DEPARTMENT OF THE ARMY FIELD MANUAL

RESCINDED Per DA Memo
310-15
30 May 1979

105-MM HOWITZER
M108
SELF-PROPELLED

HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1963

AGO 7305C
105-MM HOWITZER, M108, SELF-PROPELLED

FM 6–79, 9 January 1963, is changed as follows:

*Page 18*, paragraph 19. Line 5, "(aiming posts)" is changed to read "(aiming posts or collimator)."

*Page 19*, paragraph 19. The following note is added immediately below the last line of text:

*Noté*. See figure 7.1.

*Page 19*, figure 7.1 is added as follows:
Figure 7.1. Infinity-aiming reference collimator and auxiliary equipment.

Page 23, paragraph 26. Line 3 “aiming posts” is changed to read “aiming posts or collimator.”

Page 25. Paragraph 26d is added as follows:

d. The infinity-aiming reference collimator is an optical instrument which simulates an azimuth reference target at infinity. When used as the primary aiming point it is alined with the vertical reticle of the panoramic telescope as directed by the gunner.
(1) The collimator is emplaced in any convenient position, from 4 to 17 meters from the left side of the weapon. Best results are obtained from 5 to 12 meters.

(2) While the howitzer is being laid, number 1 alines the optical system of the collimator on the center of the telescope rotating head and cross-levels the reticle pattern.

(3) After the howitzer is laid the gunner directs number 1 in alining the 0 line of the collimator reticle with the vertical reticle of the panoramic telescope.

(4) To lay for direction during firing, the gunner sets the announced deflection on the panoramic telescope and alines any number on the panoramic telescope reticle with the same number on the collimator reticle. This procedure for laying compensates for weapon displacement. See figure 8.1.

Note. For positive location, an area at least 7 mils in diameter must be seen at all times on the collimator reticle.

Page 25, Figure 8.1 is added as follows:
Figure 8.1. Gunners sight picture of collimator when correcting for displacement.
Page 71. Paragraph 83b(5) is superseded as follows:

(5) Aiming posts or the collimator will be set out at deflection as determined by unit SOP. Aiming posts will be placed so that the near aiming post is located halfway between the far aiming post and the sight. Usually the far aiming post will be placed approximately 100 meters from sight. The collimator will be emplaced from 4 to 17 meters with best results between 5 to 12 meters.

Page 72, paragraph 83c, test No. 1 and 10. Line 7 in Action of Candidate column, is changed to read “aiming posts or alined on the collimator.”

Page 72, paragraph 83c, test No. 2 and 11. Line 4 is changed to read “Lays on aiming posts or collimator.”

Page 74, paragraph 83d(3). Line 3, “aiming post” is changed to read “aiming post or appropriate number on the collimator reticle.”

Page 77, paragraph 86b(4). Line 2, “aiming post” is changed to read “aiming post or collimator.”

Page 77, paragraph 86c(1). Item 1, line 5, is changed to read “reticle of the telescope or takes up the proper sight picture with the collimator.”

Page 78, paragraph 86c(2). Examiner Commands column, Line 1, “POSTS” is changed to read “POINT.”

Page 78, paragraph 86d(1)(a). Line 4 is
changed to read “scope, or the collimator, reticle and the panoramic reticle are not properly alined.”

Page 78. Paragraph 86d(2)(b), is superseded as follows:

(b) Aiming posts or collimator are not properly alined.

Page 81, paragraph 89b(1). Line 2 is changed to read “posts or collimator.”

Page 81, paragraph 89b(2). Line 2, “aiming posts” is changed to read “aiming posts or collimator.”

Located in back of manual: Table III, chief of section column:

Sequence 3, column 3, lines 4 and 6 “CHARGE 8” is changed to read “CHARGE 7.”

Sequence 5, lines 9 and 10, “and shell HE M482, Charge 8,” is deleted.

Table III.1 is added (located in back of this change).
By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:
To be distributed in accordance with DA Form 12-11 requirements for 105 MM Howitzer, M108, Self-Propelled.
Table III.1 Direct Fire Table, 105-mm Howitzer, M108

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<tr>
<th>Range meters</th>
<th>Elevation mils</th>
<th>Vertical displacement feet</th>
<th>Trajectory characteristics</th>
<th>Firing data</th>
<th>Range meters</th>
<th>Elevation mils</th>
<th>Vertical displacement feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1</td>
<td>.0</td>
<td>Within these range limits the trajectory is flat enough to prevent an 8-foot tank from passing beneath it. Range shifts of 100 meters will usually be sufficient to bring the rounds on target. Fields of fire and terrain, allowing the upper range limits, are ideal at which to engage the target. This allows maximum time for firing.</td>
<td>1. Start firing at estimated range or 400 meters, whichever is greater.</td>
<td>100</td>
<td>2</td>
<td>.0</td>
</tr>
<tr>
<td>200</td>
<td>3</td>
<td>.5</td>
<td></td>
<td>2. Make 100-meter range changes until a target hit is obtained.</td>
<td>200</td>
<td>4</td>
<td>.5</td>
</tr>
<tr>
<td>300</td>
<td>4</td>
<td>1.0</td>
<td></td>
<td></td>
<td>300</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>400</td>
<td>6</td>
<td>1.5</td>
<td></td>
<td></td>
<td>400</td>
<td>8</td>
<td>2.0</td>
</tr>
<tr>
<td>500</td>
<td>8</td>
<td>2.0</td>
<td></td>
<td></td>
<td>500</td>
<td>11</td>
<td>3.0</td>
</tr>
<tr>
<td>600</td>
<td>9</td>
<td>3.0</td>
<td></td>
<td></td>
<td>600</td>
<td>13</td>
<td>3.5</td>
</tr>
<tr>
<td>700</td>
<td>11</td>
<td>3.5</td>
<td>Within these range limits, it is necessary to establish a bracket. This is necessary due to the relatively flat trajectory and the difficulty in estimating the exact range change necessary to place the round on target. Range changes of 200 meters should be made until a bracket is obtained. The bracket then should be split until a target hit is obtained.</td>
<td>1. Start firing at estimated range.</td>
<td>700</td>
<td>15</td>
<td>4.0</td>
</tr>
<tr>
<td>800</td>
<td>13</td>
<td>4.0</td>
<td></td>
<td>2. Adjustment by bracket (overs and shorts) is necessary.</td>
<td>800</td>
<td>18</td>
<td>5.5</td>
</tr>
<tr>
<td>900</td>
<td>15</td>
<td>5.0</td>
<td></td>
<td></td>
<td>900</td>
<td>20</td>
<td>6.0</td>
</tr>
<tr>
<td>1000</td>
<td>17</td>
<td>6.0</td>
<td></td>
<td></td>
<td>1000</td>
<td>22</td>
<td>7.0</td>
</tr>
<tr>
<td>1100</td>
<td>19</td>
<td>7.0</td>
<td></td>
<td></td>
<td>1100</td>
<td>25</td>
<td>8.0</td>
</tr>
<tr>
<td>1200</td>
<td>21</td>
<td>8.0</td>
<td></td>
<td></td>
<td>1200</td>
<td>27</td>
<td>9.0</td>
</tr>
<tr>
<td>1300</td>
<td>24</td>
<td>9.0</td>
<td></td>
<td></td>
<td>1300</td>
<td>30</td>
<td>10.0</td>
</tr>
<tr>
<td>1400</td>
<td>26</td>
<td>10.0</td>
<td></td>
<td></td>
<td>1400</td>
<td>33</td>
<td>11.0</td>
</tr>
<tr>
<td>1500</td>
<td>28</td>
<td>11.5</td>
<td>At these ranges a target hit is only reasonably possible. Again, a bracket must be established. Range changes of 400 meters should be made until the bracket is obtained. Fire should be opened only if surprise is not important. Beyond 2200 meters direct laying on a moving target is not advisable. The increasing angle of fall of the projectile, the difficulty in estimating ranges and the size of the target in the sight combine to make target hits difficult and unlikely.</td>
<td>1. Start firing at estimated range.</td>
<td>1500</td>
<td>35</td>
<td>12.0</td>
</tr>
<tr>
<td>1600</td>
<td>31</td>
<td>12.5</td>
<td></td>
<td>2. Adjustment by bracket (overs and shorts) is necessary.</td>
<td>1600</td>
<td>38</td>
<td>13.0</td>
</tr>
<tr>
<td>1700</td>
<td>34</td>
<td>14.0</td>
<td></td>
<td></td>
<td>1700</td>
<td>41</td>
<td>14.5</td>
</tr>
<tr>
<td>1800</td>
<td>37</td>
<td>15.5</td>
<td></td>
<td></td>
<td>1800</td>
<td>44</td>
<td>15.5</td>
</tr>
<tr>
<td>1900</td>
<td>40</td>
<td>17.0</td>
<td></td>
<td></td>
<td>1900</td>
<td>46</td>
<td>17.0</td>
</tr>
<tr>
<td>2000</td>
<td>43</td>
<td>18.5</td>
<td></td>
<td></td>
<td>2000</td>
<td>49</td>
<td>18.0</td>
</tr>
<tr>
<td>2100</td>
<td>46</td>
<td>20.0</td>
<td></td>
<td></td>
<td>2100</td>
<td>52</td>
<td>20.0</td>
</tr>
<tr>
<td>2200</td>
<td>49</td>
<td>22.0</td>
<td></td>
<td></td>
<td>2200</td>
<td>55</td>
<td>21.0</td>
</tr>
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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 23 June 1966

105-MM HOWITZER M108 SELF-PROPELLED

FM 6–79, 9 January 1963, is changed as follows:
Figure 6. (Superseded) Posts, mounted.
Figure 7. (Superseded) Posts, prepared for action.
Figure 8. (Superseded) Range card for direct laying.
26. Aiming Points

After the howitzer points as required.

\[ \text{c. The aiming posts by the gunner.} \]

(5) (Superseded) Unit SOP will specify the deflection at which to place the aiming posts.

\[ \text{Figure 10.1. (Added) Test target dimensions.} \]
45. Micrometer Test

The micrometer test is performed as follows:

* * * * * * *

d. (Superseded) Reseat the quadrant on the leveling plates; the bubbles should center.

Note. Do not disturb the lay of the tube.

* * * * * * *

67. Failure To Fire

(Superseded)

If the weapon fails to fire—

a. Keep the weapon trained on the target.

b. Clear unnecessary personnel from the vicinity of the howitzer.

c. Make two additional attempts to fire the weapon.

d. Wait two minutes after last attempt to fire.

e. The assistant gunner opens the breech and number 1 removes the cartridge case.

f. If the primer is dented a faulty primer is indicated and the cartridge case is replaced and the weapon is fired.

g. If the primer is not dented, a faulty firing mechanism is indicated.

Caution: The firing mechanism can be recocked without opening or unlocking the breech. Personnel stay clear of the path of recoil when recocking weapon.
By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DCSPER (2) Ft Devens (2)
ACSI (2) Ft Hood (2)
DCSLOG (2) Ft Lewis (2)
DCSOPS (2) Ft Riley (2)
CORC (2) TJAGSA (1)
CRD (1) USAMPS (1)
COA (1) MFSS (1)
CINFO (1) USAOC&S (1)
TIG (1) USAES (1)
CNGB (2) USAQMS (1)
USCONARC (5) USATSCH (1)
USACDC (2) USASCS (1)
ARADCOM (2) USACHS (1)
ARADCOM Rgn (1) USMA (2)
OS Maj Comd (2) Cen (5)
LOGCOMD (1) Units org under fol TOE:
Armies (5) 6–345 (5)
Corps (3) 6–347 (5)
Div (2) 6–465 (5)
Div Arty (1) 6–467 (5)
Bde (1) 17–22 (1)
Ft Carson (2)

NG: State AG (3); units—same as Active Army except allowance is one copy to each unit.

USAR: Units—same as Active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320–50.
# 105-MM HOWITZER M108, SELF-PROPELLED

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1. Purpose and Scope

a. This manual is a guide to assist commanders and chiefs of sections in developing 105-mm howitzer M108, self-propelled sections into teams that will operate effectively in battle.

b. This manual prescribes the duties of the section personnel in—

(1) Section drill.
(2) Preparation for firing and traveling.
(3) Firing.
(4) Tests and adjustments.
(5) Maintenance and inspections.
(6) Decontamination of equipment.
(7) Destruction of equipment.

c. This manual is applicable to both nuclear and nonnuclear warfare without modification.

d. To improve this manual, users are encouraged to submit recommended changes and comments. The procedure is as follows:

(1) Key comments to the specific page, paragraph, and line.
(2) Include supporting reasons with each comment.
(3) Send direct to U.S. Army Artillery and Missile School, ATTN: AKPSIPL, Fort Sill, Okla.

2. Composition of the Howitzer Section

The personnel of the howitzer section are the—

a. Chief of Section (CS).
b. Gunner (G).
c. Assistant Gunner (AG).
d. Three cannoneers numbered 1 through 3.
e. Motor Carriage Driver (D).

Figure 1. 105-mm howitzer M108, self-propelled.
3. Duties of the Chief of Section

The chief of section is the noncommissioned officer in command of the section. He is responsible for the—

a. Training and efficiency of personnel.

b. Performance of duties in drill, firing, tests and adjustments, inspection, and maintenance.

c. Observance of safety precautions.

d. Preparation of field fortifications.

e. Camouflage discipline; local security; and chemical, biological, and radiological security discipline.


g. Police and improvement of the section area.

4. Equipment

a. Capabilities and limitations of the howitzer are shown in figure 2.

b. Section equipment is shown in figure 3.

5. References

Publications applicable to the 105–mm howitzer M108, self-propelled, are listed in the appendix.
Figure 2. Performance characteristics.
Figure 3. Section equipment.
CHAPTER 2
SECTION DRILL

Section I. GENERAL

6. Purpose
This chapter prescribes the—
   a. Objectives and instructions for section drill.
   b. Commands and formations for section drill.

7. Objectives
The objective of section drill is the attainment of efficiency: precision coupled with high speed.

8. Instructions
Section drill will be—
   a. Conducted in silence except for commands and reports.
   b. Repeated until reactions are automatic, rapid and efficient.
   c. Supervised so that mistakes are discovered, reported and corrected immediately.
   d. Supervised by battery officers to insure uniformity and efficiency.
   e. Conducted so that each member of the section can perform all duties within the section.
Section II. COMMANDS AND FORMATIONS

9. Forming the Section

To form the section, the chief of section takes his post and gives one of the following commands:

a. To form the section the command is FALL IN. The section—
   (1) Moves at double time.
   (2) Forms in single rank at close interval, with the gunner on the right, the assistant gunner, cannoneers in numerical order, and the driver at the left of the rank.
   (3) Centers on the chief of section at a distance of 3 paces (fig. 4).

b. To form the section in a particular place, the commands may be 1. IN FRONT (REAR) OF YOUR PIECE, 2. FALL IN. The section—
   (1) Moves and forms a single rank as in a above.
   (2) Faces the direction of fire.

c. To form the section in a particular direction the commands may be 1. ON THE ROAD FACING THE PARK. 2. FALL IN. The section—
   (1) Moves and forms a single rank as in a above.
   (2) Faces the direction indicated in the command.
d. At the first formation for a drill or exercise, the caution “as a section” precedes the command.

10. To Call Off

With the section in formation the command is CALL OFF.

a. All personnel except the gunner execute eyes right.

b. The section calls off in sequence: “Gunner, Assistant gunner, 1, 2, 3, Driver.”

c. As each man calls out, he turns his head smartly to the front.

11. To Take Posts

The command is 1. CANNONEERS, 2. POSTS.

a. The command is general and may be given in or out of ranks, at a halt, or marching.

Figure 4. Section in formation.
b. All movements are executed at double time and are terminated at the position of attention.

c. The section moves to posts as shown in—
   (1) Figure 5, dismounted.
   (2) Figure 6, mounted.
   (3) Figure 7, prepared for action.

12. To Change Posts

To train all members of the section in all duties, posts should be changed frequently. With the section in formation, the commands are—

   a. 1. CHANGE POSTS, 2. MARCH
      (1) Number 3 moves at double time to the post of the assistant gunner.
      (2) The assistant gunner and numbers 1 and 2 take two left steps each cannoneer taking the position of the next higher numbered cannoneer.

   b. 1. SECTION CHANGE POSTS, 2. MARCH.
      (1) The left most man moves at double time to the post of gunner.
      (2) All other men move as in a above.

13. To Mount

To mount, the following commands may be given:

   a. 1. PREPARE TO MOUNT, 2. MOUNT.
      (1) At the preparatory command, the section moves at double time to positions shown in figure 5.
(2) At the command of execution, personnel mount and take positions as shown in figure 6.

(3) If any member of the section is not to mount, he is designated and cautioned to stand fast. 1. PREPARE TO MOUNT, DRIVER STAND FAST, 2. MOUNT.

b. MOUNT. The section moves directly to the positions shown in figure 6.

Note. Transportation must be provided for cannoneers not mounted in the motor carriage.

14. To Dismount

To dismount the following commands may be given:

a. 1. PREPARE TO DISMOUNT, 2. DISMOUNT.

(1) At the preparatory command, compartment doors are opened, and personnel assume a crouched position in order to dismount rapidly.

(2) At the command of execution, personnel take positions as shown in figure 5.

b. DISMOUNT. The section moves without delay to positions as shown in figure 5.

15. To Fall Out

The command FALL OUT is given to provide rest and relief during drill or firing.

a. During Drill—

(1) The command may be given at any time.
Figure 5. Posts, dismounted.
Figure 6. Posts, mounted.
Figure 7. Posts, prepared for action.
(2) The section remains in vicinity of drill area.

b. *When Firing*—

(1) The command may be given when firing is temporarily suspended.

(2) The section remains in vicinity of, but clear of the piece.

(3) The settings and layings are not disturbed.
CHAPTER 3
DUTIES OF THE HOWITZER SECTION

Section I. PREPARATIONS FOR FIRING

16. Purpose

This chapter prescribes duties for—

a. Preparing the howitzer for firing (table I).

b. Firing by indirect laying (table II).

c. Firing by direct laying (table III).

d. Preparing the howitzer for traveling (table IV).

Note. Tables I, II, III, and IV are located in back of the manual.

17. At the Position

a. The howitzer is emplaced under direct supervision of the chief of section.

b. Preparation of the firing position prior to occupation is governed by time factors and unit SOP. The following preparation will, however, facilitate the occupation.

   (1) Mark the position with a stake to indicate where the center of the carriage is to be placed.

   (2) Place another stake at a distance of 50 to 100 meters, in the approximate direc-
tion of fire, at which the driver can point the tube.

c. Hand signals are used for guiding the driver.

18. To Prepare for Action

a. The command is PREPARE FOR ACTION.
   (1) The command may be given with the howitzer in position or approaching the position.
   (2) Duties of individuals are given in table I.
   (3) Each man takes his post (fig. 7) when he has completed his duties.

b. Normally the howitzer is partially prepared for action before arriving at the firing position.

c. All duties are conducted at double time.

d. If the howitzer is not to be prepared for action at the firing position, a supplementary command DO NOT PREPARE FOR ACTION must be given.

Section II. FIRING

19. Firing by Indirect Laying

The vast majority of targets will be attacked by indirect laying. Indirect laying is a method of taking targets under fire by placing the line of sight of the panoramic telescope on an aiming point other than the target (aiming posts). To provide timely and accurate fire the section must be indoctrinated with a sense of urgency. Every
effort must be made to execute the timely and effective delivery of fire. A detailed list of duties is contained in table II.

20. Firing by Direct Laying

Some targets may be attacked by direct laying. This is a method of taking the target under fire by sighting directly on the target. Since such targets are usually capable of returning fire, the following factors must be emphasized.

a. Speed and accuracy in laying.

b. High standards of training.

c. Section operation as an independent unit.

21. Methods of Direct Laying

a. Sighting System. The two-man, two-sight system is the principal sighting system to be used with the weapon.

(1) The gunner establishes lead with the panoramic telescope.

(2) The assistant gunner establishes range with the direct fire telescope.

b. One-Man, One-Sight System. The one-man, one-sight system in which the gunner lays for both deflection and elevation may be used if required. However, the two-man, two-sight system provides faster laying, better accuracy, and a greater assurance of first round hits.

c. Laying Method. Central laying is used in conjunction with click sights.
(1) The gunner sets the lead on the azimuth counter.
(2) Traverses the tube until the vertical reticle is on the center of the target.
(3) Subsequent changes in lead are made in 5-mil increments by sound (clicks) and feel when turning the azimuth knob.

d. Tracking the Target. After lead and range are laid on the target, continuous tracking is maintained during the firing sequence.

e. Specific Duties in Firing. Specific duties in firing by direct laying are shown in table III.

22. Range Card

a. The chief of section is responsible for the defense of his assigned sector. He should also be prepared to deliver fire in all sectors (directions).

b. During reconnaissance of the position and shortly after occupation of position the chief of section will—

(1) Measure or estimate the ranges to prominent terrain features and likely avenues or approach.
(2) Establish reference points as required.
(3) Prepare a range card (fig. 8).
(4) As time permits replace estimated ranges with more accurate ranges obtained by pacing, taping, speedometer, maps or survey.

c. The executive officer will assign numbers to certain prominent terrain features to facilitate
Figure 8. Range card for direct laying.
target location. For example, the executive commands, TARGET, TANKS, POINT NUMBER 2, FIRE AT WILL.

d. As time permits a deflection and a quadrant for each numbered point should be added to the range card to expedite and increase accuracy in firing.

e. The field of fire of the section should, if possible, be cleared of obstruction that might hinder fields of fire or observation. Care must be taken not to expose the location of the position.

23. Trajectory Characteristics

Trajectory characteristics for different ranges must be considered prior to taking a target under fire. Information covering the effective direct fire ranges of the weapon will be published when firing table information is available.

24. Preparations for Traveling

The command is MARCH ORDER.

a. Duties of individuals are given in table IV.

b. Each man takes his post (fig. 5) when he has completed his duties.
CHAPTER 4
TECHNIQUES AND SITUATIONS THAT REQUIRE SPECIAL ATTENTION

25. Precision in Laying

a. Fire control instruments, fuze setters, and elevation and traverse mechanisms must be operated to reduce the effects of lost motion.

b. The gunner and assistant gunner will verify the laying after the breech has been closed.

c. For uniformity and accuracy—

(1) The line of sight for setting and reading a scale or centering a bubble should be at a right angle to the scale or level vial to prevent parallax errors.

(2) The vertical reticle of the panoramic telescope is aligned with the left edge of the aiming posts.

26. Aiming Points

After the howitzer has been laid for direction, it is referred to a primary aiming point, normally the aiming posts and alternate aiming points (distant aiming points) as required.

a. An aiming point must be a sharply defined point, or a clearly visible vertical line.

b. Alternate aiming points (distant aiming points) must be at least 2,000 meters distant.
This distance prevents displacement in firing or traverse from causing more than a $\frac{1}{2}$ mil horizontal change in direction with the same settings on the scales.

c. The aiming posts are placed in alinement with the vertical reticle of the panoramic telescope as directed by the gunner.

(1) The *far* aiming post is placed at least 100 meters from the piece. This distance is the most desirable for accuracy, visibility, and control of the aiming post lights.

(2) The *near* aiming post must be set up halfway between the far post and the piece. Equal spacing is accomplished either by pacing, or by measuring with the panoramic telescope and using the aiming post as a stadia rod or by using a wire or cord with the appropriate distances marked in a convenient manner.

(3) If the aiming post is used as a stadia rod, the procedure is as follows:

(a) Number 1 stands at the far aiming post and holds the upper section of an aiming post parallel to the ground and perpendicular to the line of sight.

(b) The gunner measures the length of the aiming post in mils on the reticle of the panoramic telescope.

(c) The gunner directs number 1 to move toward the piece and to emplace the
near aiming post at a point where the upper section measures twice the number of mils it measured at the far aiming post.

(4) For night use, the light on the far aiming post should be placed so that it appears several feet above the light on the near aiming post. The lights placed in this manner establish a vertical line for laying the howitzer.

(5) Unit SOP will specify the deflection at which to place the aiming posts; however, placing the aiming posts at a deflection from 2,400 to 2,600 reduces misalignment and allows for maximum visibility.

(6) Correction for displacement of the aiming posts from the vertical reticle of the panoramic telescope is discussed in table II.

27. Changes in Data During Firing

If it is necessary to change any element of firing data, the executive commands CORRECTION.

a. Piece Unloaded. Set off new data and resume firing when the quadrant is announced.

b. Piece Loaded. Set off new data and resume firing when the quadrant is announced if no change is required in the fuze, time setting, or charge.

(1) If the data requires a change in the fuze, time setting, or charge, the chief of sec-
tion will suspend firing and report to the executive, “Number 2 loaded, charge ( ), fuze ( ), time ( ),” stating the elements that are changed.

(2) In continuous fire, changes in data are applied without stopping the fire or breaking its continuity.

28. To Unload the Howitzer

a. Once a completed round is loaded, it should be fired. However, if unloading is required, the command is UNLOAD.

b. If the howitzer has been fired repeatedly and the tube is heated, it should be fired if possible; or if necessary, unload the weapon as quickly as possible.

c. Unloading will be supervised by an officer and the procedure is as follows:

(1) The assistant gunner opens the breech slowly.

(2) Number 1 standing at the breech, receives the ejected round.

d. If the extractor fails to eject the cartridge case, the procedure is as follows:

(1) Number 2 obtains the rammer staff and the unloading rammer head.

(2) The officer inspects the rammer head to insure that it is free from obstruction.

(3) Number 2 inserts the rammer into the bore until the head incloses the fuze and touches the projectile.
Number 2 then pushes on the rammer, and taps the end of the staff lightly with a wooden block if necessary, until the round is dislodged.

Number 1 receives the round as it is pushed out of the breech.

e. If the cartridge case is extracted but not the projectile, the procedure is as follows:

(1) Number 1 fills the chamber with waste and closes the breechblock.

(2) Number 2 dislodges the projectile as in d above.

(3) Number 1 opens the breech, removes the waste and receives the projectile as number 2 pushes the projectile to the rear.

29. Care of Ammunition

To insure uniform results in firing, to prolong the life of the tube, and to avoid accidents, great care must be exercised in handling and storing ammunition. The following requirements should be met.

a. Information contained in TM 9–1900 that are applicable to field service should be followed.

b. Protect the ammunition from damage.

(1) Leave in containers until just prior to firing.

(2) Use tarpaulins and dunnage to protect ammunition against weather, dirt, and sun.
(3) Raise ammunition stacked in the open 6 inches off the ground, and dig drainage ditches around the stacks.

(4) Allow six inches air space between the top of the stack and the covering tarpaulin.

Note. Uniform propellant temperatures must be maintained to provide accurate firing.

c. Explosive elements in fuzes are particularly sensitive to shock and high temperature. The precautions to be observed are as follows:

(1) Protect from weather, direct sunlight and rough handling.

(2) Remove protection and safety devices from fuzes just prior to their use.

(3) Do not attempt to disassemble a fuze.

d. Protection against hostile fire may be accomplished by—

(1) Dispersing ammunition in small stacks.

(2) Store ammunition in trenches and dugouts.

(3) Insure that each stack of ammunition does not contain more than 75 rounds, is not more than four layers high.

(4) Placing stacks of ammunition at least 10 meters apart.

e. Ammunition should be sorted into lot numbers as it is stored.

30. Amphibious Operation

a. General. The howitzer can be equipped with a flotation device which will enable the vehicle to navigate rivers, lakes, and other water obstacles (fig. 9).

b. Equipment. The flotation device consists of the following:

(1) Bags. Four bag-retainer assemblies will be installed on each side of the vehicle, and one bag on the front of the vehicle.

(2) Water barriers. Barriers will be installed on each forward side and across the front of the vehicle to reduce water seepage to the power plant compartment.

(3) Auxiliary equipment. Auxiliary equipment includes the necessary valves, blowers, hoses, and fittings to inflate the bags.

c. Preparation. Approximately 5 minutes is required to prepare the howitzer for amphibious operation. A detailed list of duties is contained in table V (located in back of manual).
Figure 9. Howitzer prepared for amphibious operation.
CHAPTER 5
BORESIGHTING

Section I. GENERAL

31. Description

Boresighting is—

a. A process to verify, and align if required, that the optical axis of the panoramic telescope and the direct fire telescope is parallel to the axis of the tube in deflection and elevation.

b. Conducted prior to firing and, when necessary, during lulls in firing.

c. Performed to insure accuracy in laying for elevation and direction.

32. Methods of Boresighting

a. The two methods of boresighting this howitzer are—

(1) Testing target method (pars. 35–37).

(2) Distant aiming point method (pars. 38–40).

b. The method of boresighting to be used will be determined by the unit SOP and the time available.
33. Equipment

The equipment that is needed for boresighting is described below.

a. Front and Rear Boresight.

(1) Front and rear boresights are used to aline the tube on the testing target or distant aiming point.

(2) If boresights are not available, cross-hairs are fastened to the muzzle and the firing pin hole in the breech block is used as the rear sighting guide.

b. Testing Target. The testing target provides accurate aiming diagrams for the tube, panoramic telescope, and direct fire telescope in boresighting and testing. The testing target is prepared as follows:

(1) Mount the testing target on a flat piece of material and fasten it to a stand to provide stability (fig. 10).

(2) Install a plumbline and mil scale for use in leveling or canting the target (fig. 10).

(3) Draw vertical reference lines for use when the trunnions are not level. The testing target must be canted an equal amount and in the same direction (fig. 10).

(4) To facilitate boresighting in darkness, bore a $\frac{1}{16}$-inch hole through the center of each aiming diagram and cover each hole with a piece of heavy cloth.
Figure 10. Testing target.
flashlight is held against the material to provide an aiming point for blackout conditions.

c. Tools. Section equipment includes all necessary tools for boresighting and testing.

*Caution:* Use the proper tools to prevent damage to fire control equipment.

d. Plumbline. The plumbline is used to level the trunnions for testing and to boresight the howitzer if time is not a factor. The plumbline is prepared as follows:

(1) Suspend the line from any convenient location so that the muzzle of the howitzer can be placed at a distance of approximately 5 feet from the line. For a more complete test insure that the line is long enough to allow for the highest possible tube elevation.

(2) Attach a weight to the end of the line for tautness and, to prevent the line from swinging, place the weight in a liquid-filled container.

34. Requirements for On-Carriage Fire Control Alinement

Correct alinement exists when—

a. The mounts and instruments are securely attached, and when no binding or excessive backlash exists in the gears.

b. The line of sight of the panoramic telescope is parallel to the axis of the bore throughout elevation limits.
c. The line of sight of the direct fire telescope is parallel to the axis of the bore.

d. The azimuth counter reads 3200.

e. The gunner’s aid counter reads zero.

f. The elevation and azimuth slip scales on the direct fire telescope mount read 4.

g. All bubbles are centered.

Section II. TESTING TARGET METHOD

35. General

The testing target method consists of aligning the line of sight of the tube, panoramic telescope, and the direct fire telescope with the aiming diagrams on the testing target.

36. Preparations for Boresighting

Preparations for boresighting are as follows:

a. Place the howitzer on level ground.

b. Place the tube in the center of traverse.

c. Install the front and rear boresights (par. 33a).

d. Level the trunnions by using a plumbline or a gunner’s quadrant. The plumbline method is preferable, and the procedure is as follows:

   (1) Install a plumbline (par. 33d).

   (2) Traverse the cab until the plumbline is aligned with the front and rear boresights.
(3) Elevate and depress the tube throughout its limits. The vertical hairline of the front boresight should remain in coincidence with the plumbline.

(4) If coincidence is not maintained, build up the low track or shift the howitzer slightly.

(5) Perform (3) and (4) above until coincidence is maintained throughout the elevation limits.

e. The gunner's quadrant normally will be used to level the trunnions under field conditions when time is critical. The procedure is as follows:

(1) Use gunner's quadrant that has been checked by the end-for-end test (par. 44).

(2) Set the index arm and the micrometer scale on the quadrant at zero.

(3) Place the quadrant on the breechblock on the leveling pads that are perpendicular to the long axis of the tube.

(4) Shift the howitzer slightly or build the low track until the bubble on the gunner's quadrant is centered.

f. Set the tube at zero elevation by using a gunner's quadrant and applying corrections, as determined from the end-for-end test.

g. Center the bubbles in the pitch-level vial and cross-level vial of the panoramic telescope mount.
37. Boresighting Procedures with Testing Target

With the weapon prepared as in paragraph 36, boresight as follows:

a. Testing Target Location. Locate testing target at least 50 meters in front of the howitzer.

b. Testing Target Alinement. Without moving the tube, aline the center aiming diagram of the testing target with the line of sight through the tube. The testing target must be placed perpendicular to the axis of the bore. The testing target must then be made secure.

c. Panoramic Telescope Alinement.
   (1) Set the gunner’s aid counters to zero.
   (2) Adjust the azimuth and elevation knobs on the panoramic telescope to lay the reticle precisely on the left aiming diagram.
   (3) Check that—
      (a) The muzzle crosshairs are centered on the center aiming diagram.
      (b) The telescope mount is level.
   (4) The azimuth counter of the panoramic telescope should read 3200 mils. If the reading is not 3200 mils, turn the boresight adjustment shaft until 3200 appears in the counter window.

d. Direct Fire Telescope Alinement.
   (1) Rotate the azimuth and elevation knobs on the direct fire telescope to lay the
reticle precisely on the right aiming diagram.

(2) Set the telescope mount slip scales to
elevation 4, azimuth 4.

*Note.* Do not move the elevation or azimuth
knobs when setting slip scales.

Section III. DISTANT AIMING POINT METHOD

38. General

The distant aiming point method consists of alining the line of sight of the tube, the pano-
ramic telescope and the direct fire telescope on
an aiming point at a distance of at least 2,000
meters.

39. Preparations for Boresighting

*a.* Select a well-defined point at a distance of

not less than 2,000 meters.

*b.* Preparations prescribed for the testing tar-
get method (par. 35) apply except that accurate
leveling of the trunnions is not required.

40. Boresighting Procedures with Distant Aiming Point

*a.* Lay the line of sight of the tube on the dis-
tant aiming point.

*b.* Lay the reticle of the panoramic telescope
and the direct fire telescope on the distant aiming
point with the same sight picture observed
through the tube.

*c.* Adjust the telescopes as required (par. 37c
and d).
CHAPTER 6
BASIC PERIODIC TESTS

Section I. GENERAL

41. Purpose

Basic periodic tests are performed—

a. To determine whether the on-carriage sighting equipment, the gunner’s quadrant, and the fuze setter are in correct adjustment.

b. By the section and the artillery mechanic under the supervision of the battery executive.

c. At the discretion of the unit commander. Suggested times are—

(1) Once each year if howitzer is used for nonfiring training.
(2) Every 3 months if the howitzer is fired.
(3) As soon as possible after intensive use, accidents, or travel in extremely rough terrain.
(4) When fire is inaccurate for no apparent reason.

42. Preparations for Basic Periodic Tests

The following conditions must be established prior to conducting the tests:

a. Drive the motor carriage to a site that is as near level as possible.
b. Suspend a plumbline (par. 33d).

c. Level the trunnions by using the plumbline.

d. Boresight the howitzer by using the testing target.

Section II. TESTS OF GUNNER'S QUADRANT

43. General

The gunner's quadrant must be in proper adjustment to conduct the tests and adjustments on other sighting and fire control equipment.

44. End-for-End Test

The end-for-end test is conducted as follows:

a. Inspect the shoes on the gunner's quadrant for dirt, nicks, and burrs.

b. Inspect the quadrant seats on the breech for dirt, nicks, and burrs.

c. Zero the scales on the gunner's quadrant.

d. Place the quadrant on the quadrant seats. Depress and elevate the tube until the bubble in the gunner's quadrant is centered.

e. Reverse the quadrant on the seats and check the bubble. If the bubble recenters, the quadrant is in adjustment, and the test is complete.

f. If the bubble does not center, turn micrometer knob and try to center the bubble.

(1) If the bubble centers, read the black figures on the micrometer scale and divide
by 2. *This is the correction for the gunner's quadrant.*

(2) Place this correction on the micrometer scale, and level the tube.

(3) Reverse the quadrant. The bubble should center.

*g.* If the bubble does not center as in *f* above, move the gunner's quadrant arm down one graduation (10 mils).

(1) Turn the micrometer knob until the bubble centers.

(2) Take the reading on micrometer scale, add 10 to it and divide the sum by 2. Place the result on the micrometer scale.

(3) With the quadrant arm set at minus 10 and the above result on the micrometer scale, place the quadrant on the quadrant seats and level the tube.

(4) Reverse the quadrant. The bubble should center.

(5) Subtract the reading on the micrometer scale from 10 to obtain the error.

*Note.* If an error is determined during the end-for-end test, it will be used only during the sighting tests and adjustments and will not be carried in fire missions. If the error exceeds 0.4 mil the quadrant must be sent to ordnance.

45. Micrometer Test

The micrometer test is performed as follows:
a. Set the radial arm to read 10 mils on the elevation scale, and set the micrometer at zero.

b. Place the quadrant on the leveling plates with the line-of-fire arrow pointing toward the muzzle, and center the quadrant bubble by elevating the tube.

c. Set the radial arm at zero, and set the micrometer at 10 mils.

d. Reverse the quadrant; the bubbles should center.

Note. Do not disturb the lay of the tube.

e. If the bubble does not center, the micrometer is in error and must be adjusted by ordnance personnel.

46. Comparison Test

The comparison test is conducted in the following manner:

a. Compare the readings as follows:

(1) Take readings at low, medium, and high elevations.

(2) Use each gunner’s quadrant in the battery.

(3) Use the leveling plates of a single piece.

b. Compute the average reading at each elevation.

c. Compare each quadrant reading with the average.

d. Any quadrant differing more than 0.4 mil from the average must be adjusted by ordnance personnel.
Section III. TESTS OF ON-CARRIAGE FIRE CONTROL EQUIPMENT

47. Panoramic Telescope Mount

For tests and adjustment of the panoramic telescope mount M145 and linkage, see TM 9–2350–217–10.

48. Elevation Quadrant

For the orientation check of the elevation quadrant M15, see TM 9–2350–217–10.

Section IV. TEST OF FUZE SETTERS

49. General

Examine the fuze setters as follows:

a. Check for burred or dented edges—
   (1) The stop that fits into the slot of the movable time ring.
   (2) The adjusting pawl which engages the notch in the fixed fuze ring.

b. Depress the adjustable pawl against its spring to determine that the movement of the pawl is freed.

c. Test the fuze setter with the fuze for which it was designed; the time scale on the fuze setter must have the same graduation as the time ring on the fuze.

50. Time Scale Test

The time scale test is performed to verify that the time set on the fuze agrees within prescribed
tolerances with the time setting on the fuze setter. This test may be conducted during firing or as a separate test.

Warning: Never use a fuze from a dud.

a. The time set on the fuze should agree with the time setting on the fuze setter within one-fourth of the smallest graduation on the fuze time ring. The tolerances are—

(1) 0.05 second for fuzes having 0.2 second graduation.

(2) 0.125 second for fuzes having 0.5 second graduations.

b. If a fuze setting does not agree with the time set on the fuze setter proceed as follows:

(1) Repeat the test as a check with a different setting.

(2) If the fuzes and the fuze setter still do not agree, refer the instrument to ordnance.

c. Do not set any one live fuze more than twice.

d. When tests are complete, reset all fuzes to SAFE and replace the safety wire or cotter pin.
CHAPTER 7
MAINTENANCE AND INSPECTIONS

51. General

Systematic maintenance and inspection are essential to insure that—

a. The howitzer section is prepared to carry out its mission immediately.

b. Unexpected breakdowns are not experienced at a critical time when maximum performance is essential.

c. Expensive and time-consuming repairs are reduced to a minimum.

52. Disassembly, Assembly, and Adjustment

Authorized adjustments and disassemblies to be performed by battery personnel are prescribed in TM 9–2350–217–10, and appropriate Department of the Army supply manuals. Deviation from these procedures is not authorized, except as permitted by the responsible ordnance officer.

53. Records

The principal records pertaining to the weapon are the Equipment Log Book, DA Form 2404, Equipment Inspection and Maintenance Worksheet, and DA Form 2407, Maintenance Request. For detailed information on the use of these forms, see TM 38–750.
54. Maintenance

Detailed instructions for maintaining the howitzer and the carriage are contained in TM 9–2350–217–10.

55. Inspection

a. The chief of section should inspect his equipment daily and take immediate action to correct any deficiencies found.

b. The executive, accompanied by the artillery mechanic, should make a daily informal command inspection on different parts of the weapon and carriage.

c. The executive should make a thorough mechanical inspection at least once a month of the weapons, auxiliary equipment, tools, and spare parts.

d. Detailed instructions for inspecting the howitzer and the carriage are contained in TM 9–2350–217–10.

56. Operational Services

A daily service is performed by the driver and the crew each day the vehicle is operated. This service is divided into three parts.

a. Before-operation service is a brief service to determine if the vehicle is ready for operation. At this time the chief of section verifies that sufficient ammunition, rations, tools, and equipment are available and secured. A detailed list of duties is contained in table VI (located in back of manual).
b. During-operation service consists of detecting any unsatisfactory performance of the vehicle. A detailed list of duties is contained in table VII (located in back of manual).

c. After-operation service prepares the vehicle to operate again on a moment's notice. This is the basic daily service for the vehicle, and it is particularly important to detect deficiencies that developed during operation. All defects that the driver and crew cannot remedy must be reported at this time. The chief of section will resupply, as required, ammunition and rations and verify that all equipment is present. Procedures for daily preventive-maintenance services are contained in TM 9–2350–217–10. A detailed list of duties is contained in table VIII (located in back of manual).
CHAPTER 8
DECONTAMINATION OF EQUIPMENT

57. General
   a. Equipment that has been contaminated with the following agents constitutes a hazard to personnel and must be removed or neutralized:
      (1) Chemical.
      (2) Biological.
      (3) Radiological.
   b. Decontamination is the process of covering, removing, destroying, or changing the contaminating agent or agents into harmless substances.
   c. Decontamination must be started as soon as possible in order to reduce hazards, and allow safe operation of equipment.

58. Decontamination of Toxic Chemical Agents
   Table IX prescribes the methods for decontaminating for toxic chemical agents.
<table>
<thead>
<tr>
<th>Contaminated Object</th>
<th>Preferred decontamination methods</th>
<th>Alternate decontamination methods</th>
<th>Field expedient methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canvas</strong></td>
<td>Boil in soapy water for 1 hour.</td>
<td>Immerse in boiling water for 1 hour.</td>
<td>Aerate (except for V-agents).</td>
</tr>
<tr>
<td></td>
<td>Use 5 percent solution of household bleach for V-agents.</td>
<td>Launder by standard methods. Use DANC(^1) solution or DS2(^1). Use slurry.(^2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use 5 percent solution washing soda for G-agents.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clothing</strong></td>
<td>Immerse in boiling water for 1 hour, stir, add 1 pound of soap to each 10 gallons of water.</td>
<td>Launder by standard methods. Dry clean. Use DS2 for cotton items only.</td>
<td>Rub M5 ointment on small contaminated areas. Aerate (except for V-agents.)</td>
</tr>
<tr>
<td></td>
<td>Use 5 percent solution of bleach for V-agents.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use 5 percent solution of washing soda for G-agents.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unpainted Metals</strong></td>
<td>Use DS2 or DANC, then rinse or wipe with organic solvent,(^3) and dry.</td>
<td>Wash with cool soapy water(^3) and rinse.</td>
<td>Aerate.</td>
</tr>
<tr>
<td>Contaminated Object</td>
<td>Preferred decontamination methods</td>
<td>Alternate decontamination methods</td>
<td>Field expedient methods</td>
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</tr>
<tr>
<td>Painted Metals.</td>
<td>Spray with DS2 or DANC solution.</td>
<td>Wash with hot soapy water and rinse (Slurry may be used if it is removed within 1 hour and the surface is oiled.)</td>
<td>Aerate.</td>
</tr>
<tr>
<td>Instruments</td>
<td>Clean with alcohol (or gasoline) and apply a thin coat of oil.</td>
<td>Wipe with rag dampened with DANC or DS2, dry with clean rag, and oil.</td>
<td>Weather.</td>
</tr>
</tbody>
</table>

1 These decontaminants are injurious to plastic and hard rubber and should not be used in the bore.
2 Equal weights of water and chloride of lime.
4 Organic solvents (petroleum products) and water do not neutralize contaminants. Precautions must be taken to dispose of these solvents as contaminated materiel.
59. Decontamination of Biological Agents

Decontaminants and decontamination procedures for toxic chemical agents are usually effective against biological agents.

60. Decontamination of Radiological Agents

a. *Radioactive contaminants* cannot be made safe by chemical action. They must be removed or shielded if it is impracticable to wait for natural decay.

b. *Decontamination* is the process of *reducing* the hazard by removing the contaminant or shielding against radiation. Methods are given in table X.
Table X. Decontamination for Radiological Agents.

<table>
<thead>
<tr>
<th>Method</th>
<th>Contaminated object</th>
<th>Technique</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash and scrub</td>
<td>All nonporous surfaces (metal, paint, plastics)</td>
<td>Work from top to bottom and up wind.</td>
<td>Drainage must be controlled—water is contaminated.</td>
</tr>
<tr>
<td>with water.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detergent (soap)</td>
<td>All nonporous surfaces.</td>
<td>Heat water if possible. Rub surface and wipe dry.</td>
<td>Rags and runoff require disposal.</td>
</tr>
<tr>
<td>solution.</td>
<td></td>
<td>(Moist application is all that is desired, do not let drip.)</td>
<td></td>
</tr>
<tr>
<td>Organic solvents.</td>
<td>All nonporous surfaces.</td>
<td>Immerse or wash with solvent, then wash in hot soapy water and rinse with clear water.</td>
<td>Vapors are toxic. Fire precautions are required.</td>
</tr>
<tr>
<td>(Petroleum products.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brushing</td>
<td>Porous and nonporous surfaces.</td>
<td>Brush, sweep, dust from equipment or clothing.</td>
<td>Limited control of contaminated dust. Wear protective mask.</td>
</tr>
</tbody>
</table>

Hot spots may be reduced by sanding, filing, or grinding. These methods are not practicable for large areas—a protective mask and gloves must be worn.
<table>
<thead>
<tr>
<th>Launder _______</th>
<th>Clothing.</th>
<th>Use hot soapy water and rinse with clear water.</th>
<th>Water requires disposal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathing and scrubbing.</td>
<td>Personnel.</td>
<td>Use brushes, running water, and soap.</td>
<td>Continue scrubbing until contamination level is safe.</td>
</tr>
</tbody>
</table>
CHAPTER 9
DESTRUCTION OF EQUIPMENT

61. General

a. Tactical situations may arise in which it is necessary to abandon equipment in a combat zone. In such a situation all equipment must be destroyed to prevent its use by the enemy.

b. Equipment will be destroyed only on the authority delegated by a division or higher commander.

62. Plans

A plan will be prepared by each battery to expedite destruction of equipment. The principles are as follows:

a. The plan must be adequate, uniform, easily executed.

b. Destroy essential parts first.

c. Destruction must be as complete as possible.

d. Destroy the same essential parts throughout the battery.

e. Destroy spare parts and accessories with the same priority as those installed on equipment.

63. Methods

a. The most generally applicable methods of destruction are—
(1) *Mechanical*—Requires ax, pick, sledge or similar equipment.

(2) *Burning*—Requires gasoline, oil, or other flammables.

(3) *Demolition*—Requires ammunition or explosives.

(4) *Gunfire*—Requires artillery, rocket launchers, rifle grenades, or hand grenades.

b. In general, destruction of essential parts, followed by burning is sufficient to render the weapon useless.

64. Reference

Detailed information on destruction of the equipment is contained in TM 9–2350–217–10.
CHAPTER 10
SAFETY PRECAUTIONS

65. General

Safety precautions to be observed in training are prescribed in AR 385–63. Additional information is given in FM 6–40, FM 6–140, TM 9–2350–217–10, and TM 9–1900. The more important safety precautions are summarized in this chapter.

66. Ammunition

The following precautions must be observed when handling ammunition:

a. Store ammunition in the firing area so that it is protected against accidental explosions.

b. Keep fire and flammables out of the area.

c. Protect ammunition from direct rays of the sun.

d. Do not disassemble fuzes.

e. All ammunition prepared for firing and not fired must be checked to insure that—

(1) Powder increments are present and in proper order and in good condition, and of the proper lot number.

(2) Lot number of the ammunition corresponds to the lot number on the container.
(3) Time fuzes are reset to SAFE and the safety wires are replaced.

67. Failure to Fire

If the weapon fails to fire—

a. Keep the weapon trained on the target.

b. Clear unnecessary personnel from the vicinity of the howitzer.

c. Make two additional attempts to fire the weapon.

d. Wait 10 minutes after the last attempt to fire.

e. The executive command UNLOAD.

f. The assistant gunner opens the breech and number 1 removes the cartridge case.

g. If the primer is dented, a faulty primer is indicated, and the cartridge case is replaced.

h. If the primer is not dented, a faulty firing mechanism is indicated.

i. For detailed procedures refer to TM 9–2350–217–10.

68. Drill and Firing

a. Load the weapon only when firing is imminent.

b. Personnel move in rear of the piece when going from side to side.

c. Personnel stay clear of recoil path.

d. Crewmembers should use earplugs or cotton to protect eardrums.

e. A safety officer will be present during all firing in training exercises. Specific duties for the safety officer are listed in FM 6–40.
CHAPTER 11
TRAINING

Section I. GENERAL

69. Purpose

The purpose of this chapter is to present the minimum requirements for training the howitzer section. It includes—

a. Information for conduct of training.
b. Minimum training schedule.
c. Gunner's qualification tests.

70. Conduct of Training

Section training is conducted by the section chief. Battery officers are responsible for preparing the training plans and for supervising their execution. The chief of section—

a. Trains each member of his section to function smoothly and efficiently in all duties in the section.
b. Welds the section into an effective, coordinated team, capable of functioning efficiently in combat.
c. Emphasizes the application of prior instruction to current training.
d. Maintains a progress card on each man to show—
(1) Instruction attended.
(2) Tests taken.
(3) Remarks pertaining to progress.

e. References—AR 611–201, ATP 6–100, FM 21–5, and FM 6–125.

Section II. MINIMUM TRAINING SCHEDULE

71. Training Periods

a. The principles that should be followed in scheduling and preparing training periods are listed below:

(1) Arrange periods in service of the piece drill along with other battery training to provide a balanced training program.

(2) Section drill should not exceed 30 minutes and be conducted in a vigorous manner.

(3) Precede and follow howitzer drill with logically related subject. For example, precede the drill period with tests and adjustments and follow with inspection and maintenance.

b. Army Subject Schedule 6–3 provides uniform guidance for connoneer training.

c. Operational and maintenance characteristics of the weapon are referenced in TM 9–2350–217–10.

d. The training schedule outlined in paragraph 72 is a guide to meet minimum training requirements.
<table>
<thead>
<tr>
<th>Method</th>
<th>Hours</th>
<th>Subject</th>
<th>Text reference</th>
<th>Training aids and equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>C, D, PW</td>
<td>1</td>
<td>Organization and composition of howitzer section, general duties of individuals, and formation of howitzer section.</td>
<td>Pars. 2, 3, 9</td>
<td>Howitzer and motor carriage.</td>
</tr>
<tr>
<td>C, D, PW</td>
<td>1</td>
<td>Posts and posting, changing posts, and mounting and dismounting.</td>
<td>Pars. 9–15.</td>
<td>Do</td>
</tr>
<tr>
<td>C, D, PW</td>
<td>2</td>
<td>Prepare for action, March order.</td>
<td>Par. 18.</td>
<td>Do</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1-hour periods).</td>
<td>Par. 24.</td>
<td></td>
</tr>
<tr>
<td>C, D, PW</td>
<td>24</td>
<td>Howitzer drill, duties in firing by indirect laying.</td>
<td>Par. 19.</td>
<td>TOE equipment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(½-hour periods).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C, D, PW</td>
<td>9</td>
<td>Howitzer drill, duties in firing by direct laying.</td>
<td>Pars. 20–23.</td>
<td>Do</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(½-hour periods).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Duration</td>
<td>Description</td>
<td>Reference</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------</td>
<td>-------------------------------------------------------</td>
<td>------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Tests and adjustments of sighting and fire control equipment.</td>
<td>6</td>
<td>Tests and adjustments of sighting and fire control equipment.</td>
<td>Pars. 31-50.</td>
<td>Do.</td>
</tr>
<tr>
<td>Aiming post displacement correction.</td>
<td>2</td>
<td>Aiming post displacement correction.</td>
<td>Par. 26.</td>
<td>TOE equipment, blackboard, and chalk.</td>
</tr>
<tr>
<td>Inspections and maintenance drills.</td>
<td>4</td>
<td>Inspections and maintenance drills.</td>
<td>Pars. 51-56.</td>
<td>TOE equipment.</td>
</tr>
<tr>
<td>Decontamination of materiel.</td>
<td>1</td>
<td>Decontamination of materiel.</td>
<td>Pars. 57-60.</td>
<td>Decontamination and TOE equipment.</td>
</tr>
<tr>
<td>Destruction of materiel to prevent use by the enemy.</td>
<td>1</td>
<td>Destruction of materiel to prevent use by the enemy.</td>
<td>Pars. 61-64.</td>
<td>Demolition and TOE equipment.</td>
</tr>
<tr>
<td>Safety precautions.</td>
<td>1</td>
<td>Safety precautions.</td>
<td>Pars. 65-68.</td>
<td>TOE equipment.</td>
</tr>
</tbody>
</table>

C—Conference, D—Demonstration, PW—Practical Work
<table>
<thead>
<tr>
<th>Method</th>
<th>Hours</th>
<th>Subject</th>
<th>Text reference</th>
<th>Training aids and equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW________</td>
<td>4</td>
<td>Service practice, firing by direct laying.</td>
<td>Pars. 20–23.</td>
<td>TOE equipment.</td>
</tr>
<tr>
<td>C, PW______</td>
<td>6</td>
<td>Review and tests of subjects previously covered.</td>
<td>All previous references.</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>(1-hour periods)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C—Conference, D—Demonstration, PW—Practical Work
Section III. GUNNER’S QUALIFICATION TESTS

73. Purpose and Scope

This section prescribes the tests to be given in the qualification of gunners. The purpose of the tests is to—

a. Determine the relative proficiency of the artillery soldier while performing the duties of gunner, 105-mm howitzer M108, self-propelled. The tests are not a basis for determining the relative proficiency of batteries or higher units.

b. Serve as an adjunct to training.

74. Standards of Precision

The following standards are required of the candidate:

a. Counter settings must be exact.

b. Leveling bubbles must be centered exactly.

c. Vertical reticle in the panoramic telescope must be aligned on the left edge of the aiming post or on the same part of the aiming point or target each time the howitzer is laid.

d. Final motions must be made in the appropriate direction.

(1) Counter settings are made from lower to higher numbers.

(2) Elevation should be in the direction of the more difficult movement.

(3) Traverse is from left to right.

(4) Vertical reticle of the panoramic telescope is moved from left to right.
75. Assistance

a. The candidate will receive no unauthorized assistance.

b. The candidate may select assistants as authorized in the tests.

c. If an assistant or the examiner causes the candidate to fail a test, the test will be disregarded and another test of the same nature will be administered.

76. Time

a. The time allowed for each test is from the last word of the command to the last word of the candidate’s report.

b. The candidate may begin the test after the first word of the first command.

77. Scoring

a. Scoring will be in accordance with the headings entitled Penalties and Credit.

b. No penalty will be assessed in excess of the maximum credit allowed for each test.

78. Preparation for Tests

a. The howitzer will be prepared for action and the candidate will be posted in the position corresponding to the test or as indicated by the heading entitled Special Instructions.

b. Examiner will insure that the candidate understands the requirements of the test.

c. Candidate reports, “I am ready,” before each test.
79. Qualification Scores

Minimum scores required for qualification in the courses are as follows:

<table>
<thead>
<tr>
<th>Individual Classification</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert gunner</td>
<td>90</td>
</tr>
<tr>
<td>First-class gunner</td>
<td>80</td>
</tr>
<tr>
<td>Second-class gunner</td>
<td>70</td>
</tr>
</tbody>
</table>

80. Outline of Tests

<table>
<thead>
<tr>
<th>Par.</th>
<th>Subject</th>
<th>No. of tests</th>
<th>Points each</th>
<th>Maximum credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Direct laying, panoramic telescope</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>82</td>
<td>Direct laying, direct fire telescope</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>83</td>
<td>Indirect laying, deflection only</td>
<td>18</td>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>84</td>
<td>Laying for quadrant with the elevation counter</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>85</td>
<td>Laying for quadrant with the gunner's quadrant</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>86</td>
<td>Displacement correction</td>
<td>2</td>
<td>(1)</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Part I</td>
<td></td>
<td>3</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Part II</td>
<td></td>
<td>1</td>
<td>(1)</td>
</tr>
<tr>
<td>87</td>
<td>Measuring site to the mask</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>88</td>
<td>Measuring quadrant</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>89</td>
<td>Measuring deflection</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>90</td>
<td>Tests and adjustments of sighting and fire control equipment</td>
<td>5</td>
<td>--</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Tests 1 and 2</td>
<td>(2)</td>
<td>1</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Test 4</td>
<td>(1)</td>
<td>2</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Tests 3 and 5</td>
<td>(2)</td>
<td>3</td>
<td>(6)</td>
</tr>
<tr>
<td>91</td>
<td>Materiel</td>
<td>3</td>
<td>--</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Test 1</td>
<td>(1)</td>
<td>3</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Test 2</td>
<td>(1)</td>
<td>3</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Test 3</td>
<td>(1)</td>
<td>4</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>Total credit</td>
<td>--</td>
<td>--</td>
<td>100</td>
</tr>
</tbody>
</table>
81. Direct Laying Panoramic Telescope

a. **Scope of Tests.**
   (1) Four tests (two groups of two tests each) will be conducted.
   (2) Tests 1 and 2 (and tests 3 and 4) will be executed as one series of commands.

b. **Special Instruction.**
   (1) Place a stationary target approximately 600 meters from the howitzer.
   (2) Set azimuth counter to 3,200 mils, and set the gunner's aid counter to zero.
   (3) Point howitzer so that a 100-mil shift is required for tests 1 and 3.
   (4) Post the candidate as the gunner.
   (5) The laying of the piece will not be disturbed after tests 1 and 3.
   (6) The examiner will reverse the assumed direction of movement for test 3.
### c. Outline of Tests.

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 3</td>
<td>TARGET; THAT TANK, SHELL HE, CHARGE 8, FUZE QUICK, LEAD RIGHT 10, RANGE 800.</td>
<td>Sets lead on the azimuth counter. Traverses tube until vertical reticle is on the center of the target mass. Centers the pitch and cross-level bubbles. Commands FIRE and steps clear.</td>
</tr>
<tr>
<td>2 and 4</td>
<td>RIGHT (LEFT) 10, ADD (DROP) 200.</td>
<td>Sets off change in lead by using click sights. Traverses the tube until the vertical reticle is on the center of the target. Commands FIRE and steps clear.</td>
</tr>
</tbody>
</table>
d. Penalties. No credit will be allowed if, after each test—

(1) The incorrect lead is set on the azimuth counter.

(2) The vertical reticle is not centered on the mass of the target.

(3) The pitch and cross-level bubbles are not centered.

e. Credit.

Time in seconds, exactly or less than: 5 < 6 < 7
Credit: 2.0 < 1.5 < 1.0

82. Direct Laying, Direct Fire Telescope

a. Scope of Tests.

(1) Four tests (two groups of two tests each) will be conducted.

(2) Tests 1 and 2 (and tests 3 and 4) will be executed as one series of commands.

(3) The candidate will be tested as the assistant gunner in the two-man, two-sight system.

b. Special Instructions.

(1) A stationary target will be placed approximately 600 meters from the howitzer.

(2) For tests 1 and 3, the correct range line as viewed through the telescope will be placed more than 100 meters away from the target.

(3) The laying of the piece will not be disturbed after tests 1 and 3.
c. **Outline of Tests.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 3</td>
<td>TARGET; THAT TANK, SHELL HE, CHARGE 8, FUZE QUICK, LEAD LEFT 5, RANGE 600.</td>
<td>Places proper range line on the center of the visible mass of the target. Checks and adjusts for cant as required. Calls &quot;Set&quot; and steps clear. Same as test 1 above.</td>
</tr>
<tr>
<td>2 and 4</td>
<td>ADD (DROP) 200</td>
<td></td>
</tr>
</tbody>
</table>
d. Penalties. No credit will be given if after each test—

1. The correct range line is not on the center of the visible mass of the target.
2. The bubble in the cant-level vial is not centered.

e. Credit.

Time in seconds, exactly or less than: 2 ___ 2½ ___ 3
Credit ____________________________ 2 ___ 1.5 ___ 1.0

83. Indirect Laying, Deflection Only

a. Scope of Tests.

1. Eighteen tests (two groups of nine tests each) will be conducted.
2. Tests 1 through 9 (and tests 10–18) will be executed as one series of commands.

b. Special Instructions.

1. The examiner will identify an aiming point for the candidate.
2. Special corrections will be given only in the tests indicated in c below.
3. The deflection limits for each test are as follows:

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Maximum change (mils)</th>
<th>Minimum change (mils)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 and 11</td>
<td>180</td>
<td>140</td>
</tr>
<tr>
<td>3 and 12</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>7 and 16</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>8 and 17</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>9 and 18</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

4. The howitzer will be laid with the correct deflection at the conclusion of each test.
(5) Aiming posts will be set out at the deflection as determined by unit SOP, and the far aiming post will be 100 meters from the sight.

(6) The examiner will designate the section number and special corrections in deflection to be applied by the candidate.

(7) The candidate will be posted as gunner.
### c. Outline of Tests.

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 10</td>
<td>SPECIAL CORRECTIONS, DEFLECTION 3200, NUMBER 1 LEFT 7.</td>
<td>Sets deflection and applies special correction. Centers cross-level and pitch level bubbles. Traverses the piece until the vertical reticle is on the left edge of the aiming posts. Checks centering of bubbles. Re-lays if necessary. Calls “Ready” and steps clear.</td>
</tr>
<tr>
<td>3 and 12</td>
<td>DEFLECTION 3130.</td>
<td>Same as test 2 above.</td>
</tr>
</tbody>
</table>
AGO 7305C

4 and 13
NUMBER 1 RIGHT 4.

CEASE FIRE, END OF MISSION.
(Operation is not timed.)

5 and 14
AIMING POINT, CHURCH STEEPLE, REFER.

6 and 15
DEFLECTION 3200 REFER.

7 and 16
SPECIAL CORRECTIONS, DEFLECTION 3129 NUMBER 1 LEFT 6.

8 and 17
DEFLECTION 3069.

9 and 18
DEFLECTION 3071.

Same as test 2, except he sets right 4 on the gunner's aid counter.
Sets gunner's aid counter to zero.

Refers telescope to church steeple.
Uncovers azimuth counter.
Reads deflection and calls "Number 1, deflection ( )."
Rotates azimuth knob until reset counter reads 3200.
Verifies that the vertical reticle is on the church steeple.
Calls "Number 1, deflection 3200 and steps clear."
Same as test 1 above.

Same as test 2 above.
Same as test 2 above.
d. **Penalties.** No credit will be given if, after each test—

(1) The deflection is not set correctly.
(2) The cross-level and pitch-level bubbles are not centered.
(3) The vertical reticle of the telescope is not on the aiming point or on the left edge of the aiming post.
(4) Last motion in traverse is not from left to right.

e. **Credit.** Time in seconds, exactly or less than—

<table>
<thead>
<tr>
<th>Tests 1, 10, 6, and 15</th>
<th>12 ___ 13 ___ 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other tests</td>
<td>8 ___ 9 ___ 10</td>
</tr>
<tr>
<td>Credit</td>
<td>2.0 ___ 1.5 ___ 1.0</td>
</tr>
</tbody>
</table>

84. Laying for Quadrant with the Elevation Counter

a. **Scope of Tests.** Three tests will be conducted.

b. **Special Instructions.**

(1) Each test will require a change from 20 to 40 mils.
(2) Commands in tests 2 and 3 will not be in multiples of 5.
(3) Candidate will be posted as assistant gunner.
(4) The setting on the elevation counter will be within 40 mils of the initial elevation.
**c. Outline of Tests.**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>QUADRANT 375-</td>
<td>Sets quadrant on the elevation counter. Centers pitch and cross-level bubbles. Calls “Ready” and steps clear.</td>
</tr>
<tr>
<td></td>
<td>QUADRANT 342-</td>
<td>Same as test 1 above.</td>
</tr>
<tr>
<td>3</td>
<td>SPECIAL CORRECT-</td>
<td>Same as test 1 above, except he sets up 2 on the gunner's aid counter.</td>
</tr>
<tr>
<td></td>
<td>TIONS, NUMBER 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UP 2, QUADRANT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>363.</td>
<td></td>
</tr>
</tbody>
</table>

**d. Penalties.** No credit will be allowed if, after each test—

1. The quadrant is not set accurately.
2. The cross-level and pitch-level bubbles are not centered.
3. The last movement of the tube is not in the direction in which it is more difficult to elevate.

**e. Credit.**

Time in seconds, exactly or less than

<table>
<thead>
<tr>
<th>Score</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>6</td>
<td>1.0</td>
</tr>
</tbody>
</table>

85. Laying for Quadrant with the Gunner’s Quadrant

**a. Scope of Tests.** Three tests will be conducted.

**b. Special Instructions.**

1. Gunner’s quadrant will be set at zero for the first test.
(2) Tests 2 and 3 will require changes from 30 to 60 mils.

(3) Candidate will be posted to the left of, and facing the breech, and will be holding the gunner’s quadrant.

(4) An assistant will elevate or depress the tube as directed by the candidate.

c. Outline of Tests.

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>QUADRANT 210------</td>
<td>Sets quadrant elevation on the gunner’s quadrant. Seats the quadrant. Directs his assistant to elevate or depress the tube until the quadrant bubble is centered. Calls “Ready” and awaits verification of the laying.</td>
</tr>
<tr>
<td>2</td>
<td>QUADRANT 257------</td>
<td>Same as test 1 above.</td>
</tr>
<tr>
<td>3</td>
<td>QUADRANT 193------</td>
<td>Same as test 1 above.</td>
</tr>
</tbody>
</table>

d. Penalties. No credit will be allowed if, after each test—

(1) Quadrant elevation is not set correctly.

(2) Quadrant is not properly seated.

(3) Quadrant bubble is not properly centered.

(4) Last movement of the tube was not in the direction in which it is more difficult to elevate.
e. Credit.

Time in seconds, exactly or less than 6 ___ 6% ___ 7
Credit ___________________________ 2.0 ___ 1.5 ___ 1.0

86. Displacement Correction

a. Scope of Test. One test, consisting of two parts, is conducted.

b. Special Instructions.

(1) Aiming posts will be set out at prescribed distances.

(2) An assistant will be stationed by the far aiming post.

(3) The examiner will require the candidate to lay the piece on an announced deflection and report "I am ready."

(4) The motor carriage will be moved so that a 5- to 10-mil aiming post displacement occurs.

(5) The lay of the howitzer at the end of part I will not be disturbed for part II.

c. Outline of Test.

(1) Part I.

<table>
<thead>
<tr>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORRECT FOR DISPLACEMENT.</td>
<td>Lays howitzer so that the far aiming post appears midway between the near aiming post and the vertical reticle of the telescope. Checks centering of bubbles. Re-lays if necessary. Calls &quot;Ready&quot; and steps clear.</td>
</tr>
</tbody>
</table>
(2) **Part II.**

<table>
<thead>
<tr>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALINE AIMING POSTS</td>
<td>Records deflection on the turret and announces &quot;Deflection ( ), recorded.&quot; Directs assistant in alining aiming posts. Calls &quot;Ready&quot; and steps clear.</td>
</tr>
</tbody>
</table>

**d. Penalties.**

(1) **Part I.** No credit will be allowed if—

(a) The far aiming post does not appear midway between the near aiming post and the vertical hairline of the telescope.

(b) Cross-level and pitch-level bubbles are not centered.

(c) Final motion of traverse was not from left to right.

(2) **Part II.** No credit will be allowed if—

(a) Deflection is other than the announced deflection.

(b) Aiming posts are not properly alined.

(c) Vertical hairline of the telescope is not on the left edge of the aiming posts.

e. **Credit.**

<table>
<thead>
<tr>
<th>Part I, time in seconds, exactly or less than</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3 3½ 3⅛ 3⅞ 4</td>
</tr>
<tr>
<td>Part II, no time limit</td>
<td>Credit</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
</tr>
</tbody>
</table>

*AGO 7805C*
87. Measuring Site to the Mask

a. Scope of Test. One test will be conducted.

b. Special Instructions.

(1) The howitzer, prepared for action, will be placed 200 to 400 meters from a mask of reasonable height.

(2) The tube will be pointed 100 to 150 mils above the crest and 100 to 150 mils to the right or left of the highest point on the crest.

(3) The candidate will be posted at the rear of the breech.

(4) An assistant will traverse and elevate the tube as directed by the candidate.

c. Outline of Test.

<table>
<thead>
<tr>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEASURE SITE TO MASK.</td>
<td>Sights along lowest element of the bore, and directs the movement of the tube until the line of sight just clears the highest point of the crest. Centers the cross-level and pitch-level bubbles. Reads the elevation from the elevation counter. Reports “Number ( ), sight to mask ( ).”</td>
</tr>
</tbody>
</table>

d. Penalties. No credit will be allowed if—

(1) The line of sight along the lowest element of the bore does not just clear the highest point of the crest.
(2) The cross-level and pitch-level bubbles are not properly centered.
(3) Site is not announced correctly.
(4) Last movement of the tube was not in the direction in which it is more difficult to elevate.

e. Credit.

<table>
<thead>
<tr>
<th>Time in seconds,</th>
</tr>
</thead>
<tbody>
<tr>
<td>exactly or less than</td>
</tr>
<tr>
<td>Credit</td>
</tr>
</tbody>
</table>

88. Measuring Quadrant

a. Scope of Test. One test is conducted.

b. Special Instructions. Prior to the test the examiner will lay the tube at a selected quadrant and will set the gunner’s quadrant to zero.

c. Outline of Test.

<table>
<thead>
<tr>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEASURE THE QUADRANT.</td>
<td>Places gunner's quadrant on the quadrant seats on the breech ring. Levels the bubble on the gunner's quadrant by raising the index arm and turning the micrometer knob. Announces “NUMBER ( ) Quadrant ( )” and hands quadrant to examiner.</td>
</tr>
</tbody>
</table>

d. Penalties. No credit will be allowed if—

(1) The quadrant bubble is not centered when the quadrant is properly seated.
(2) The quadrant is not announced correctly.

e. Credit.

Time in seconds,

<table>
<thead>
<tr>
<th>Credit</th>
<th>4.0</th>
<th>3.0</th>
<th>2.0</th>
</tr>
</thead>
</table>

89. Measuring Deflection

a. Scope of Test. One test is conducted.

b. Special Instructions.

(1) The piece will be laid on the aiming posts.

(2) An aiming point within 200 mils left or right of the aiming posts will be designated and will be identified by the candidate.

c. Outline of Test.

<table>
<thead>
<tr>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER 1, AIMING POINT THAT (MARKER) REFER.</td>
<td>Centers the cross-level and pitch-level bubbles. Refers to aiming point. Reads deflection from the azimuth counter and reports &quot;Number 1, Deflection ( ),&quot; and steps clear.</td>
</tr>
</tbody>
</table>

d. Penalties. No credit will be allowed if—

(1) The cross-level and pitch-level bubbles are not centered properly.

(2) Vertical reticle of the telescope is not on the aiming point.
(3) Deflection is not announced correctly.
(4) The weapon is traversed.

e. Credit.

Time in seconds,
extactly or less than________ 5 ___ 5% ___ 6 ___ 6%
Credit ______________________ 4 ___ 3 ___ 2.0 ___ 1.5

90. Tests and Adjustments of Sighting and Fire Control Equipment

a. Scope of Tests. Five tests will be conducted in which the candidate will be required to—

(1) Demonstrate the testing methods and authorized adjustments of sighting and fire control equipment.

(2) Describe the action taken (send to ordnance) if adjustment is not authorized by the user.

b. Special Instructions.

(1) The piece will be prepared for tests as indicated in paragraph 44.

(2) Necessary items of equipment are boresights, testing target, gunner's quadrant, and plummet.

(3) An assistant will elevate or depress the tube at the direction of the candidate during tests 1 and 2, and will aline the testing target for test 5.

(4) Tests will be conducted in numerical order.

(5) The gunner's quadrant used for tests 1 and 2 will be used for tests 3 and 4 with the correction determined in test 1, pro-
vided the correction does not exceed 0.4 mil.

(6) Adjustments on the telescope mount M145 and linkage are as prescribed in TM 9–2350–217–10.

(7) Tube will be leveled after test 2 and will not be disturbed thereafter.

c. Outline of Tests.

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PERFORM END-FOR-END TEST ON THE GUNNER'S QUADRANT.</td>
<td>Performs test as prescribed in paragraph 44. Calls “Correction ( ) mils, quadrant serviceable, (unserviceable)” and hands the quadrant to the examiner.</td>
</tr>
<tr>
<td>2</td>
<td>PERFORM MICROMETER TEST ON THE GUNNER'S QUADRANT. Note. Level the tube at conclusion of test 2.</td>
<td>Performs test as prescribed in paragraph 45. Calls “Quadrant micrometer is (is not) in error.”</td>
</tr>
<tr>
<td>3</td>
<td>TEST PANORAMIC TELESCOPE MOUNT AND LINKAGE.</td>
<td>Performs tests and makes adjustments as prescribed in TM 9–2350–217–10. Calls “Ready” when tests and adjustments are complete.</td>
</tr>
</tbody>
</table>
d. Penalties. The tests are not essentially speed tests. The prescribed times are to insure that the candidate performs the tests without wasted effort.

(1) *Test 1.* No credit will be allowed if—

(a) The bubble in the gunner’s quadrant does not center when checked by the examiner.

(b) The error (one-half of the angle that was indicated when the quadrant was first reversed and the bubble was centered, using the index arm and the micrometer knob) is not announced correctly by the candidate.

(c) The candidate fails to declare the quadrant unserviceable if the error exceeds 0.4 mil or fails to declare the quadrant serviceable if the error is 0.4 mil or less.

(d) The time to complete the test exceeds 2 minutes.

(2) *Test 2.* No credit will be allowed if—

(a) The procedure is not followed correctly.
(b) The time to complete the test exceeds 1 minute.

(3) Test 3. No credit will be allowed if—

(a) The procedure is not followed correctly.

(b) The checks and adjustments are not accomplished at quadrants 416,858 and 1,300 mils in sequence.

(c) The candidate does not declare the telescope mount unserviceable if the readings disagree more than 0.5 mil.

(d) The candidate does not adjust linkage within prescribed limits.

(e) No time is prescribed for this test.

(4) Test 4. No credit will be allowed if—

(a) The procedure is not followed correctly.

(b) Candidate fails to notify the examiner if the reading on the gunner's quadrant disagrees more than 0.5 mil with the elevation quadrant.

(c) No time is prescribed for this test.

(5) Test 5. No credit will be allowed if—

(a) The candidate fails to make indicated adjustments.

(b) The candidate does not adjust azimuth counter to read exactly 3,200.

(c) Direct fire telescope mount slip scales are not set at elevation 4, azimuth 4.

(d) The time to complete tests and adjustments exceeds 4½ minutes.
e. Credit. If tests and adjustments are within prescribed limits, maximum credit will be given as follows:

<table>
<thead>
<tr>
<th>Test</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

Maximum Credit 10

91. Materiel

a. Scope of Tests. Three tests are performed.

b. Special Instructions.

(1) Tests 1 and 2. A paulin will be placed on the compartment floor for layout of disassembled parts. The candidate will be allowed to select the tools prior to the test. The candidate may have an assistant to aid him in moving the breech-block.

(2) Test 3. A complete set of lubrication equipment, and lubricants authorized for use by battery personnel will be made available. Lubricants will be clearly marked.

c. Outline of Tests.

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Examiner commands</th>
<th>Action of candidate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DISASSEMBLE BREECH MECHANISM AND FIRING LOCK.</td>
<td>Performs operation as prescribed in TM 9–2330–217–10. Identifies all parts to the examiner.</td>
</tr>
<tr>
<td>Test No.</td>
<td>Examiner commands</td>
<td>Action of candidate</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>2</td>
<td>ASSEMBLE BREECH MECHANISM AND FIRING LOCK.</td>
<td>Performs operation as prescribed in TM 9-2350-217-10</td>
</tr>
<tr>
<td>3</td>
<td>PERFORM DAILY AND QUARTERLY LUBRICATION.</td>
<td>Selects proper lubricants and equipment. Shows how, when, and with which lubricant is used at each point. (Actual lubrication is not performed.) Checks all lubricant levels.</td>
</tr>
</tbody>
</table>

d. **Penalties.**

(1) The tests are not speed tests; however, times are prescribed to insure that the candidate performs the tests without wasted effort.

(2) No credit will be given if the following time limits are exceeded:

<table>
<thead>
<tr>
<th>Test</th>
<th>Time (mins.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

(3) One-half point will be assessed for each component incorrectly identified in test 1. There are no prescribed times for identifying the components. However, the examiner may reduce the grade if the candidate demonstrates obvious unfamiliarity with the components.
(4) One-half point will be assessed for each lubrication point missed, each lubricant improperly selected, and each lubricating device improperly selected.

e. Credit.

<table>
<thead>
<tr>
<th>Test</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Maximum Credit 10
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<th>Code</th>
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</tr>
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</tr>
<tr>
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<tr>
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<td>Regulations for Firing Ammunition for Training Target Practice, and Combat.</td>
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<td>Organization Policies and Responsibilities for Maintenance Operation.</td>
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*AGO 7305C*
FM 6-40  Field Artillery Cannon Gunnery.
FM 6-125  Qualification Tests for Specialists Field Artillery.
FM 6-140  The Field Artillery Battery.
FM 17-50  Armor Logistics.
FM 21-5   Military Training.
FM 21-30  Military Symbols.
FM 21-40  Small Unit Procedures in Nuclear, Biological, and Chemical Warfare.
FM 21-60  Visual Signals.
FM 22-5   Drills and Ceremonies.
ATP 6-100 Army Training Program for Field Artillery Units.
ATT 6-117 Training Test for Field Artillery Howitzer Battery, Light or Medium Towed and Self-Propelled.
TM 3-220  Chemical, Biological, and Radiological Decontamination.
TM 9-238  Deep Water Fording of Ordnance Materiel.
TM 9-500  Ordnance Corps Equipment Data Sheets.
TM 9-575  Auxiliary Sighting and Fire Control Equipment.
TM 9-1527 Ordnance Maintenance: Gunner's Quadrants M1
and M1918 and Machine Gun Clinometer M917.

**TM 9–1590**  

**TM 9–1900**  
Ammunition, General.

**TM 9–2350–217–10**  

**TM 9–2350–217–20**  
Organizational Maintenance, Howitzer, Light, Self-Propelled 105-mm, T195E1, and Howitzer, Medium, Self-Propelled: 155-mm, T196E1.

**TM 11–206**  
Interphone Controls C-980/U and C-981/U and Intercommunication Set Control C-980 A/U.

**TM 11–2643**  
Intercommunication Sets AN/UIC–1 and AN/UIC–IX.

**TM 21–301**  
Driver Selection, Training and Supervision; Tracked Vehicles.

**TM 21–306**  
Manual for the Tracked Vehicle Driver.

**TM 38–750**  
The Army Equipment Records System and Procedures.
LO 9-2350-217-10 Part IV. Lubrication Instructions.
SM 9-5-1315 Ammunition, 75-mm Through 125-mm.
SM 9-5-1390 Ammunition and Explosives, Fuzes and Primers.
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<td></td>
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<td>56</td>
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</tr>
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<td>_</td>
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<td>11, 12</td>
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</tr>
<tr>
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<td>11</td>
<td>10</td>
</tr>
<tr>
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<td>_</td>
<td>100</td>
</tr>
<tr>
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<td>_</td>
<td>100</td>
</tr>
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</tr>
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By Order of the Secretary of the Army:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:

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NG: State AG (3).

USAR: Same as Active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320-50.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1962—650586

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### Table VII. Duties in During Operations Service

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner (left side)</th>
<th>Assistant gunner (right side)</th>
<th>Number 1 (left side)</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supervises the section during the service.</td>
<td>Check presence, security, and condition of sighting equipment. Check security of ammunition and all equipment inside the vehicles.</td>
<td>Check track tension and condition of track shoes, pads, and guides. Check for leaks and condition of the hydraulic track adjuster. Check for loose or damaged drive sprockets. Check for loose or damaged road wheels. Check for loose track pin bolts. Check for loose or damaged idler wheels. Check hubs for excessive heat. Check for broken welds and missing parts.</td>
<td></td>
<td>Checks radiator water level. Checks engine oil level and adds oil if necessary. Refuels vehicle if required. Checks transmission oil level and adds oil if required. Check batteries and cables.</td>
</tr>
<tr>
<td>2</td>
<td>Check condition and completeness of all exterior mounted equipment. Check for broken welds and missing parts.</td>
<td></td>
<td></td>
<td></td>
<td>Checks foot controls. Checks instruments and warning lights for normal indication. Checks vehicle steering action. Checks hand controls. Checks periscopes.</td>
</tr>
<tr>
<td>3</td>
<td>Reports “Ready.”</td>
<td>Reports “Ready.”</td>
<td>Reports “Ready.”</td>
<td>Reports “Ready.”</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Reports “Sir, number ( ) in order” or any defects the section cannot remedy without delay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table II. (Supposed) Duties in Firing, Indirect Laying

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Command the section during firing and issues an efficient and safe operation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Follows few commands and repeats commands to the section as required to ensure efficiency and safety.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Indicates that the howitzer is ready to fire, after the assistant gunner calls &quot;Set,&quot; and the gunner calls &quot;Ready&quot; by extending his right hand vertically and reporting &quot;Number 1, Ready.&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Gives the command to fire by dropping his arm sharply to his side and commanding FIRE.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Observes and checks functioning of materiel during firing: Reports promptly to the executive any mistakes, unusual incidents, equipment malfunctions, and any reason the howitzer may not be fired.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>(These duties performed as required.)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lays the quadrant according to the gunner's quadrant:
1. The command is USE GUNNER'S QUADRANT.
2. The announced quadrant is set on the gunner's quadrant.
3. The announced quadrant is set on the gunner's quadrant.
4. The assistant gunner to elevate the tube until the bubble is centered. Canons: The assistant gunner when the bubble is approaching center so that the final centering may be expedited.
5. The command is MEASURE THE QUADRANT.
6. The assistant gunner to center the cross-level bubble and turn the elevation knob until the bubble in the elevation level vial is centered.

Number 1
1. Sets and lays for deflection:
   a. The command is DEFLECTION.
   b. Sets the announced deflection on the cross-level bubble and turn the elevation knob until the bubble in the elevation level vial is centered.
2. Traverse piece until vertical line of fire is set on left edge of aiming post.
   Note. Final position of traverse is from left to right.
3. Centre pitch and cross-level bubble.

Number 2
1. The command is QUADRANT.
   a. Inserts level in the breech.
2. Cross—level bubble with cross-level bubble.
3. Calls "Set." Note. Chief of howitzer will call the command.
   a. Receives the prepared round from Number 3.
2. Loads at the command QUADRANT:
   a. Sets the announced quadrant at the elevation counter with the elevation knob.
   b. Grabs the base of the cartridge case with the right hand.
3. Elevates tube until elevation level vial bubble is centered.
   Note. Final position of traverse is from left to right.
4. Grabs the menu in front part of the aiming post.
5. Puts hands on the right arm.

Figure 11. Correction for aiming post displacement.

Table II.
<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
<th>Number 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commands PREPARE FOR ACTION.</td>
<td>Supervises work of cannoneers during all activities.</td>
<td>Denotes cab rear ring seal and releases sub traverse lock.</td>
<td>Opens left turret door.</td>
<td>Opens right turret door.</td>
<td>Opens rear hull doors.</td>
<td>Assist Number 3 in spreading poutin.</td>
<td>Secure poutin from left rear turret and spread to the left rear of the howitzer.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Checks functioning of traversing and elevation mechanisms.</td>
<td>Deflects gun shroud seal.</td>
<td>Prefers fire sector and other tasks as required and places thim on the poutin to the left rear of the howitzer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Checks recoil system for proper amount of oil, that no leaks exist; service as required.</td>
<td>Depress telescopes covers behind, and informs driver to lift the barrel.</td>
<td>Installs panoramic telescopes, uncoverts azimuth 0.000 and cross-level. Sets azimuth counter to 2,000 mile.</td>
<td>Serves the gunner's old counter.</td>
<td>Levels telescopes mounts.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>Deflects gun shroud seal.</td>
<td>Checks functioning of elevation mechanism.</td>
<td>Prefers fire sector and other tasks as required and places thim on the poutin to the left rear of the howitzer.</td>
<td>Opens left turret door.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Opens right turret door.</td>
<td></td>
<td></td>
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<td>6</td>
<td></td>
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</tr>
</tbody>
</table>

**Table 1. (Superseded) Duties in Prepare for Action**

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
<th>Number 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commands PREPARE FOR ACTION.</td>
<td>Supervises work of cannoneers during all activities.</td>
<td>Denotes cab rear ring seal and releases sub traverse lock.</td>
<td>Opens left turret door.</td>
<td>Opens right turret door.</td>
<td>Opens rear hull doors.</td>
<td>Assist Number 3 in spreading poutin.</td>
<td>Secure poutin from left rear turret and spread to the left rear of the howitzer.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Checks functioning of traversing and elevation mechanisms.</td>
<td>Deflects gun shroud seal.</td>
<td>Prefers fire sector and other tasks as required and places thim on the poutin to the left rear of the howitzer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Checks recoil system for proper amount of oil, that no leaks exist; service as required.</td>
<td>Depress telescopes covers behind, and informs driver to lift the barrel.</td>
<td>Installs panoramic telescopes, uncoverts azimuth 0.000 and cross-level. Sets azimuth counter to 2,000 mile.</td>
<td>Serves the gunner's old counter.</td>
<td>Levels telescopes mounts.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>Deflects gun shroud seal.</td>
<td>Checks functioning of elevation mechanism.</td>
<td>Prefers fire sector and other tasks as required and places thim on the poutin to the left rear of the howitzer.</td>
<td>Opens left turret door.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Opens right turret door.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6</td>
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</tbody>
</table>

**Table 1**
<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commands PREPARE FOR ACTION. Supervise work of ammunition during all activities.</td>
<td>Opens left turret door.</td>
<td>Opens right turret door.</td>
</tr>
<tr>
<td>2</td>
<td>Deflates cab rear ring seal and releases cab transmitted. Assists driver to disengage locking shell. Checks functioning of traversing and elevating mechanism.</td>
<td>Deflates gun shield seal.</td>
<td>Checks functioning of elevation mechanisms.</td>
</tr>
<tr>
<td>3</td>
<td>Checks small system for proper amount of oil; oil leaks exist, services as required.</td>
<td>DEFLECTION, 3200.</td>
<td>Note.</td>
</tr>
<tr>
<td>4</td>
<td>Verifies the adjustments of the sights and fire control equipment.</td>
<td>Note as follows:</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>*Measure sine to the mass assisted by the assistant: 1. Elevates along lowest element of bore. 2. Elevates along boring to elevates of degrees to the floor until the lowest element of the bore is above the highest crest in the field of fire. 3. Directs the assistant gunner to center midline of bore, (a) sine of depression, (b) sine of elevation. 4. Reads, elevations of elevation counter and reports to the executive: &quot;Sir, number ( ) sine ( )&quot; (Since the normal sine may be used). 5. Records and announces minimum elevation for each change to the gunner and assistant gunner.</td>
<td>Note.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Indicates alternate sighting the optics and when one is designated by the executive. If an alternate is not designated, the chief of section should select a definite fixed point at a distance of at least 2,000 meters. This sighting point is to be used as directed by the executive or at each time when the sighting point are unobstructed and when the howitzers from the aircraft carrier are recorded and reported to the executive and is used to maintain parallels, until the sighting points are reemployed.</td>
<td>Sine howitzer for direction: 1. When the command is given identifying the aiming point, identify the aiming point through telescope, and announce &quot;Number ( ) is in lead.&quot; 2. Elevate the elevation counter to zero. 3. Push down on elevation handle catch. 4. Traverse the tube until elevation handle locks in the open position. 5. Remove operating handle to latched position. 6. Reports to executive: &quot;Sir, number ( ) ready for further.&quot;</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Verifies that the khyber is prepared for action. This needs not be done.</td>
<td>Note. All ammunition take after they have performed that which needs done.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1. Duties in Prepare for Action**

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Opens rear hull doors.</td>
<td>Assists gunner staff and load as directed by the chief of section.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Programs has sector and other tasks as required and reports to the left rear of the howitzers.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lays communication cable from the Howitzer to the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Assisted by Number 1, then, and serves as the commander and howitzer.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Assembles aiming posts and places near left rear of sector bearings. Assists number staff and load as directed by the chief of section.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Removes aiming posts and recuper and secures them.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Assisted by Number 2 in unpacking and arranging ammunition. It may be necessary to secure the ammunition as it is unloaded.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Duties in Prepare for Action**

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Number 4</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Opens rear hull doors.</td>
<td>Assists gunner staff and load as directed by the chief of section.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Programs has sector and other tasks as required and reports to the left rear of the howitzers.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lays communication cable from the Howitzer to the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Assisted by Number 1, then, and serves as the commander and howitzer.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Assembles aiming posts and places near left rear of sector bearings. Assists number staff and load as directed by the chief of section.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Removes aiming posts and recuper and secures them.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Assisted by Number 2 in unpacking and arranging ammunition. It may be necessary to secure the ammunition as it is unloaded.</td>
<td>Assisted by the executive and are responsible for the howitzers.</td>
<td>Supervises work of armament and supports as required.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Table II. Duties in Firing, Indirect Laying

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commands the section during firing and ensures an efficient and safe operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Follows fire commands and repeats commands to the section as required for more efficiency and safety.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Note
- Fire must be in straight line of tele-scope is on left edge of aiming point.
- Center punch- and cross-level bubble.
- Loads the howitzer:
  - Receives the prepared round from Number 2.
  - Drops the prepared round from the gunner and the assistant gunner.

### Notes
- Fire on exposed heading of opposing must be unheard.
- It is imperative that:
  - There is no error by any nature.
  - Only flashlights be used in vicinity of charges.
  - Projection and cartridge cases must strike, otherwise they may be set off.
  - Ammunition must not burst, wet or over loaded.

### Note
- The quadrant can also be measured by placing the gunner's quadrant on the breech of the howitzer.

---

### 3

**Indicates that the howitzer is ready to fire, after the assistant gunner calls "Out" and the assistant gunner calls "Ready," by extending the right arm vertically and reporting "Number ( ), Ready."**

**At the command of the chief of section fires the howitzer by pressing the firing button on the firing handle.**

**Corrects for aiming post displacement when the vertical reticle is in the panoramic telescope is displaced from the line formed by the aiming posts. He lays the howitzer so that the far aiming post appears exactly midway between the near aiming post and the vertical reticle.**

**Prepare any ammunition:**
- Remove ammunition from containers:
  - Remove the tape from the cartridge and the label of the charge.
- Takes the cartridge end of the charge and tilts it so that the cartridge may be taken by Number 2.
- Reverses container, removes the tape, and tilts it so that Number 2 can receive the propellant.
- Places propellant into cartridge case.
- Uses gunner's quadrant.
- Inspects and cleans propellant:
  - Examines sub for defects.
  - Removes propellant end and cleans it thoroughly.
  - Any sand, dirt, oil, or grime on the propellant will cause exhaust and damage to the propellant.
- Holds propellant upright for fixing and fixing setting.
  - Rejects poor propellant.
  - Holds the propellant firmly while Number 2 feeds and sets the fuze.

When directed reads and announces the time set on the fuze.

---

### 4

**Gives the command to fire by dropping his arm sharply to his side and commanding FIRE.**

**Reports promptly to the executive any mistakes, unusual incidents, equipment malfunctions, and any reason the howitzer may not be fired.**

**Table:**

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Observes and checks functioning of material during firing:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6

**Lays for quadrant with gunner's quadrant:**
- The command is **USE GUNNER'S QUADRANT.**
- The announced quadrant is set on the gunner's quadrant.
- Places and holds gunner's quadrant firmly on the seats.
- Provides quadrant on the elevation level vial.

### Note
- Note. That the horizontal bubble should be centered.
- Note. That the words line-of-fire displacement is caused by traversing, lay as described above. If displacement is caused by
  - Traverse piece until the horizontal bubble is centered.
  - Traverse azimuth knob.
  - Traverse quadrant on the elevation level.

### Note
- **FAR POST**
- **NEAR POST**

### Figure
- **Figure 11. Correction for aiming post displacement.**
- **Table:**

### Note
- If displacement is caused by traversing, lay as described above. If displacement is caused by:
  - Traverse piece until the horizontal bubble is centered.
  - Traverse azimuth knob.
- **FAR POST**
- **NEAR POST**

---

### 5

**Lays for quadrant with quadrant:**
- The command is **CONFIRM THE QUADRANT.**
- The announced quadrant is set on the quadrant's quadrant.
- Insures that the words line-of-fire displacement is caused by traversing, lay as described above. If displacement is caused by
  - Traverse piece until the horizontal bubble is centered.

### Note
- Note. The quadrant can also be measured by placing the gunner's quadrant on the breech of the howitzer.

---

### 6 (These duties performed as required)

**Lays for quadrant with quadrant:**
- The command is **CONFIRM THE QUADRANT.**
- The announced quadrant is set on the quadrant's quadrant.
- Insures that the words line-of-fire displacement is caused by traversing, lay as described above. If displacement is caused by
  - Traverse piece until the horizontal bubble is centered.

### Note
- Note. The quadrant can also be measured by placing the gunner's quadrant on the breech of the howitzer.
Table III. Duties in Direct Laying

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
<th>Numbers 1 through 3</th>
<th>Motor carriage driver</th>
</tr>
</thead>
</table>
| 1        | Conducts fire of howitzer:  
1. Takes control of his section and fires the howitzer when the executive commands TARGET, TANK, RIGHT (LEFT) FRONT, FIRE AT WILL or simply FIRE AT WILL.  
2. Alerts section to prepare for direct fire. | Prepares panoramic telescope for direct laying:  
1. Uncover window on azimuth counter.  
2. Sets azimuth counter to 200.  
3. Verifies gunner's aid counter is zero.  
4. Actuates click sight mechanism.  
5. Centers pitch- and cross-level bubbles. | Prepares direct fire telescope:  
1. Checks reticle for optimum illumination.  
2. Check level vial mirror for convenient viewing. | Performs the same duties as in indirect laying. | Performs same duties as in indirect laying. |
| 2        | Identifies or selects target:  
1. Identifies target designated by executive.  
2. If target is a group of vehicles, selects the target that is the greatest threat to his position or the supported position based on this priority.  
3. Tanks at short range threatening to overrun the position.  
4. Hull down stationary tanks covering the advance of other tanks.  
5. Area containing personnel threatening to overrun the position.  
6. Repeats target designation to the section "Lead tank," "Moving tank." | Takes post to the flank and slightly to the rear of the piece where his observation will not be obscured by muzzle blast and smoke. | Estimates range to target:  
1. A range card (fig. 8) with accurate measurements to key points provides the most accurate ranges.  
2. Estimated ranges are used if accurate measurements are not available. | Determines lead in miles:  
Lead is based on target speed, range, direction of travel, and ammunition used. Approximate initial leads are as follows: | Sets initial lead on the azimuth counter. | Elevates or depresses the piece until the target is on the appropriate range line in the reticle. |
| 3        | Given initial commands:  
Sequence Element  
1. Target designation TARGET (TANK, etc.)  
2. Projectile, charge and fuse SHELL HEP-T (no charge or fuse required) SHELL HE, CHARGE 8, FUZE QUICK or SHELL HE, CHARGE 8, FUZE DELAY.  
3. Lead LEAD, RIGHT (LEFT) 10.  
4. Method of fire Fire is continuous unless otherwise commanded.  
5. Range RANGE 600. | Sets initial lead on the azimuth counter.  
1. Uncovers window on azimuth counter.  
2. Sets azimuth counter to 200.  
3. Verifies gunner’s aid counter is zero.  
4. Actuates click sight mechanism.  
5. Centers pitch- and cross-level bubbles. | Elevates or depresses the piece until the target is on the appropriate range line in the reticle. | Checks the level-vial mirror and adjusts for cant, as required, to center the bubble. | Maintains target on appropriate range line by continuous tracking. |
| 4        | Given subsequent commands based on observed effect:  
1. Change in lead (given RIGHT (LEFT) 5 in 5-mil increments)  
2. Change in range ADD (DROP) 100 | Actions taken for subsequent commands. While the gunner of section gives commands based on observed effects. | When the chief of section commands—  
RIGHT (LEFT) ( ).  
1. Turns azimuth knob in 5-mil increments to set the lead change as directed.  
2. Traverses howitzer until the vertical reticle is centered on the mass of the target.  
3. Checks the pitch- and cross-level bubbles are centered.  
4. Commands FIRE, after the assistant gunner has called "Set." | When the chief of section commands—  
ADD (DROP) ( ).  
1. Elevates or depresses the piece until the appropriate range line is centered on the mass of the target.  
2. Checks the level-vial mirror and adjusts for cant as required.  
3. Calls "Set." | Note: During the laying sequence, checks the direction of the lead as set by the gunner. |
| 5        | Commands END OF MISSION when target is destroyed or neutralized:  
New targets will be selected and taken under fire as outlined above.  
*Ammunition and fuse selection.  
Ammunition and fuse combinations are as follows:  
1. Shell HEP-T is designed for, and is highly effective against tanks and armored vehicles.  
2. Shell HE M1, Charge 7, and Shell HE M452, Charge 6, is ideally suited for antipersonnel fire and is also effective against tanks and vehicles.  
3. Shell, white phosphorous, may be used to set stalled targets.  
4. Fuzes delay may be used for ricochet effect. The point of impact is adjusted 10 to 30 meters in front of the target. If less than 50 percent of the bursts ricochet, change to fuse quick.  
5. Fuse time is the least desirable and should be used at ranges of 1,000 meters or greater. Areas effectively covered by air and ricochet bursts are similar. | Sets initial lead on the azimuth counter.  
1. Uncovers window on azimuth counter.  
2. Sets azimuth counter to 200.  
3. Verifies gunner’s aid counter is zero.  
4. Actuates click sight mechanism.  
5. Centers pitch- and cross-level bubbles. | Elevates or depresses the piece until the target is on the appropriate range line in the reticle. | Checks the level-vial mirror and adjusts for cant, as required, to center the bubble. | Maintains target on appropriate range line by continuous tracking. |

ONE-MAN, ONE-SIGHT SYSTEM

1. Fire commands are the same as above except range will be given in the form of a quadrant, QUADRANT ( ).  
2. Elevations are listed in table V for gun-target ranges of approximately the same altitudes. If altitude differences are apparent, it will be necessary to compute the angle value by the mil relation formula and apply it to the elevation.  
3. Subsequent commands for range changes are converted to quadrant and expressed as ADD (DROP) ( ).  
4. Lead for both deflection and range:  
1. Deflection is laid the same as the two-man, two-sight system.  
2. Range is announced as "Quadrant ( )" and is set on the elevation quadrant.  
3. Elevates howitzer until the bubble in the pitch-level vial is centered.  
5. Tracks the target and places the vertical reticle on the center of the mass of the target.  
6. Commands FIRE.
<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commands MARCH ORDER. Inspects the chamber to verify that the piece is not loaded. Supervises work of cannoneers during all activities.</td>
<td>Sets azimuth counter to 3,200 mils, and closes window. Sets gunner's aid counter to zero. Covers bubbles on the telescope mount. Removes panoramic telescope from its mount and stows in its case.</td>
<td>Sets elevation counter to zero and sets correction counter to zero. Covers bubbles on the elevation quadrant. Inspects the chamber to see that it is clear.</td>
<td>Recovers and disassembles the aiming posts and hands to the driver. Disassembles and secures the rammer staff and hands to the driver.</td>
<td>Repacks fuses and ammunition as directed by the chief of section.</td>
<td>Secures communication equipment.</td>
<td>Starts engine and checks gauges.</td>
</tr>
<tr>
<td>2</td>
<td>Traversons the tube to the center of traverse and assists the driver to engage the howitzer traveling lock.</td>
<td>Closes the breech by tripping the extractors with the base of an expended cartridge case or other appropriate tool. <strong>Warning:</strong> Never trip the extractors by hand. The hand may be crushed by the closing breechblock.</td>
<td>Repacks fuses, ammunition, and equipment as directed by the chief of section. Under direct supervision of the chief of section, replaces powder increments in cartridge cases. Insure that all increments are present, in proper order, of proper lot number and in good condition.</td>
<td></td>
<td></td>
<td>Lifts the howitzer traveling lock, and assisted by the gunner, secures the tube in the traveling position. Closes direct fire telescope window.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Locks cab traverse lock. Inflates cab race ring seal. (Prevents entrance of dust and water)</td>
<td>Inflates gun shield seal.</td>
<td></td>
<td></td>
<td></td>
<td>Takes post in drivers compartment.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Verifies all section equipment is present and secure. Closes left turret door.</td>
<td>Closes right turret door.</td>
<td>Closes real hull doors after chief of section has taken his post.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Reports to executive “Number ( ) in order,” or reports any defect the section cannot remedy without delay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence</td>
<td>Chief of section</td>
<td>Gunner</td>
<td>Assistant gunner</td>
<td>Number 1</td>
<td>Number 2</td>
<td>Number 3</td>
<td>Driver</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------</td>
<td>--------</td>
<td>------------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Attaches bilge pump hose to hull outlet.</td>
<td>Removes window cover from barrier.</td>
<td>Verifies that bag supports are engaged.</td>
<td></td>
<td>Opens and secures dipstick cover with spring retainer. Closes hull drain plugs. Closes personnel air duct.</td>
</tr>
<tr>
<td>3</td>
<td>Verifies that the howitzer is prepared for amphibious operation. Insures that all personnel are wearing life preservers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Places inflation-deflation lever to the inflate position, turns on blower switch and inflates the flotation bags. Shifts transmission lever to &quot;2&quot; range and starts bilge pump.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Commands the driver to enter the water.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>At the command of the chief of section, enters the water slowly at right angles to the bank.</td>
<td></td>
</tr>
</tbody>
</table>

---

**Preparing the Vehicle for Amphibious Operation**

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
<th>Number 1</th>
<th>Number 2</th>
<th>Number 3</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supervises the section during the operation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Removes front bag and replaces air inlet cover.</td>
<td>Assists gunner to remove front bag.</td>
<td>Removes bilge pump hose from hull outlet.</td>
<td>Replaces window cover on the barrier. Secures side bag latches on the right side of the howitzer.</td>
<td>Secures side bag latches on the left side of the howitzer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Inspects the vehicle to insure that the flotation device is secure.</td>
<td>Depresses the tube.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Reports &quot;Sir, Number ( ) in order,&quot; or any defects the section cannot remedy without delay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table VI. Duties in Before Operation Service

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Chief of section</th>
<th>Gunner</th>
<th>Assistant gunner</th>
<th>Number 1 (left side)</th>
<th>Number 2 (right side)</th>
<th>Number 1 (left side)</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supervises the section during the service.</td>
<td>Checks panoramic telescope and mount for damage, operation, and cleanliness.</td>
<td>Checks direct fire telescope and mount for damage, operation, and cleanliness. Checks elevation quadrant for damage, operation, and cleanliness.</td>
<td>Check track tension and condition of track shoes, pads, and guide. Check for leaks and condition of the hydraulic track adjuster. Check for loose or damaged drive sprockets. Check for loose or damaged road wheels. Check for loose track pin bolts. Check for loose or damaged idler wheel. Check for broken welds.</td>
<td></td>
<td>Checks hydraulic shocks for leaks and support arms for water contamination. Check oil level in road wheel hubs. Bubbles and yellow discoloration of the oil in the sight plugs indicate water contamination.</td>
<td>Checks radiator water level and adds water if required. Checks engine oil level and adds oil if required. Refuels vehicle as required. Checks transmission oil level and adds oil if required. Checks batteries and cables for corrosion.</td>
</tr>
<tr>
<td>3</td>
<td>Inspects ammunition for proper lot number, condition, and stowage.</td>
<td>Checks operation of the breechblock and cleans with a dry cloth. Checks operation of the percussion mechanism and cleans as required.</td>
<td></td>
<td>Clean bore and chamber with clean dry cloth. Loads ammunition and equipment as directed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Reports “Sir No. ( ) in order,” or any defects the section cannot remedy without delay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>