*FM 23-90/TO 11W2-5-13-21

FIELD MANUAL NO. 23-90 TECHNICAL ORDER NO. 11W2-5-13-21 HEADQUARTERS
DEPARTMENT OF THE ARMY
AND THE AIR FORCE
WASHINGTON, DC, 1 March 2000

FM 23-90 MCRP 3-15.2A

MORTARS

Table of Contents

PREFACE

CHAPTER 1 INTRODUCTION

Section I General Doctrine

1-1. Effective Mortar Fire

1-2. Mortar Positions

Section II Indirect Fire Team

1-3. Applications

1-4. Team Mission

Section III Safety Procedures

1-5. Duties of the Safety Officer and Supervisory Personnel

1-6. Ammunition Care and Handling

1-7. Field Storage of Ammunition

CHAPTER 2 SIGHTING AND FIRE CONTROL EQUIPMENT

Section I Compass, M2

2-1. Characteristics

2-2. Description

2-3. Use

Section II Aiming Circles, M2 and M2A2

- 2-4. Characteristics
- 2-5. Description
- 2-6. Use
- 2-7. Accessory Equipment
- 2-8. Setup and Leveling of Aiming Circle
- 2-9. Declination Constant
- 2-10. Orienting of the Instrument on Grid North to Measure Grid Azimuth to Objects
- 2-11. Measurement of Horizontal Angle Between Two Points
- 2-12. Orienting of the 0-3200 Line on a Given Grid Azimuth
- 2-13. Orienting of the 0-3200 Line on a Given Magnetic Azimuth
- 2-14. Verifying the Lay of the Platoon
- 2-15. Orienting by Orienting Angle
- 2-16. Disassembly of Aiming Circle
- 2-17. Care and Maintenance

Section III Sightunits

- 2-18. Sightunit, M53-Series
- 2-19. Operation of M53 Sightunit
- 2-20. Care and Maintenance of M53 Sightunit
- 2-21. Sightunit, M64-Series
- 2-22. Sightunit, M67

Section IV Boresights

- 2-23. Boresight, M45-Series
- 2-24. Boresight, M115
- 2-25. Principles of Operation
- 2-26. Installation
- 2-27. Sight Calibration
- 2-28. Boresight Method of Calibration
- 2-29. Calibration for Deflection Using the M2 Aiming Circle

Section V Other Equipment

- 2-30. Instrument Light, M53E1
- 2-31. Aiming Posts, M14 and M1A2
- 2-32. Aiming Post Lights, M58 and M59

Section VI Laying the Section

2-33. Reciprocal Laying

- 2-34. Reciprocal Laying on a Grid Azimuth
- 2-35. Reciprocal Laying on a Magnetic Azimuth
- 2-36. Reciprocal Laying Using the Orienting Angle
- 2-37. Reciprocal Laying Using the Mortar Sights
- 2-38. Reciprocal Laying Using the M2 Compass
- 2-39. Placing Out Aiming Posts
- 2-40. Alternate Method of Placing Out Aiming Posts
- 2-41. Correction for Displacement of Sight

Section VII Loading and Firing

- 2-42. Firing the Mortar
- 2-43. Target Engagement
- 2-44. Execution of Fire Commands
- 2-45. Arm-and-Hand Signals
- 2-46. Subsequent Fire Commands
- 2-47. Repeating and Correcting of Fire Commands
- 2-48. Reporting of Errors in Firing
- 2-49. Night Firing

CHAPTER 3 60-mm MORTAR, M224

- Section I Squad and Section Organization and Duties
 - 3-1. Organization
 - 3-2. Duties

Section II Components

- 3-3. Tabulated Data
- 3-4. Cannon Assembly, M225
- 3-5. Baseplate, M7
- 3-6. Baseplate, M8
- 3-7. Bipod Assembly, M170

Section III Operation

- 3-8. Premount Checks
- 3-9. Mounting of the Mortar
- 3-10. Safety Checks Before Firing
- 3-11. Small Deflection and Elevation Changes
- 3-12. Large Deflection and Elevation Changes
- 3-13. Referring of the Sight and Realignment of Aiming Posts
- 3-14. Malfunctions

- 3-15. Removal of a Misfire
- 3-16. Dismounting and Carrying of the Mortar

Section IV Ammunition

- 3-17. Classification
- 3-18. Color Codes
- 3-19. Preparation of Ammunition
- 3-20. Types of Fuzes
- 3-21. Standard B Ammunition
- 3-22. Care and Handling

CHAPTER 4 81-mm MORTAR, M252

- Section I Squad and Section Organization and Duties
 - 4-1. Organization
 - 4-2. Duties

Section II Components

- 4-3. Tabulated Data
- 4-4. Cannon Assembly, M253
- 4-5. Mount, M177
- 4-6. Baseplate, M3A1

Section III Operation

- 4-7. Premount Checks
- 4-8. Mounting of the Mortar
- 4-9. Safety Checks Before Firing
- 4-10. Small Deflection and Elevation Changes
- 4-11. Large Deflection and Elevation Changes
- 4-12. Referring of the Sight and Realignment of Aiming Posts Using M64 Sight
- 4-13. Malfunctions
- 4-14. Removal of a Misfire
- 4-15. Dismounting of the Mortar

Section IV Ammunition

- 4-16. Classification
- 4-17. Function
- 4-18. High-Explosive Ammunition
- 4-19. Red/White Phosphorus Ammunition
- 4-20. Illuminating Ammunition

- 4-21. Types of Fuzes
- 4-22. Characteristics of Proximity Fuzes
- 4-23. Fuze Wrench and Fuze Setter
- 4-24. Preparation of Ammunition
- 4-25. Care and Handling

CHAPTER 5 81-mm MORTAR, M29A1

- Section I Squad and Section Organization and Duties
 - 5-1. Organization
 - 5-2. Duties
- Section II Components
 - 5-3. Tabulated Data
 - 5-4. Cannon Assembly, M29A1
 - 5-5. Bipod Assembly, M23A1
 - 5-6. Baseplate, M3
- Section III Operation
 - 5-7. Premount Checks
 - 5-8. Mounting of the Mortar
 - 5-9. Safety Checks Before Firing
 - 5-10. Small Deflection and Elevation Changes
 - 5-11. Large Deflection and Elevation Changes
 - 5-12. Referring of the Sight and Realignment of Aiming Posts Using M53 Sight
 - 5-13. Malfunctions
 - 5-14. Removal of a Misfire
 - 5-15. Dismounting of the Mortar
- Section IV Ammunition
 - 5-16. Function
 - 5-17. High-Explosive Ammunition
 - 5-18. White Phosphorus Ammunition
 - 5-19. White Phosphorus Ammunition
 - 5-20. Types of Fuzes
 - 5-21. Characteristics of Proximity Fuzes
 - 5-22. Fuze Wrench and Fuze Setter
 - 5-23. Preparation of Ammunition
 - 5-24. Care and Handling

CHAPTER 6 4.2-INCH MORTAR, M30

Section I Squad and Section Organization and Duties

6-1. Organization

6-2. Duties

6-3. Section Drill and Section Leader Duties

Section II Components

6-4. Tabulated Data

6-5. Mortar Cannon, M30

6-6. Mortar Mount, M24A1

Section III Operation of Ground-Mounted Mortar

6-7. Mounting of the Mortar

6-8. Safety Checks Before Firing

6-9. Small Deflection Change

6-10. Large Deflection and Elevation Changes

6-11. Loading and Firing of M329A2 Round

6-12. Malfunctions

6-13. Removal of a Misfire

6-14. Dismounting of the Mortar

Section IV Mortar Carriers, M106, M106A1, and M106A2

6-15. Description

6-16. Tabulated Data

Section V Operation of Carrier-Mounted Mortar

6-17. Mortar and Vehicular Mount

6-18. Maintenance

6-19. Placement of Mortar Into Firing Position on Carrier

6-20. Laying for Deflection and Elevation

6-21. Removal of a Misfire (Carrier-Mounted)

6-22. Mounting of Mortar on Carrier From Ground-Mounted Position

6-23. Dismounting of Mortar From Carrier

6-24. Preparation for a March Order From Ground-Mounted Position

6-25. Safety Checks

6-26. Measurement of Minimum and Maximum Elevations

6-27. Squad Formations

6-28. Dismounted Mortar Squad

		6-29. Reciprocally Laying the Mortar Carrier Section
Section	VI	Ammunition
		6-30. Classification
		6-31. Types of Fuzes
		6-32. Preparation of Ammunition
		6-33. Care and Handling
CHAPTER 7		120-mm MORTAR, M120
Section	I	Squad and Section Organization and Duties
		7-1. Organization
		7-2. Duties
Section	II	Components
		7-3. Tabulated Data for the 120-mm Mortar, M120
		7-4. Barrel Assembly, M298
		7-5. Bipod Assembly, M191 (Carrier-/Ground-Mounted)
		7-6. Bipod Assembly, M190 (Ground-Mounted)
		7-7. Baseplate, M9
Section	III	Operations
		7-8. Placing a Ground-Mounted 120-mm Mortar Into Action
		7-9. Performing Safety Checks on a Ground-Mounted 120-mm Mortar
		7-10. Performing Small Deflection and Elevation Changes on a Ground-Mounted 120-mm Mortar
		7-11. Performing Large Deflection and Elevation Changes on a Ground-Mounted 120-mm Mortar
		7-12. Malfunctions on a Ground-Mounted 120-mm Mortar
		7-13. Performing Misfire Procedures on a Ground-Mounted 120-mm Mortar During Combat
		7-14. Loading and Firing the Ground-Mounted 120-mm Mortar
		7-15. Taking the 120-mm Mortar Out of Action

7-17. Tabulated Data for the M1064A3 Carrier

7-20. Placing Carrier-Mounted 120-mm Mortar Into Action

V Operation of a Carrier-Mounted 120-mm Mortar7-18. Mortar and Vehicular Mount

Section

Section

IV Mortar Carrier, M1064A37-16. Description

7-19. Maintenance

- 7-21. Lay for Deflection and Elevation on a Carrier-Mounted 120mm Mortar
- 7-22. Performing Misfire Procedures on a Carrier-Mounted 120-mm Mortar During Combat
- 7-23. Mounting of the Mortar From a Carrier to a Ground-Mounted Position
- 7-24. Taking the Mortar Out of Action (Ground-Mounted to M1064A3 Carrier-Mounted)
- 7-25. Performing Safety Checks on a Carrier-Mounted 120-mm Mortar
- 7-26. Reciprocally Laying the Mortar Carrier Section

Section VI Ammunition

- 7-27. Classification
- 7-28. Authorized Cartridges
- 7-29. Preparation for Firing
- 7-30. Loading and Firing
- 7-31. Unfired Cartridges
- 7-32. Care and Handling of Cartridges
- 7-33. Fuzes
- 7-34. Setting Fuzes
- 7-35. Resetting Fuzes

CHAPTER 8 FIRE WITHOUT A FIRE DIRECTION CENTER

Section I Fire Procedures

- 8-1. Advantages and Disadvantages
- 8-2. Firing Data
- 8-3. Observer Corrections
- 8-4. Initial Fire Commands
- 8-5. Fire Commands
- 8-6. Fire Control
- 8-7. Movement to Alternate and Supplementary Positions
- 8-8. Squad Conduct of Fire
- 8-9. Reference Line
- 8-10. Fire Adjustment
- 8-11. Squad Use of Illumination and Smoke
- 8-12. Attack of Wide Targets
- 8-13. Attack of Deep Targets

Section II Direct-Lay Method

8-14. Step 1: Initial Firing Data

8-15. Step 2: Referring the Sight

8-16. Step 3: Bracketing the Target

8-17. Step 4: Fire for Effect

Section III Direct-Alignment Method

8-18. Mortar Dismounted

8-19. Mortar Mounted

8-20. Natural Object Method

Section IV Adjustment of Range

8-21. Range Spottings

8-22. Miscellaneous Spottings

8-23. Bracketing Method

8-24. Creeping Method of Adjustment

8-25. Normal Fire Commands

8-26. Modified Fire Commands

8-27. Fire Control

8-28. Establishment of a Reference Line and Shifting From That Line

8-29. Ladder Method of Adjustment

CHAPTER 9 GUNNER'S EXAMINATION

Section I Preparatory Instruction

9-1. Methods of Instruction

9-2. Prior Training

9-3. Preparatory Exercises

9-4. Examining Board

9-5. Location and Date

9-6. Eligible Personnel

9-7. Qualification Scores

9-8. General Rules

Section II Gunner's Examination With Ground-Mounted Mortar

9-9. Subjects and Credits

9-10. Equipment

9-11. Organization

9-12. Procedure

9-13. Mounting of the Mortar

- 9-14. Small Deflection Change
- 9-15. Referring of the Sight and Realignment of Aiming Posts
- 9-16. Large Deflection and Elevation Changes
- 9-17. Reciprocal Laying

Section III Gunner's Examination With the Track-Mounted Mortar

- 9-18. Subjects and Credits
- 9-19. Equipment
- 9-20. Organization
- 9-21. Procedure
- 9-22. Placement of Mortar Into a Firing Position From Traveling Position
- 9-23. Small Deflection Change
- 9-24. Referring of the Sight and Realignment of Aiming Posts
- 9-25. Large Deflection and Elevation Changes
- 9-26. Reciprocal Laying
- 9-27. Support Squad

APPENDIX A TRAINING DEVICES

APPENDIX B MORTAR TRAINING STRATEGY

GLOSSARY

REFERENCES

AUTHENTICATION

DISTRIBUTION RESTRICTION: Approved for public release, distribution is unlimited.

^{*}This publication supersedes FM 55-1, 30 November 1984.