table C, when used together, give the number of hits theoretically necessary to destroy a given vessel by means of armor piercing projectiles from a given gun.

6. Fire effect values of shots.

a. General. In comparing various types of weapons, it is necessary to know the potential fire effect value of a shot, as distinguished from the fire effect value of a hit. The potential fire effect of a shot is obtained when the probability of hitting is multiplied by the fire effect value of a hit.

b. Components. For each shot, there is the possibility of hitting either the Class A or the Class B armor. When the value of a hit is not the same for both armors, it is necessary to determine separately the two components of the fire effect value of a shot. Each component is obtained by multiplying the corresponding value of a hit and the probability of hitting. The potential fire effect value of a shot is the sum of its Class A and Class B components.

c. Assumptions concerning presentation of target. In the general case, it is necessary to determine separately the probability of hitting the deck and the side or end section for each target angle. The determination of the probability of hitting when the target is other than bow-on or broadside is a long and tedious task. Fortunately, accuracy is not

unduly sacrificed by computing the probabilities of hitting the bow-on or broadside targets and then using these probabilities as the probabilities for obtaining various types of Class A and Class B hits in the different target angle sectors. The probabilities to be used in each case are tabulated in Table D.

d. Other assumptions concerning target.

(1) Size of target. The target is assumed to be a rectangular parallelopiped of the approximate dimensions of the vulnerable part of the actual vessel. The assumed dimensions of typical targets are given in Table E.

(2) Danger spaces. In computations, the danger spaces on the surface of the water are used instead of the corresponding sections of the material target. Their dimensions are obtained by projecting the various parts of the profile of the target upon the waterline using the slope of fall as listed in the firing tables as a direction for the parallel rays.

(3) Center of dispersion. The center of dispersion is assumed to be on the surface of the water directly below the geometrical center of the deck. This assumption must be carefully noted in the use of damage tables. In the damage tables no account is taken of trial shots; the damage tables assume that trial fire has been completed and that the center of dispersion has been correctly placed.

(4) Probable errors. The width and length of the dispersion zone depend upon the size of the deflection and range probable errors. The probable errors used in the following set of damage tables were obtained in general from Table I of TM 4-235, Coast Artillery Target Practice. In those cases where Table I of TM 4-235 did not give data at all ranges, a method of extrapolation was used. In the case of Firing Tables 6-E-1, 155-N-1, 8-I-1, and 16-E-1, where no target practice data are yet available, the probable errors used were the proving ground probable errors given in the firing tables. This fact is noted on the proper page of the damage tables.

g. Calculation of probability of hitting. For a given situation, it is necessary to calculate the probability of hitting the danger spaces corresponding to the Class A and Class B armor of the bow-on and broadside targets. The danger spaces are rectangular in shape with their sides parallel and perpendicular to the gun-target line. Therefore, by determining the probability factors as explained in paragraph 137 of FM 4-10 (Seacoast Artillery Gunnery) and entering the probability table (Table II-A) in that manual, the probability of hitting the required parts of the target may be obtained. If this probability is now multiplied by the fire effect value of the corresponding hit, the potential fire effect value of a shot is the result. It is to be noted that the Class A and Class B components must be added, as explained in subparagraph 6 b, above.

7. Spots to destroy. The number of shots of fire for effect to destroy a given target at a specified range in a given target angle sector is obtained by dividing the potential fire effect value of a shot (subparagraph 6 e) into the total fire effect required to destroy the vessel (Table C). In the present set of damage tables, the computations were made in each target angle sector for every 5,000 yards of range and for the two adjacent 1000-yard entries where a change takes place in the value of either a Class A or a Class B hit. The remainder of the table was completed by linear interpolation. In the case of some of the shorter range guns, the calculations were made for every 3,000 or 4,000 yards of range instead of every 5,000.

8. Arrangement of damage tables. The present damage tables have been calculated by the methods just described. Each page gives the number of shots of fire for effect to destroy the target for the indicated combination of gun, projectile, charge, and target. The typical targets of each gun are included. If there is a zone of immunity, it is indicated for the ranges tabulated by the area inclosed in broken lines; if there is no zone of immunity, that fact is noted. Unless there is a note to the contrary, the probable errors used are those of Table I, TM 4-235. No figures are given in these damage tables for high angle fire. The

number of shots of fire for effect to destroy the target has been given to only two significant figures whenever the number is greater than 100. Damage tables for certain obsolescent and limited standard projectiles have been omitted; if they are needed, they will be prepared by the Coast Artillery Board upon request.

9. Use of damage tables.

a. General. In the use of damage tables, the method of their construction must be borne in mind. They are based upon various assumptions, a list of which is given in paragraph 10 for ready reference. Because of these assumptions, the numbers appearing in the damage tables cannot be taken literally and they must not be interpreted as the actual results to be expected under combat conditions. They can, however, be used for purposes of comparison, and this is their main use.

b. Tactical use. Groupment commanders who direct the fire of long range seacoast artillery emplaced at widely dispersed points should draw up harbor charts showing for different areas and certain angles of approach of the target which battery would have the most destructive effect on the target. Such charts would be an aid in making decisions relative to the assignment of targets.

c. Use in maneuvers. For maneuver purposes all seacoast artillery units should be informed as to the number of theoretical shots required to destroy various types of vessels; umpires also will use this information. The information is generally furnished to the unit in the form of a curve on a chart. The horizontal scale is range and the vertical scale represents shots to destroy the target. Points are plotted directly from 0° - 30° target angle column of the damage tables, and the best representative smooth unbroken curve is drawn through the points. This curve is used for all target angles. As a convenience, an auxiliary vertical scale is added showing the time of fire of the battery in minutes, assuming a normal rate of fire.

10. List of assumptions used in calculating the damage tables.

- a. Armor piercing projectiles are used.
- b. All Class A armor is exactly vertical, and all Class B armor is exactly horizontal; there is no roll or list of the ship.
- c. The mid-angle may be used for each target angle sector.
- d. The figures concerning thickness of armor, fire effect values of hits, life of vessels in terms of fire effect value, probabilities of hits, and dimensions of targets tabulated in Tables A, B, C, D, and E apply.
- e. The data given by Figure 1 and the penetration formula of subparagraph 3 c, above, (as qualified by subparagraph 3 d) apply.
- f. The center of dispersion is located on the surface of the water directly underneath the geometrical center of the target.
- g. The probable errors of the gun are determined as described in subparagraph 6 d (4).
- h. The normal error curve governs the dispersion of the shots of the gun..

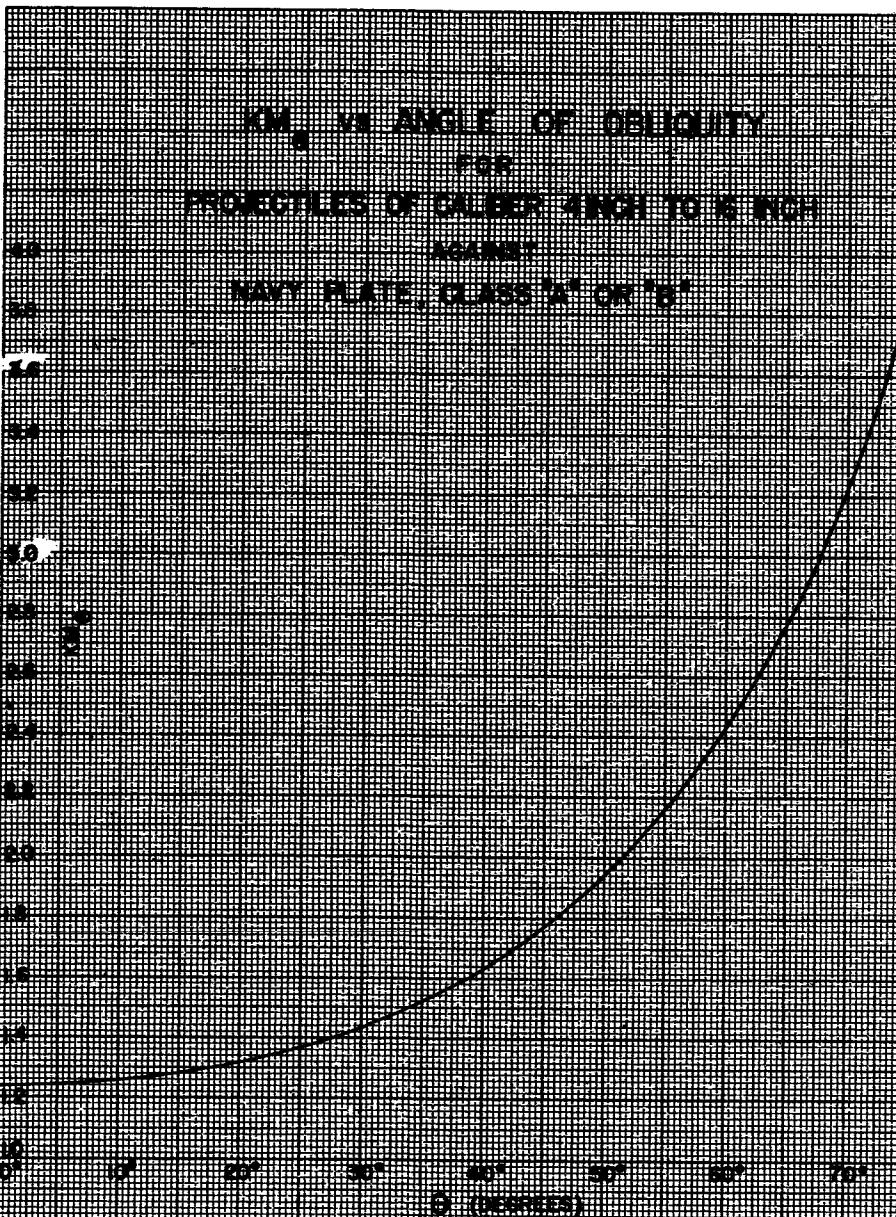


FIGURE 1
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TABLE A
ASSUMED ARMOR THICKNESS IN INCHES

Type of Vessel	Class A armor	Class B armor
Battleship (BB)	14	6
Heavy cruiser (CA)	4	2
Light cruiser (CL)	3	2
Destroyer (DD)	none	none

TABLE B
ASSUMED FIRE EFFECT VALUES OF HITS

Caliber of gun	Typical target	Weight of projectile	Perforative hits		Non-perforative hits
			Class A	Class B	
16	BB	2340	2.00	2.67	3.33
	CA	2240			1.00
14	BB	1660	1.50	2.00	
	CA	1560			.75
12	BB	1046			*1.67
	CA	824			
	CL	700			
12	BB	1070	1.00	1.33	
	CA	975			.50
	CL	870			
10	CA	617	.60	.80	
	CL				.30
8	CA	260	.30	.40	
	CL				.15
6	CL	108	.30	.40	
	DD	105			.15
155-mm	CL	100	.30	.40	
	DD				.15

NOTE: *Based on the 12-inch gun.

TABLE C

ASSUMED LIFE OF VESSELS IN FIRE EFFECT VALUE

Type of Vessel	Fire effect value to destroy
Battleship	25.00
Heavy cruiser	15.00
Light cruiser	9.00
Destroyer	1.80

TABLE D

ASSUMED PROBABILITIES FOR CLASS A AND CLASS B HITS

Section of Target	Target Angle Sectors		
	0° - 30°	30° - 60°	60° - 90°
End, Class A	Bow-on	Zero	Zero
Side, Class A	Zero	Broadside	Broadside
Deck, Class B	Bow-on	Broadside	Broadside

TABLE E

ASSUMED DIMENSIONS OF TARGETS

Type of Vessel	Deck (yards)	Hull (yards)	
		Above water	Below water
Battleship	32 x 160	10	4
Heavy cruiser and light cruiser	20 x 130	8	4
Destroyer	10 x 80	5	2

DAMAGE TABLE

6-inch Gun, M1897-M1908, 108-lb. A.P. Projectile

Firing Table 6-C-2

DESTROYER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
2000	7	6	6
3000	8	7	7
4000	8	7	7
5000	9	9	9
6000	10	10	10
7000	14	15	15
8000	17	19	19
9000	25	28	28
10000	33	36	36
11000	46	49	49
12000	58	62	62
13000	79	81	81
14000	100	100	100
15000	130	130	130
16000	160	150	150
17000	200	180	180

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

6-inch Gun, M1897-M1908, 108-lb. A.P. Projectile

Firing Table 6-C-2

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
2000	30	60	30
3000	31	60	30
4000	31	60	30
5000	35	67	34
6000	39	73	37
7000	51	97	51
8000	62	120	65
9000	91	170	98
10000	120	220	130
11000	170	310	190
12000	210	390	240
13000	320	500	350
14000	390	600	600
15000	520	750	750
16000	640	900	900
17000	820	1100	1100

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

6-inch Gun, M1900-M1903-M1905, 108-lb. A.P. Projectile

Firing Table 6-C-2

DESTROYER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
2000	7	6	6
3000	8	7	7
4000	8	7	7
5000	9	8	8
6000	10	9	9
7000	12	12	12
8000	14	14	14
9000	19	19	19
10000	23	24	24
11000	31	32	32
12000	38	39	39
13000	48	50	50
14000	58	60	60
15000	74	75	75
16000	90	90	90
17000	110	100	100

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

6-inch Gun, M1900-M1903-M1905, 108-lb. A.P. Projectile

Firing Table 6-C-2

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
2000	30	60	30
3000	31	60	30
4000	31	60	30
5000	35	64	32
6000	38	68	34
7000	47	82	43
8000	55	96	51
9000	71	120	69
10000	87	150	86
11000	110	200	120
12000	140	240	150
13000	200	300	300
14000	240	360	360
15000	310	450	450
16000	380	530	530
17000	450	640	640

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

6-inch Gun, 105-lb. A.P. Projectile

Firing Table 6-E-1

DESTROYER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
2000	6	6	6
3000	7	6	6
4000	7	6	6
5000	8	6	6
6000	9	7	7
7000	10	7	7
8000	11	8	8
9000	13	10	10
10000	15	12	12
11000	17	14	14
12000	22	19	19
13000	28	24	24
14000	33	29	29
15000	40	36	36
16000	46	42	42
17000	53	49	49
18000	63	58	58
19000	72	66	66
20000	82	75	75
21000	95	87	87
22000	110	98	98
23000	120	110	110
24000	130	120	120
25000	140	140	140
26000	140	150	150
27000	150	160	160
27520	160	160	160

NOTES: There is no Zone of Immunity for this Damage Table.Proving Ground Probable Errors rather than Target Practice
Probable Errors were used in the computation of this Damage
Table.

DAMAGE TABLE

6-inch Gun, 105-lb. A.P. Projectile

Firing Table 6-E-1

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
2000	30	60	30
3000	30	60	30
4000	31	60	30
5000	31	60	30
6000	35	61	31
7000	40	63	31
8000	44	64	32
9000	54	75	39
10000	63	86	46
11000	73	97	53
12000	92	120	72
13000	110	150	91
14000	130	180	110
15000	150	210	130
16000	210	260	260
17000	240	310	310
18000	280	360	360
19000	310	400	400
20000	350	450	450
21000	400	530	530
22000	450	600	600
23000	190	310	310
24000	200	330	330
25000	220	350	350
26000	230	360	360
27000	240	380	380
27520	250	390	390

NOTES: The area enclosed by the broken lines is the Zone of Immunity.

Proving Ground Probable Errors rather than Target Practice Probable Errors were used in the computation of this Damage Table.

DAMAGE TABLE

155-mm Gun, 100-lb. A.P. Projectile

Firing Table 155-N-1

DESTROYER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
2000	6	6	6
3000	6	7	7
4000	6	7	7
5000	6	8	8
6000	6	8	8
7000	6	11	11
8000	7	13	13
9000	7	16	16
10000	7	18	18
11000	9	22	22
12000	10	25	25
13000	12	29	29
14000	13	32	32
15000	16	37	37
16000	18	41	41
17000	21	46	46
18000	23	50	50
19000	28	55	55
19200	29	56	56

NOTES: There is no Zone of Immunity for this Damage Table.

Proving Ground Probable Errors rather than Target Practice Probable Errors were used in the computation of this Damage Table.

DAMAGE TABLE

155-mm Gun, 100-lb. A.P. Projectile

Firing Table 155-W-1

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
2000	30	30	30
3000	31	30	30
4000	31	31	31
5000	32	31	31
6000	37	66	33
7000	41	76	40
8000	46	85	46
9000	50	95	53
10000	63	110	110
11000	67	130	130
12000	72	160	160
13000	76	180	180
14000	80	200	200
15000	90	230	230
16000	100	270	270
17000	110	300	300
18000	120	330	330
19000	53	170	170
19200	54	180	180

NOTES: The area enclosed by the broken lines is the Zone of Immunity.

Proving Ground Probable Errors rather than Target Practice Probable Errors were used in the computation of this Damage Table.

DAMAGE TABLE

8-inch Railway Gun, MK VI, Modification 3A2,
260-lb. A.P. Projectile, Normal Charge

Firing Table 8-I-1

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	34	34	34
6000	38	41	41
7000	42	48	48
8000	45	56	56
9000	49	63	63
10000	53	70	70
11000	56	79	79
12000	59	160	93
13000	62	170	110
14000	65	190	120
15000	68	200	130
16000	73	220	150
17000	78	240	170
18000	39	140	140
19000	42	150	150
20000	45	160	160
21000	56	180	180
22000	67	200	200
22180	69	200	200

NOTES: The area enclosed by the broken lines is the Zone of Immunity.

Proving Ground Probable Errors rather than Target Practice Probable Errors were used in the computation of this Damage Table.

DAMAGE TABLE

8-inch Railway Gun, MK VI, Modification 3A2,
260-lb. A.P. Projectile, Normal Charge

Firing Table 8-I-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	57	110	57
6000	63	130	70
7000	70	150	82
8000	76	170	95
9000	83	190	110
10000	89	210	120
11000	96	230	140
12000	100	260	160
13000	110	280	180
14000	120	310	310
15000	130	340	340
16000	140	380	380
17000	140	410	410
18000	64	230	230
19000	70	250	250
20000	75	270	270
21000	91	300	300
22000	110	330	330
22180	110	330	330

NOTES: The area enclosed by the broken lines is the Zone of Immunity.

Proving Ground Probable Errors rather than Target Practice
Probable Errors were used in the computation of this Damage
Table.

DAMAGE TABLE

8-inch Railway Gun, MK VI, Modification 3A2,
260-lb. A.P. Projectile, Supercharge

Firing Table 8-I-1

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	34	38	38
6000	38	45	45
7000	43	51	51
8000	47	58	58
9000	52	64	64
10000	56	71	71
11000	64	85	85
12000	72	99	99
13000	80	110	110
14000	88	130	130
15000	96	140	140
16000	110	160	160
17000	120	170	170
18000	140	320	200
19000	160	350	220
20000	170	380	240
21000	190	410	270
22000	210	430	290
23000	100	240	190
24000	110	250	200
25000	130	260	260
26000	140	270	270
27000	160	280	280
28000	170	280	280
29000	190	290	290
30000	200	300	300
31000	240	330	330
32000	270	350	350
32980	310	380	380

NOTES: The area enclosed by the broken lines is the Zone of Immunity.

Proving Ground Probable Errors rather than Target Practice
Probable Errors were used in the computation of this Damage
Table.

DAMAGE TABLE

8-inch Railway Gun, Mk VI, Modification 3A2,
260-lb. A.P. Projectile, Supercharge

Firing Table 8-I-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	57	120	63
6000	64	140	74
7000	72	160	86
8000	79	180	97
9000	87	200	110
10000	94	220	120
11000	110	250	140
12000	120	280	160
13000	130	320	190
14000	150	350	210
15000	160	380	230
16000	190	430	270
17000	220	480	300
18000	240	520	340
19000	270	580	370
20000	320	630	430
21000	360	670	470
22000	390	710	510
23000	180	390	390
24000	200	410	410
25000	210	430	430
26000	230	440	440
27000	260	460	460
28000	280	470	470
29000	310	490	490
30000	330	500	500
31000	390	540	540
32000	460	590	590
32980	520	630	630

NOTES: The area enclosed by the broken lines is the Zone of Immunity.

Proving Ground Probable Errors rather than Target Practice
Probable Errors were used in the computation of this Damage
Table.

DAMAGE TABLE

10-inch Gun, 617-lb. A.P. Projectile

Firing Table 10-B-1

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	16	16	16
6000	24	22	22
7000	31	28	28
8000	39	35	35
9000	46	41	41
10000	54	47	47
11000	83	68	68
12000	110	89	89
13000	140	110	110
14000	170	130	130
15000	110	110	110
16000	150	140	140
17000	190	170	170

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

10-inch Gun, 617-lb. A.P. Projectile

Firing Table 10-B-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	27	27	27
6000	39	37	37
7000	52	47	47
8000	64	58	58
9000	77	68	68
10000	89	78	78
11000	140	110	110
12000	180	140	140
13000	230	180	180
14000	280	210	210
15000	190	180	180
16000	260	240	240
17000	320	290	290

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 975-lb. A.P. Projectile, Non-Stacked Charge

Firing Table 12-F-3

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	10	10	10
6000	13	13	13
7000	16	16	16
8000	18	19	19
9000	21	22	22
10000	24	25	25
11000	31	31	31
12000	20	30	30
13000	26	36	36
14000	33	41	41
15000	39	47	47
16000	50	56	56
17000	62	65	65
18000	73	74	74
19000	85	83	83
20000	96	92	92
21000	120	110	110
22000	140	130	130
23000	160	140	140
24000	190	160	160
25000	210	180	180
26000	250	220	220
27000	290	260	260
28000	330	300	300
29000	370	340	340
30000	410	380	380
30100	410	380	380

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 975-lb. A.P. Projectile, Non-Stacked Charge

Firing Table 12-F-3

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	16	17	17
6000	21	22	22
7000	26	27	27
8000	31	32	32
9000	36	37	37
10000	41	42	42
11000	52	51	51
12000	34	50	50
13000	44	60	60
14000	55	69	69
15000	65	79	79
16000	84	93	93
17000	100	110	110
18000	120	120	120
19000	140	140	140
20000	160	150	150
21000	200	180	180
22000	240	210	210
23000	270	250	250
24000	310	280	280
25000	350	310	310
26000	410	360	360
27000	460	420	420
28000	520	470	470
29000	630	600	520
30000	680	710	630
30100	680	710	630

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 975-lb. A.P. Projectile, Non-Stacked Charge

Firing Table 12-F-3

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	26	54	27
6000	30	63	33
7000	34	72	38
8000	37	80	44
9000	41	89	49
10000	68	110	110
11000	84	130	130
12000	100	150	150
13000	120	180	180
14000	130	200	200
15000	150	220	220
16000	190	260	260
17000	230	300	300
18000	280	330	330
19000	320	370	370
20000	360	410	410
21000	440	480	480
22000	530	550	550
23000	610	620	620
24000	700	690	690
25000	780	760	760
26000	940	850	850
27000	1100	930	930
28000	470	530	530
29000	540	600	600
30000	610	660	660
30100	630	660	660

Note: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

12-inch Gun, 975-lb. A.P. Projectile, Stacked Charge

Firing Table 12-F-3

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	9	9	9
6000	11	11	11
7000	14	13	13
8000	16	15	15
9000	19	17	17
10000	21	19	19
11000	26	24	24
12000	17	23	23
13000	21	27	27
14000	26	32	32
15000	30	36	36
16000	38	42	42
17000	46	49	49
18000	55	55	55
19000	63	62	62
20000	71	68	68
21000	89	82	82
22000	110	97	97
23000	120	110	110
24000	140	130	130
25000	160	140	140
26000	190	170	170
27000	220	200	200
28000	240	220	220
29000	270	250	250
30000	300	280	280
30100	320	280	280

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 975-lb. A.P. Projectile, Stacked Charge

Firing Table 12-F-3

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	15	16	16
6000	19	19	19
7000	23	22	22
8000	26	26	26
9000	30	29	29
10000	34	32	32
11000	43	39	39
12000	28	38	38
13000	35	45	45
14000	43	53	53
15000	50	60	60
16000	64	70	70
17000	78	80	80
18000	92	90	90
19000	110	100	100
20000	120	110	110
21000	150	130	130
22000	180	160	160
23000	210	180	180
24000	240	210	210
25000	270	230	230
26000	310	260	260
27000	350	300	300
28000	390	330	330
29000	450	480	410
30000	500	540	470
30100	540	540	470

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 975-lb. A.P. Projectile, Stacked Charge

Firing Table 12-F-3

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	25	52	26
6000	28	57	29
7000	31	63	33
8000	34	68	36
9000	37	73	39
10000	60	84	84
11000	72	100	100
12000	84	120	120
13000	96	140	140
14000	110	150	150
15000	120	170	170
16000	150	200	200
17000	180	220	220
18000	210	250	250
19000	240	270	270
20000	270	300	300
21000	340	350	350
22000	400	400	400
23000	470	460	460
24000	530	510	510
25000	600	560	560
26000	710	640	640
27000	810	710	710
28000	360	380	380
29000	410	430	430
30000	460	470	470
30100	460	470	470

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

12-inch Gun, 1070-lb. A.P. Projectile, Non-Stacked Charge

Firing Table 12-K-2

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	10	10	10
6000	13	13	13
7000	16	16	16
8000	19	19	19
9000	22	22	22
10000	25	25	25
11000	17	26	26
12000	23	32	32
13000	28	38	38
14000	34	43	43
15000	39	49	49
16000	51	59	59
17000	62	68	68
18000	74	78	78
19000	85	87	87
20000	97	97	97
21000	120	110	110
22000	140	130	130
23000	170	150	150
24000	190	160	160
25000	210	180	180
26000	250	210	210
27000	290	240	240
28000	310	260	260

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 1070-lb. A.P. Projectile, Non-Stacked Charge

Firing Table 12-K-2

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	16	17	17
6000	21	22	22
7000	26	27	27
8000	31	32	32
9000	36	37	37
10000	41	42	42
11000	29	43	43
12000	38	53	53
13000	47	63	63
14000	56	72	72
15000	65	82	82
16000	84	98	98
17000	100	110	110
18000	120	130	130
19000	140	140	140
20000	160	160	160
21000	200	190	190
22000	240	220	220
23000	280	250	250
24000	320	280	280
25000	360	310	310
26000	430	350	350
27000	430	480	420
27600	520	520	440

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 1070-lb. A.P. Projectile, Non-Stacked Charge

Firing Table 12-K-2

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	26	55	27
6000	31	66	33
7000	35	77	40
8000	40	88	46
9000	44	99	53
10000	49	110	59
11000	78	130	130
12000	96	160	160
13000	110	180	180
14000	130	210	210
15000	150	230	230
16000	190	270	270
17000	230	310	310
18000	280	350	350
19000	320	390	390
20000	360	430	430
21000	450	500	500
22000	540	570	570
23000	630	640	640
24000	720	710	710
25000	810	780	780
26000	960	890	890
27000	430	450	450
27600	460	500	500

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

12-inch Gun, 1070-lb. A.P. Projectile, Stacked Charge

Firing Table 12-K-2

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	9	10	10
6000	11	12	12
7000	14	14	14
8000	16	16	16
9000	19	18	18
10000	21	20	20
11000	14	20	20
12000	18	24	24
13000	22	29	29
14000	26	33	33
15000	30	37	37
16000	39	44	44
17000	47	51	51
18000	56	58	58
19000	64	65	65
20000	73	72	72
21000	90	86	86
22000	110	99	99
23000	130	110	110
24000	140	130	130
25000	160	140	140
26000	190	160	160
27000	220	190	190
27600	240	200	200

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 1070-lb. A.P. Projectile, Stacked Charge

Firing Table 12-K-2

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	16	16	16
6000	20	19	19
7000	24	23	23
8000	27	26	26
9000	31	30	30
10000	35	33	33
11000	24	34	34
12000	31	41	41
13000	37	48	48
14000	44	54	54
15000	50	61	61
16000	64	73	73
17000	78	85	85
18000	92	96	96
19000	110	110	110
20000	120	120	120
21000	150	140	140
22000	180	160	160
23000	210	190	190
24000	240	210	210
25000	270	230	230
26000	330	260	260
27000	360	370	310
27600	390	380	330

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 1070-lb. A.P. Projectile, Stacked Charge

Firing Table 12-K-2

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	25	52	26
6000	29	59	30
7000	32	65	34
8000	36	72	39
9000	39	78	43
10000	43	85	47
11000	67	99	99
12000	80	120	120
13000	94	140	140
14000	110	160	160
15000	120	180	180
16000	150	210	210
17000	180	240	240
18000	220	260	260
19000	250	290	290
20000	280	320	320
21000	350	380	380
22000	410	430	430
23000	480	490	490
24000	540	540	540
25000	610	600	600
26000	710	680	680
27000	320	350	350
27500	350	370	370

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

12-inch Gun, 870-lb. A. P. Projectile

Firing Table 12-L-4

LIGHT CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	9	9	9
6000	11	11	11
7000	13	13	13
8000	16	14	14
9000	18	16	16
10000	20	18	18
11000	28	24	24
12000	36	29	29
13000	43	35	35
14000	51	40	40
15000	30	37	37
16000	39	45	45
17000	48	53	53
18000	58	62	62
19000	67	70	70
20000	76	78	78
21000	97	96	96
22000	120	110	110
23000	140	130	130
24000	160	150	150
25000	180	170	170
26000	210	180	180
27000	240	240	220
27500	240	260	240

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 870-lb. A.P. Projectile

Firing Table 12-L-4

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	15	15	15
6000	19	18	18
7000	22	21	21
8000	26	24	24
9000	29	27	27
10000	33	30	30
11000	46	39	39
12000	59	49	49
13000	71	58	58
14000	84	67	67
15000	51	62	62
16000	67	76	76
17000	83	89	89
18000	98	100	100
19000	110	120	120
20000	130	130	130
21000	160	150	150
22000	190	210	170
23000	220	250	210
24000	260	290	240
25000	290	330	280
26000	340	370	320
27000	390	420	370
27500	410	440	390

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

12-inch Gun, 870-lb. A.P. Projectile

Firing Table 12-L-4

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	25	51	26
6000	27	55	28
7000	29	58	29
8000	52	63	63
9000	56	72	72
10000	59	80	80
11000	71	100	100
12000	83	120	120
13000	96	140	140
14000	110	160	160
15000	120	180	180
16000	150	210	210
17000	190	250	250
18000	220	280	280
19000	260	320	320
20000	290	350	350
21000	370	420	420
22000	450	480	480
23000	520	550	550
24000	600	610	610
25000	680	680	680
26000	760	780	780
27000	880	880	880
27500	930	930	930

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

14-inch Gun, 1560-lb. A.P. Projectile

Firing Table 14-A-2

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	10	10	10
6000	10	11	11
7000	11	13	13
8000	11	14	14
9000	12	16	16
10000	12	17	17
11000	15	21	21
12000	17	25	25
13000	20	30	30
14000	22	34	34
15000	25	38	38
16000	29	46	46
17000	34	54	54
18000	36	61	61
19000	43	69	69
20000	47	77	77
21000	56	92	92
22000	64	110	110
23000	73	120	120
24000	81	140	140
25000	90	150	150

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

14-inch Gun, 1560-lb. A.P. Projectile

Firing Table 14-A-2

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	17	34	17
6000	19	37	19
7000	20	41	21
8000	22	44	23
9000	23	48	25
10000	25	51	27
11000	30	63	34
12000	35	75	42
13000	40	86	49
14000	45	98	57
15000	50	110	64
16000	58	130	79
17000	66	150	95
18000	74	170	110
19000	110	190	190
20000	120	220	220
21000	140	250	250
22000	160	280	280
23000	170	320	320
24000	190	350	350
25000	210	380	380

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

14-inch Gun, 1400-lb. A.P. Projectile

Firing Table 14-B-2

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	10	10	10
6000	12	12	12
7000	14	14	14
8000	16	15	15
9000	18	17	17
10000	12	18	18
11000	15	23	23
12000	18	28	28
13000	20	32	32
14000	23	37	37
15000	26	42	42
16000	31	51	51
17000	35	60	60
18000	40	70	70
19000	44	79	79
20000	49	88	88
21000	57	99	99
22000	65	110	110
23000	73	120	120

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

14-inch Gun, 1400-lb. A.P. Projectile

Firing Table 14-B-2

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	17	33	17
6000	19	37	19
7000	21	41	22
8000	22	46	24
9000	24	50	27
10000	26	54	29
11000	30	63	35
12000	45	74	74
13000	52	89	89
14000	59	100	100
15000	66	120	120
16000	77	150	150
17000	88	170	170
18000	98	200	200
19000	110	220	220
20000	120	250	250
21000	140	290	290
22000	160	320	320
23000	180	360	360

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

14-inch Gun, 1400-lb. A.P. Projectile

Firing Table 14-C-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	10	10	10
6000	12	11	11
7000	14	13	13
8000	15	14	14
9000	17	16	16
10000	19	17	17
11000	12	17	17
12000	13	19	19
13000	14	22	22
14000	15	24	24
15000	16	26	26
16000	18	30	30
17000	20	34	34
18000	21	37	37
19000	23	41	41
20000	25	45	45
20200	25	45	45

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

14-inch Gun, 1400-lb. A.P. Projectile

Firing Table 14-C-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	17	34	17
6000	19	36	18
7000	21	38	20
8000	22	40	21
9000	24	42	22
10000	35	46	46
11000	37	52	52
12000	39	58	58
13000	42	64	64
14000	44	70	70
15000	46	76	76
16000	50	87	87
17000	53	98	98
18000	57	110	110
19000	60	120	120
20000	64	130	130
20200	65	130	130

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

14-inch Gun, 1560-lb. A.P. Projectile

Firing Table 14-D-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	10	10	10
6000	11	11	11
7000	9	11	11
8000	10	12	12
9000	10	13	13
10000	11	14	14
11000	12	16	16
12000	13	18	18
13000	14	20	20
14000	15	22	22
15000	16	24	24
16000	18	27	27
17000	19	31	31
18000	21	34	34
19000	22	38	38
20000	24	41	41
21000	27	45	45
21500	28	47	47

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

14-inch Gun, 1560-lb. A.P. Projectile

Firing Table 14-D-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	17	34	17
6000	19	36	18
7000	20	38	19
8000	22	39	21
9000	23	41	22
10000	25	43	23
11000	27	48	27
12000	29	53	30
13000	31	58	34
14000	33	63	37
15000	35	69	59
16000	49	79	79
17000	52	89	89
18000	56	100	100
19000	59	110	110
20000	63	120	120
21000	70	130	130
21500	73	130	130

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

14-inch Gun, 1400-lb. A. P. Projectile

Firing Table 14-E-3

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	20	10	10
6000	20	11	11
7000	20	12	12
8000	21	12	12
9000	21	13	13
10000	21	14	14
11000	23	17	17
12000	25	20	20
13000	26	23	23
14000	28	26	26
15000	30	29	29
16000	34	35	35
17000	37	41	41
18000	41	47	47
19000	44	53	53
20000	48	59	59
21000	54	67	67
22000	60	75	75
23000	67	84	84
24000	73	92	92
25000	79	100	100
26000	89	110	110
27000	99	120	120
28000	110	140	140
29000	120	150	150
30000	130	160	160
31000	160	180	180
32000	180	200	200
33000	210	230	230
34000	230	250	250
35000	260	270	270
36000	300	300	300
37000	340	330	330
38000	380	410	340
39000	420	450	420

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

14-inch Gun, 1400-lb. A.P. Projectile

Firing Table 14-E-3

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	23	33	17
6000	25	35	18
7000	27	37	19
8000	28	40	21
9000	30	42	22
10000	32	44	23
11000	36	52	28
12000	41	60	33
13000	45	68	39
14000	50	76	44
15000	54	84	49
16000	62	97	58
17000	69	110	67
18000	96	130	130
19000	100	150	150
20000	110	160	160
21000	120	180	180
22000	140	210	210
23000	150	230	230
24000	170	260	260
25000	180	280	280
26000	200	310	310
27000	220	340	340
28000	250	380	380
29000	270	410	410
30000	290	440	440
31000	340	510	510
32000	160	260	260
33000	180	280	280
34000	210	310	310
35000	230	330	330
36000	270	360	360
37000	310	390	390
38000	350	420	420
39000	380	440	440

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

14-inch Gun, 1560-lb. A.P. Projectile

Firing Table 14-G-2

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	20	10	10
6000	20	11	11
7000	20	12	12
8000	21	12	12
9000	21	13	13
10000	21	14	14
11000	23	17	17
12000	24	19	19
13000	26	22	22
14000	27	24	24
15000	29	27	27
16000	33	32	32
17000	36	38	38
18000	40	43	43
19000	43	49	49
20000	47	54	54
21000	53	62	62
22000	59	70	70
23000	65	77	77
24000	71	85	85
25000	77	93	93
26000	88	100	100
27000	98	120	120
28000	110	130	130
29000	120	140	140
30000	130	150	150
31000	150	170	170
32000	180	190	190
33000	200	210	210
34000	230	230	230
35000	250	250	250
36000	300	280	280
37000	350	310	310
38000	400	330	330
39000	450	360	360
40000	500	390	390
41000	610	530	530
42000	720	670	670
42279	750	710	710

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

14-inch Gun, 1560-lb. A.P. Projectile

Firing Table 14-G-2

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	23	33	17
6000	25	35	18
7000	26	37	19
8000	28	39	20
9000	29	41	21
10000	31	43	22
11000	35	50	27
12000	39	58	31
13000	44	65	36
14000	48	73	40
15000	52	80	45
16000	59	94	55
17000	66	110	65
18000	74	120	74
19000	81	140	84
20000	88	150	94
21000	99	170	110
22000	110	190	120
23000	120	210	140
24000	160	240	210
25000	180	260	260
26000	200	290	290
27000	220	320	320
28000	240	350	350
29000	260	380	380
30000	280	410	410
31000	330	460	460
32000	380	500	500
33000	185	270	270
34000	210	290	290
35000	230	310	310
36000	270	350	350
37000	310	390	390
38000	350	420	420
39000	390	460	460
40000	430	500	500
41000	520	590	590
42000	610	680	680
42279	640	710	710

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Howitzer, 2100-lb. A.P. Projectile, Zone 1

Firing Table 16-A-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	16	11	11
6000	19	14	14
7000	9	13	13
8000	10	15	15
9000	11	17	17
10000	12	19	19
11000	13	21	21
12000	14	23	23
13000	16	32	26
14000	17	34	29
14450	18	35	30

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Howitzer, 2100-lb. A.P. Projectile, Zone 1

Firing Table 16-A-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	27	31	31
6000	29	36	36
7000	30	41	41
8000	32	45	45
9000	33	50	50
10000	35	55	55
11000	37	61	61
12000	40	68	68
13000	42	74	74
14000	48	38	38
14450	48	39	39

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Howitzer, 2100-lb. A.P. Projectile, Zone 2

Firing Table 16-A-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	14	10	10
6000	17	12	12
7000	19	14	14
8000	11	13	13
9000	12	15	15
10000	12	16	16
11000	13	18	18
12000	14	20	20
13000	15	21	21
14000	16	23	23
15000	17	25	25
16000	19	28	28
17000	19	35	30
17540	21	37	32

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Howitzer, 2100-lb. A.P. Projectile, Zone 2

Firing Table 16-A-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	27	29	29
6000	28	33	33
7000	30	37	37
8000	31	40	40
9000	33	44	44
10000	34	48	48
11000	36	53	53
12000	38	58	58
13000	41	62	62
14000	43	67	67
15000	45	72	72
16000	49	78	78
17000	19	39	39
17540	20	40	40

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Howitzer, 2100-lb. A.P. Projectile, Zone 3

Firing Table 16-A-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	13	9	9
6000	15	11	11
7000	17	12	12
8000	11	12	12
9000	12	13	13
10000	12	14	14
11000	13	16	16
12000	14	18	18
13000	15	19	19
14000	16	21	21
15000	17	23	23
16000	18	25	25
17000	19	26	26
18000	20	28	28
19000	21	29	29
20000	22	31	31
20960	23	38	33

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Howitzer, 2100-lb. A.P. Projectile, Zone 3

Firing Table 16-A-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	16	28	14
6000	29	30	30
7000	30	33	33
8000	32	36	36
9000	33	39	39
10000	34	42	42
11000	36	47	47
12000	38	51	51
13000	41	56	56
14000	43	60	60
15000	45	65	65
16000	48	69	69
17000	50	73	73
18000	53	76	76
19000	55	80	80
20000	22	40	40
20960	23	41	41

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Howitzer, 2100-lb. A.P. Projectile, Zone 4

Firing Table 16-A-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	11	8	8
6000	14	9	9
7000	16	10	10
8000	11	11	11
9000	11	12	12
10000	12	13	13
11000	13	14	14
12000	14	16	16
13000	15	17	17
14000	16	19	19
15000	17	20	20
16000	18	21	21
17000	19	23	23
18000	20	24	24
19000	21	26	26
20000	22	27	27
21000	23	29	29
22000	24	31	31
23000	25	32	32
24000	26	34	34
24540	27	35	35

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Howitzer, 2100-lb. A.P. Projectile, Zone 4

Firing Table 16-A-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
5000	15	27	14
6000	18	29	16
7000	20	32	17
8000	23	34	19
9000	25	36	20
10000	34	38	38
11000	36	42	42
12000	38	45	45
13000	40	49	49
14000	42	52	52
15000	44	56	56
16000	46	60	60
17000	48	64	64
18000	51	68	68
19000	53	72	72
20000	55	76	76
21000	59	79	79
22000	23	39	39
23000	24	40	40
24000	25	42	42
24540	26	43	43

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, 3/4 Charge

Firing Table 16-B-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	7	11	11
11000	8	13	13
12000	9	15	15
13000	10	16	16
14000	11	18	18
15000	12	20	20
16000	13	23	23
17000	15	26	26
18000	16	29	29
19000	18	32	32
20000	19	35	35
21000	21	39	39
22000	24	44	44
23000	26	48	48
24000	29	53	53
25000	31	57	57
26000	35	63	63
27000	40	68	68
28000	44	74	74
29000	49	80	80
29570	51	83	83

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, 3/4 Charge

Firing Table 16-B-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	18	34	18
11000	20	39	21
12000	22	43	25
13000	23	48	28
14000	25	52	31
15000	33	58	58
16000	36	66	66
17000	39	74	74
18000	42	83	83
19000	45	91	91
20000	48	99	99
21000	54	110	110
22000	60	120	120
23000	65	140	140
24000	71	150	150
25000	77	160	160
26000	82	83	83
27000	86	91	91
28000	91	98	98
29000	95	110	110
29570	98	110	110

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, 7/8 Charge
 Firing Table 16-B-1
 HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	7	10	10
11000	8	11	11
12000	9	13	13
13000	9	14	14
14000	10	16	16
15000	11	17	17
16000	12	20	20
17000	14	22	22
18000	15	25	25
19000	17	27	27
20000	18	30	30
21000	20	34	34
22000	23	37	37
23000	25	41	41
24000	28	44	44
25000	30	48	48
26000	34	53	53
27000	38	58	58
28000	43	62	62
29000	47	67	67
30000	51	72	72
31000	60	82	82
32000	68	91	91
33000	77	100	100
34000	85	110	110
35000	94	120	120
35910	100	130	130

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, 7/8 Charge
 Firing Table 16-B-1
 BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	16	31	16
11000	18	35	19
12000	20	39	21
13000	21	42	24
14000	23	46	26
15000	25	50	29
16000	28	57	34
17000	31	63	39
18000	34	70	43
19000	37	76	48
20000	47	85	85
21000	52	96	96
22000	58	110	110
23000	63	120	120
24000	69	130	130
25000	74	140	140
26000	82	150	150
27000	90	170	170
28000	98	180	180
29000	103	91	91
30000	108	100	100
31000	115	110	110
32000	122	120	120
33000	129	120	120
34000	136	130	130
35000	143	140	140
35910	90	140	140

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, Full Charge
 Firing Table 16-B-1
 HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	8	9	9
11000	9	10	10
12000	9	11	11
13000	10	13	13
14000	10	14	14
15000	11	15	15
16000	12	17	17
17000	13	19	19
18000	15	21	21
19000	16	23	23
20000	17	25	25
21000	19	28	28
22000	22	31	31
23000	24	35	35
24000	27	38	38
25000	29	41	41
26000	33	45	45
27000	37	50	50
28000	41	54	54
29000	45	59	59
30000	49	63	63
31000	57	69	69
32000	65	76	76
33000	74	82	82
34000	82	89	89
35000	90	95	95
36000	100	100	100
37000	110	110	110
38000	130	120	120
39000	140	130	130
40000	150	140	140
41000	180	170	170
42000	210	200	200
43000	250	220	220
44000	280	250	250
44680	300	270	270

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, Full Charge
 Firing Table 16-B-1
 BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	15	29	15
11000	17	32	17
12000	18	35	19
13000	20	37	20
14000	21	40	22
15000	23	43	24
16000	26	49	26
17000	28	55	32
18000	31	61	36
19000	33	67	40
20000	36	73	44
21000	41	82	50
22000	46	92	56
23000	50	100	63
24000	55	110	69
25000	60	120	75
26000	75	130	130
27000	86	140	140
28000	98	150	150
29000	110	160	160
30000	120	170	170
31000	130	190	190
32000	57	110	110
33000	65	120	120
34000	73	120	120
35000	81	130	130
36000	93	140	140
37000	100	150	150
38000	120	150	150
39000	130	160	160
40000	140	170	170
41000	170	200	200
42000	200	220	220
43000	220	250	250
44000	250	270	270
44680	270	290	290

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2340-lb. A.P. Projectile, 3/4 Charge

Firing Table 16-C-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	7	11	11
11000	8	13	13
12000	9	14	14
13000	10	16	16
14000	11	17	17
15000	12	19	19
16000	13	22	22
17000	14	25	25
18000	16	27	27
19000	17	30	30
20000	18	33	33
21000	21	36	36
22000	23	40	40
23000	26	43	43
24000	28	47	47
25000	31	50	50
26000	35	55	55
27000	39	61	61
28000	43	66	66
29000	47	72	72
30000	51	77	77
31000	59	85	85
32000	66	93	93
32400	69	96	96

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Gun, 2340-lb. A.P. Projectile, 3/4 Charge

Firing Table 16-C-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	18	33	18
11000	20	38	21
12000	22	42	24
13000	23	47	27
14000	25	51	30
15000	27	56	33
16000	30	63	38
17000	33	70	43
18000	35	76	48
19000	38	83	53
20000	43	94	94
21000	53	110	110
22000	58	120	120
23000	62	130	130
24000	67	140	140
25000	70	140	140
26000	74	74	74
27000	74	79	79
28000	77	84	84
29000	81	90	90
30000	86	95	95
31000	94	100	100
32000	102	110	110
32400	106	120	120

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2340-lb. A.P. Projectile, 7/8 Charge

Firing Table 16-C-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	7	10	10
11000	8	11	11
12000	9	12	12
13000	9	14	14
14000	10	15	15
15000	11	16	16
16000	12	18	18
17000	14	21	21
18000	15	23	23
19000	17	26	26
20000	18	28	28
21000	20	31	31
22000	23	34	34
23000	25	36	36
24000	28	41	41
25000	30	44	44
26000	34	48	48
27000	38	53	53
28000	42	57	57
29000	46	62	62
30000	50	66	66
31000	58	72	72
32000	66	77	77
33000	75	83	83
34000	83	88	88
35000	91	94	94
36000	100	110	110
37000	120	120	120
38000	130	130	130
39000	150	150	150
39260	150	150	150

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Gun, 2340-lb. A.P. Projectile, 7/8 Charge

Firing Table 16-C-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	16	31	16
11000	18	34	18
12000	20	38	20
13000	21	41	23
14000	23	45	25
15000	25	48	27
16000	28	54	31
17000	30	60	36
18000	33	67	40
19000	35	73	45
20000	38	79	49
21000	43	89	56
22000	48	99	63
23000	53	110	70
24000	58	120	77
25000	63	130	84
26000	66	140	90
27000	86	150	150
28000	39	83	83
29000	44	89	89
30000	48	94	94
31000	55	100	100
32000	61	110	110
33000	68	120	120
34000	74	120	120
35000	81	130	130
36000	93	140	140
37000	100	150	150
38000	120	160	160
39000	130	170	170
39260	130	170	170

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2340-lb. A.P. Projectile, Full Charge

Firing Table 16-C-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	8	9	9
11000	9	10	10
12000	9	11	11
13000	10	12	12
14000	10	13	13
15000	11	14	14
16000	12	16	16
17000	13	18	18
18000	15	20	20
19000	16	22	22
20000	17	24	24
21000	19	27	27
22000	22	30	30
23000	24	32	32
24000	27	35	35
25000	29	38	38
26000	33	42	42
27000	37	46	46
28000	40	50	50
29000	44	54	54
30000	48	58	58
31000	56	64	64
32000	64	70	70
33000	72	75	75
34000	80	83	81
35000	88	87	87
36000	100	98	98
37000	110	110	110
38000	130	120	120
39000	140	130	130
40000	150	140	140
41000	170	160	160
42000	200	180	180
43000	220	190	190
44000	250	210	210
45000	270	230	230
46000	300	250	250
47000	340	280	280
48000	370	300	300
49000	410	330	330
49140	410	330	330

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Gun, 2340-lb. A.P. Projectile, Full Charge

Firing Table 16-C-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	15	29	15
11000	17	32	17
12000	18	34	18
13000	20	37	20
14000	21	39	21
15000	23	42	23
16000	25	47	27
17000	28	52	30
18000	30	58	34
19000	33	63	37
20000	35	68	41
21000	40	76	46
22000	44	85	52
23000	49	93	57
24000	53	100	63
25000	58	110	66
26000	66	120	76
27000	74	130	85
28000	81	140	93
29000	89	150	100
30000	97	160	110
31000	49	93	74
32000	56	100	80
33000	63	110	86
34000	70	110	91
35000	77	120	97
36000	83	130	100
37000	98	130	100
38000	115	140	110
39000	128	150	120
40000	130	170	130
41000	150	190	190
42000	170	200	200
43000	200	220	220
44000	220	230	230
45000	240	250	250
46000	270	280	280
47000	300	310	310
48000	330	340	340
49000	370	370	370
49140	370	370	370

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, 2/3 Charge

Firing Table 16-D-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	7	13	13
11000	8	15	15
12000	9	17	17
13000	10	20	20
14000	11	22	22
15000	12	24	24
16000	13	28	28
17000	15	31	31
18000	16	35	35
19000	18	38	38
20000	19	42	42
21000	22	47	47
22000	25	53	53
23000	28	58	58
24000	30	63	63
24530	32	66	66

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, 2/3 Charge

Firing Table 16-D-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	26	39	39
11000	28	45	45
12000	30	51	51
13000	31	58	58
14000	33	64	64
15000	35	70	70
16000	38	80	80
17000	41	90	90
18000	44	100	100
19000	47	110	110
20000	50	120	120
21000	57	130	130
22000	24	68	68
23000	26	72	72
24000	29	77	77
24530	30	79	79

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, Full Charge
 Firing Table: 16-D-1
 HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	8	9	9
11000	9	10	10
12000	9	11	11
13000	10	13	13
14000	10	14	14
15000	11	15	15
16000	12	17	17
17000	13	19	19
18000	15	21	21
19000	16	23	23
20000	17	25	25
21000	19	28	28
22000	22	31	31
23000	24	33	35
24000	27	38	38
25000	29	41	41
26000	33	45	45
27000	37	50	50
28000	41	54	54
29000	45	59	59
30000	49	63	63
31000	57	69	69
32000	65	76	76
33000	74	82	82
34000	82	89	89
35000	90	95	95
36000	100	100	100
37000	110	110	110
38000	130	120	120
39000	110	130	130
40000	150	140	140
41000	180	170	170
42000	210	200	200
43000	250	220	220
44000	280	250	250
44680	300	270	270

NOTE: There is no Zone of Immunity for this Damage Table.

DAMAGE TABLE

16-inch Gun, 2100-lb. A.P. Projectile, Full Charge
 Firing Table 16-D-1
 BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	15	29	15
11000	17	32	17
12000	18	35	19
13000	20	37	20
14000	21	40	22
15000	23	43	24
16000	26	49	26
17000	28	55	32
18000	31	61	36
19000	33	67	40
20000	36	73	44
21000	41	82	50
22000	46	92	56
23000	50	100	63
24000	55	110	69
25000	60	120	75
26000	75	130	130
27000	86	140	140
28000	98	150	150
29000	110	160	160
30000	120	170	170
31000	130	190	190
32000	157	110	110
33000	65	120	120
34000	73	120	120
35000	81	130	130
36000	93	140	140
37000	100	150	150
38000	120	150	150
39000	130	160	160
40000	140	170	170
41000	170	200	200
42000	200	220	220
43000	220	250	250
44000	250	270	270
44680	270	290	290

NOTE: The area enclosed by the broken lines is the Zone of Immunity.

DAMAGE TABLE

16-inch Gun, 2240-lb. A.P. Projectile, 2/3 Charge

Firing Table 16-E-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	6	10	10
11000	6	12	12
12000	7	14	14
13000	7	15	15
14000	8	17	17
15000	8	19	19
16000	9	22	22
17000	9	26	26
18000	10	29	29
19000	10	33	33
20000	11	36	36
21000	11	38	38
22000	11	41	41
23000	11	43	43
24000	11	46	46
24910	11	48	48

NOTES: There is no Zone of Immunity for this Damage Table.

Proving Ground Probable Errors rather than Target Practice
 Probable Errors were used in the computation of this Damage
 Table.

DAMAGE TABLE

16-inch Gun, 2240-lb. A.P. Projectile, 2/3 Charge

Firing Table 16-E-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	21	31	17
11000	21	35	20
12000	26	39	39
13000	27	45	45
14000	27	50	50
15000	28	56	56
16000	30	65	65
17000	31	74	74
18000	33	82	82
19000	34	91	91
20000	36	100	100
21000	15	43	43
22000	15	47	47
23000	15	52	52
24000	15	56	56
24910	15	60	60

NOTES: The area enclosed by the broken lines is the Zone of Immunity.

Proving Ground Probable Errors rather than Target Practice
 Probable Errors were used in the computation of this Damage
 Table.

DAMAGE TABLE

16-inch Gun, 2240-lb. A.P. Projectile, Full Charge

Firing Table 16-E-1

HEAVY CRUISER TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	7	8	8
11000	7	8	8
12000	7	9	9
13000	7	9	9
14000	7	10	10
15000	7	10	10
16000	7	11	11
17000	8	12	12
18000	8	14	14
19000	9	15	15
20000	9	16	16
21000	10	18	18
22000	10	20	20
23000	11	21	21
24000	11	23	23
25000	12	25	25
26000	13	27	27
27000	14	29	29
28000	16	31	31
29000	17	33	33
30000	18	35	35
31000	19	37	37
32000	20	39	39
33000	21	42	42
34000	22	44	44
35000	23	46	46
36000	23	48	48
37000	24	50	50
38000	24	51	51
39000	25	53	53
40000	25	55	55
41000	24	56	56
42000	23	57	57
43000	21	57	57
44000	20	58	58
45000	19	59	59
45155	16	59	59

NOTES: There is no Zone of Immunity for this Damage Table.

Proving Ground Probable Errors rather than Target Practice Probable Errors were used in the computation of this Damage Table.

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DAMAGE TABLE

16-inch Gun, 2240-lb. A.P. Projectile, Full Charge

Firing Table 16-E-1

BATTLESHIP TARGET

Shots of Fire for Effect to Destroy the Target

Ranges Use nearest 1000 yards	Target Angle		
	0° - 30°	30° - 60°	60° - 90°
10000	14	25	13
11000	15	26	14
12000	16	27	15
13000	17	29	15
14000	18	30	16
15000	19	31	17
16000	20	34	19
17000	21	37	21
18000	22	41	24
19000	23	44	26
20000	24	47	28
21000	25	52	32
22000	27	57	35
23000	28	62	39
24000	30	67	42
25000	31	72	46
26000	33	78	51
27000	35	84	55
28000	37	90	60
29000	45	95	95
30000	48	100	100
31000	20	56	56
32000	21	58	58
33000	22	61	61
34000	22	63	63
35000	23	65	65
36000	23	67	67
37000	24	69	69
38000	24	70	70
39000	25	72	72
40000	25	74	74
41000	24	74	74
42000	23	74	74
43000	22	75	75
44000	21	75	75
45000	20	75	75
45155	19	72	72

NOTES: The area enclosed by the broken lines is the Zone of Immunity.

Proving Ground Probable Errors rather than Target Practice Probable Errors were used in the computation of this Damage Table.

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