

INCH-POUND

MIL-DTL-24784/10C(NAVY)

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SUPERSEDING

MIL-DTL-24784/10B(SH)

15 February 2002

## DETAIL SPECIFICATION SHEET

### TRAINING AID BOOKLET (TAB) REQUIREMENTS FOR NAVAL SHIPS SYSTEMS

This specification is approved for use by the Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-DTL-24784.

#### 1. SCOPE

1.1 Scope. This specification sets forth requirements for the preparation of Training Aid Booklets (TABs) for use on Naval ships (see 6.2).

1.2 TAB coverage. The TAB is a schematic and pictorial representation of systems and equipment installed onboard a specific ship. TAB coverage does not include maintenance information, nor does the TAB coverage include the internal details of nomenclature type or otherwise uniquely identified systems or equipment documented by other technical manuals supplied onboard ship.

#### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

##### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

#### DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-24784 - Manuals, Technical: General Acquisition and Development Requirements,  
General Specification for

(Copies of this document are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05M3, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to [CommandStandards@navy.mil](mailto:CommandStandards@navy.mil), with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## ASME INTERNATIONAL

ASME Y14.38 - Abbreviations and Acronyms (DoD adopted)

(Copies of this document are available from ASME International, 22 Law Drive, PO Box 2900, Fairfield, NJ 07007-2900 or online at [www.asme.org](http://www.asme.org).)

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. (IEEE)

IEEE 315 - Graphic Symbols for Electrical and Electronics Diagrams (DoD adopted)

(Copies of this document are available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331 or online at [www.ieee.org](http://www.ieee.org).)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Preparation of digital data for page-oriented printed delivery. The source information for the TAB shall be prepared in the Extensible Markup Language (XML) or the Standardized General Mark-Up Language (SGML) in accordance with MIL-DTL-24784.

3.2 Security classifications, distribution statement, and destruction notice. The security classifications, distribution statement, and destruction notice shall be in accordance with MIL-DTL-24784.

3.3 Deliverable products and data items. Deliverable products and data items shall be in accordance with MIL-DTL-24784 (see 6.2).

3.4 Format and development instructions. Unless otherwise specified by the acquiring activity or herein (see 6.2), the writing style, safety precautions, tabular material, graphics, and numbering shall be in accordance with MIL-DTL-24784.

3.4.1 Format and layout. All typed and illustrative matter developed for final production shall be in a horizontal (landscape) format. Layout of text pages shall be in accordance with figure 1. Layout of illustration pages shall be in accordance with figure 2 or figure 3, as appropriate.

3.4.2 Marginal copy. Marginal copy shall consist of running heads and feet of illustration titles. Marginal copy shall be located on each page as indicated in figures 2 and 3. Format for 4¼- by 11-inch TABs shall be in accordance with figure 2 and shall maintain the same margins and marginal copy.

3.4.3 Running heads. The running head for each page shall include the ship applicability notation (ship class or hull number), security classification (supplement) or distribution limitation, NAVSEA publication identification number, and the generic title of the diagram or contents (see 3.6.6.1).

3.4.4 Running feet.

3.4.4.1 Page number positioning. All page numbers shall be located at the lower outside of the page, approximately ¼ inch from the bottom and ¼ inch from the outside edge.

3.4.5 Page size. Unless otherwise specified by the acquiring activity (see 6.2), the page size for all preliminary and final TABs shall be 11 by 8½ inches, with a maximum image area of 9½ by 7½ inches (see figure 1). Only when the increased cost of production can be justified by the effectiveness of the page layout will the alternate page size of 4¼ by 11 inches be specified. When this alternate is specified, the acquisition documents must prohibit the use of foldouts and foldups.

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3.4.6 Illustration titles. Titles shall be located adjacent to the page number. The primary source document from which the illustration was developed shall be identified immediately below the illustration title in the manner shown in figures 2 and 3.

3.4.7 Line widths. Line artwork shall be prepared with line widths of sufficient size and strength to reproduce a minimum final line width, without dropout (when reduced), of 0.01 inch.

3.4.8 Piping illustrations. Pipe sizes shall be indicated by line width. A code to indicate the pipe size scale shall appear on the illustration. Recommended pipe size scale for oversized artwork is shown on figure 4.

3.4.9 Electrical system illustrations. Electrical distribution wire and cable sizes shall be annotated on the illustration. Bus bars shall be depicted in rectangular form and identified accordingly.

3.4.10 Illustration size. All original artwork shall be prepared for reproduction at final sizes as indicated on figure 2 (9½ by 7½ for single illustration pages), and figure 3 (9½ by 3½ for double illustration pages).

3.4.11 Multiple or parallel installations. Only one system shall be illustrated when multiple or parallel systems or components are installed in the ship. A note shall be added to the illustration to indicate the existence of the system(s) or component(s) not shown.

3.4.12 Color in illustrations. When specified by the acquiring activity (see 6.2), only the Pantone PMS colors and variations of use identified in MIL-DTL-24784 shall be used for TABs. The color-coded drawing copies shall identify each color by number and variation of use.

3.5 Arrangement. Unless otherwise specified by the acquiring activity (see 6.2), the manual shall be arranged in a standardized format [that is, front matter, technical content, appendices, glossaries, indices and Technical Manual Deficiency Evaluation Report (TMDER)] and appropriately divided by volume, part, chapter and section in accordance with Appendix A of MIL-DTL-24784 and the following.

3.5.1 Division of coverage. The TAB shall consist of at least two unclassified volumes. A third volume (supplement) shall be used when classified information must be included in the TAB coverage. The division of coverage shall be as follows:

- a. Volume 1 - Piping systems.
- b. Volume 2 - Electrical and electronic systems.
- c. Volume 3 - Supplement (classified data applicable to both volumes).

3.5.2 Volume and part limitation. Volumes, or parts thereof, shall not exceed 500 pages (250 sheets).

3.5.3 Cover or title page. The cover or title page shall be prepared as shown in Appendix A of MIL-DTL-24784, except that it shall be prepared in a horizontal (landscape) format.

3.6 Technical content. The technical content of each volume of the TAB shall be arranged as follows:

- a. General information.
- b. List of abbreviations.
- c. List of symbols.
- d. System and component designation tables.
- e. Perspective and plan views.
- f. System and component diagrams.

3.6.1 General information. General information shall include, as a minimum, the following data:

- a. Full title and Government identification numbers of all volumes and separately bound parts of volumes comprising the TAB (including supplements).
- b. Explanation of the purpose and scope of the TAB.
- c. Explicit applicability of the TAB.

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- d. Brief synopsis of the content of each volume.
- e. Brief description of the graphic techniques used in the TAB.
- f. Statement on reporting of errors (see TMDER in Appendix A of MIL-DTL-24784).

3.6.1.1 Use of general information page(s). The general information shall be included in each volume of the TAB, and shall be identical.

3.6.1.2 Multipart volumes. When multiple parts are used for Volume 1 or Volume 2 (or both) of the TAB, the general information shall be included only in Part 1 of each volume.

3.6.2 List of abbreviations. A complete listing of abbreviations and their meaning shall be included in each volume immediately following the general information. For multipart volumes, the list of abbreviations shall appear in Part 1 only.

3.6.2.1 Nonstandard abbreviations. The use of nonstandard abbreviations shall be held to a minimum. Nonstandard abbreviations shall be used only when no authorized equivalent exists in ASME Y14.38M. When used, nonstandard abbreviations shall not be in conflict with an ASME Y14.38M abbreviation.

3.6.3 List of symbols. A list of symbols shall be included in each volume (Part 1 only, on multipart volumes) of the TAB, immediately following the list of abbreviations. The listing for each volume shall be limited to symbols used in the applicable volume but shall be inclusive of all symbols used therein.

3.6.3.1 Symbols. Graphic symbols for use on TAB diagrams shall be in accordance with Electrical and electronic - IEEE 315.

3.6.3.1.1 Nonstandard symbols. The use of nonstandard symbols shall be held to a minimum. Nonstandard symbols shall be used only when no authorized equivalent exists in the documents specified above. Where nonstandard symbols are used, explanations shall be provided. When used, nonstandard symbols shall not be in conflict with the above documents.

3.6.4 System and component designation tables. Data shall be included in tabular form to explain the use of color codes, piping system designators, location identification numbers for controls and instruments, switchboard and circuit breaker identifications, and so forth, and shall be arranged in logical order immediately following the list of symbols. Any other data that will enable users to better understand the TAB shall be presented in additional tables or by suitable notes positioned near the system or component illustrations to which they apply.

3.6.5 Perspective and plan views. Perspective and plan views (see figure 5) shall be included in the TAB to illustrate such specific aspects of the ship as:

- a. Antenna and mast arrangements.
- b. Exterior installations including superstructure details and cavity drain systems.
- c. Compartment and access arrangements.
- d. Arrangement of tanks.
- e. Electrical generator location and numbering.
- f. Bulkheads (pressure).
- g. Hull and hull openings.
- h. Tanks and compartments (volumes).

3.6.6 System and component diagrams. Each installed system (piping, electrical, and electronic) shall be illustrated through the use of functional schematic diagrams (see figures 6 and 7). Where essential to the understanding of system operation, components of the system shall be separately illustrated and may be depicted using other types of drawings such as perspective, orthographic projection, cross-section, or isometric projection. Text shall be restricted to safety precautions and shall only be used to provide instructions or explanations, which cannot be covered adequately by annotating the illustrations. Systems that shall be covered include, but are not limited to, the following categories:

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- a. High-pressure air systems.
- b. Low-pressure air systems.
- c. Ventilation systems.
- d. Gas (refrigerants, oxygen, compressed gasses, and so forth) distribution systems.
- e. Water (potable, sea water, air-conditioning, chilled water for electronic system cooling, waste, drain, and so forth) systems.
- f. Hydraulic systems.
- g. Electric power [60 hertz (Hz) and 400 Hz, alternating current (ac), 250 volts direct current (Vdc), and battery] generation and distribution systems.
- h. Interior communication (IC) systems.
- i. Fire alarm, firefighting, and damage control systems.
- j. Steam systems.
- k. Feed and condensate systems.
- l. Distilling plant systems.
- m. Fuel and lube oil systems.
- n. Those systems presently covered by the engine room fluid systems composite.
- o. Salvage systems.
- p. Oxygen generator, CO<sub>2</sub> scrubber, CO-H<sub>2</sub> burner.
- q. Electronic equipment cooling flow.
- r. Escape systems.

3.6.6.1 Specific examples. Specific examples of system and component diagrams to be included are presented below. Note that the generic categories and titles under which the examples have been placed are neither exclusive nor all encompassing.

## VOLUME 1 - PIPING

## Air-Conditioning and Ventilation:

- Air-Conditioning Chilled Water System
- Refrigerant 11 Air-Conditioning Plant
- Ventilation and Air-Conditioning Control System
- Ventilation System
- Ventilation Flow Diagram

## Atmosphere Systems and Components:

- Atmosphere Analyzing System
- CO<sub>2</sub> Removal System
- CO-H<sub>2</sub> Burner
- Lithium Bromide Absorption System
- Main Oxygen System
- Oxygen Generator System

## Compressed Air Systems and Components:

- High-Pressure Air System
- HP-Air System Air Dryer

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HP-Air Compressor Condensate Drain  
700-lb/in<sup>2</sup> Service Air System  
100- and 150-lb/in<sup>2</sup> Service Air Systems  
20-lb/in<sup>2</sup> Service Air System  
Diesel Engine Air Start

Emergency Systems:

Air Salvage System  
Emergency Air Breathing System  
Forward and After Escape Trunks

Fuel Oil Systems:

Diesel Generator Fuel System  
Fuel and Compensating Water System  
Fuel Filter Separator

Fresh Water Systems and Components:

Fresh Water Drain Collecting System  
Plumbing System  
Potable Water System  
3000 Gallons per Day Distilling System  
1800 Gallons per Day Distilling System  
Auxiliary Fresh Water Cooling System  
Diesel Generator Fresh Water Cooling System

Hydraulic Systems and Components:

Hydraulic Power Plant  
Main and Vital Hydraulic System  
External Hydraulic System  
Snorkel Mast Hydraulic Operation  
Periscope Hydraulic Operation  
Antenna Masts Hydraulic Operation  
Hydraulic Accumulator Indicators  
Steering Hydraulic System  
Fairwater Planes Hydraulic System  
Stern Planes Hydraulic System  
Windlass and Capstan Hydraulic Operation  
Steering and Diving Control Station

Lube Oil Systems and Components:

Diesel Generator Lube Oil System  
Main Lube Oil System  
Shaft Lube Oil System

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SSTG Lube Oil System

Turbine Lube Oil Fill, Transfer, and Purification System

MBT Systems and Components:

MBT Flooding and Venting

MBT HP Blow System

MBT HP Blow Valves

MBT LP Blow System

Sea Water Systems and Components:

Main Sea Water Cooling System

Main and Auxiliary Sea Water Hull and Backup Valve Operation

Auxiliary Sea Water Cooling System

Air Conditioning Sea Water Cooling System

Diesel Generator Sea Water Cooling System

Drain System

Auxiliary Drain System

Gravity Drains

Surge Tank Arrangement

Snorkel System:

Snorkel System and Panels

Inboard and Outboard Induction and Ventilation Exhaust Valves

Induction Head Valve

Inboard and Outboard Diesel Exhaust Valves

Steam Systems and Components:

Auxiliary Steam System

Gland Seal and Exhaust Systems

High Pressure Steam Drain System

Steam Generator Cutout Valve Operation

Main Steam Root Valve and Crossover Valve Operation

Trim System and Components:

Trim System Suction and Discharge Valves

Trim System - Forward and Aft

Hovering and Depth Control System

Miscellaneous Systems and Components:

Battery Electrolyte Agitation System

Clutch Control System

Depth Gage Piping

Floating Wire Antenna Operating Gear

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Forward and After Signal Ejectors  
Mode Selector Switch  
Propulsion Turbine Throttle Valve and Governor Operation  
Refrigeration System  
SSTG Throttle Valve and Governor Operation  
Torpedo Loading, Stowage, and Handling  
Torpedo Firing Sequence  
Torpedo Tube Hydraulic System  
Torpedo Tube Flood and Drain System  
Trash Disposal Unit  
Trash Disposal Compactor  
Vibration Reducer Control System

VOLUME 2 - ELECTRIC - ELECTRONICS

Electric Propulsion:

Electric Propulsion Motor Control  
Propulsion Clutch and Hydraulic Pump Control  
Secondary Propulsion Motor Control  
Storage Battery - Cell Arrangement and Metering

Electric Power Generation and Control:

Electric Power Sources and Major Circuit Breakers  
Motor Generator Sets Operating Controls  
Ship Service Turbine Generator Sets Operating Controls  
Diesel Generator Control  
Electric Power Generation Block Diagram  
400 Hz Motor Generator Sets Control  
Synchronizing Scheme Diagram  
Electric Plant Circuit Breakers Control  
Ground Detection

Electric Power Distribution and Lighting:

Ship Service 400-Hz Power Distribution  
Outboard Lighting  
Ship Service Lighting Power Distribution  
Emergency Lighting Power Distribution

Electrical Auxiliaries:

Lube Oil and Fuel Oil Equipment  
Auxiliary Sea Water Cooling Pumps Equipment  
Main Sea Water Cooling Pumps Equipment  
Auxiliary Fresh Water Cooling Pumps Equipment



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Main Feed Pumps Equipment  
Main Condensate Pumps Equipment  
Ventilation and Heating Equipment  
Air-Conditioning Equipment  
High-Pressure Air Compressor and Low-Pressure Blower Equipment  
Trim and Drain Pumps and Submersible Pumps Equipment  
Hydraulic Power Plant Equipment  
Distilling Equipment  
Atmosphere Analyzer System  
Hydrocarbon Analyzer System  
Air Sampling and Analysis Equipment  
Atmosphere Cleansing and Replenishment Equipment  
Galley and Laundry Equipment  
Refrigeration Equipment

Interior Communications:

Main Ballast Tank Vent Valves Indicators and Control System  
Ballast Control Panel  
Ballast Control Panel Common Alarm Circuits  
Depth and Course Control System  
Hovering and Depth Control System  
Ship Control Panel  
Pressure Indicating System  
Snorkel System  
Hull Opening Indicator and Control System  
Trim and Drain Indicator and Control System  
High Pressure Air Indicator and Control System  
Electronic Mast Position and Hoist Control System  
Remote Tank Level Indicator System  
Trim and Drain Pump Remote Flow Indicator System  
Refrigeration Temperature Indicator System  
Hydraulic Accumulator Contents Indicator System  
Rudder, Fairwater, and Stern Planes Angle Indicator System  
Depth Indicator System  
Ship Safety Alarm System  
Dead Reckoning System  
Maneuvering Room Panel Common Alarm Circuits  
Reactor Compartment Bilge Liquid Level Indicator and Alarm System  
Propeller Shaft Revolution Indicator System  
Engine Order and Wrong Direction Indicator System  
Battery Electrolyte Agitation System  
Battery Air Flow Indicator System

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Hydrogen Detector System  
Gyrocompass Repeater and Gyrocompass System  
Underwater Log and Dummy Log System  
Ships Angle Indicator System  
Trim Angle Indicator System  
Main and Auxiliary Sea Water System Status Panel  
Sea Water Valve Control and Position Indicator System  
Salinity Indicator System  
Temperature Monitoring System  
Electronic Equipment Cooling Water Temperature and Flow Monitoring System  
Propeller Shaft IC Circuit  
Diesel Generator IC Circuit  
Integrated Announcing System  
Officer Call System  
Dial Telephone System  
Sound Powered Telephone System

Steam Plant:

Steam Plant Valve Position Indicator System  
Steam Plant Alarms

Electronic Systems:

Hz Electronics Power Distribution  
Hz Electronics Power Distribution  
ECM Systems

Radar Systems:

Surface Search  
Air Search  
Tracking  
IFF

Radio Systems:

Communications  
Tactical  
LORAN  
SatNav  
RDF

Sonar Systems:

Receiving  
Detecting Ranging  
Depth Sounding  
Distress Alert  
Underwater Telephone

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Tracking - Speed

Hydrophone and Transducer Arrangement

## 4. VERIFICATION

4.1 Verification. The verification requirements shall be in accordance with MIL-DTL-24784.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. TABs prepared in accordance with this specification are primarily intended as a training aid for use by the ship crews in studying the installed systems of the ship. The TAB is also intended to be used as a reference document by engineering and technical personnel.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification (or any TMCR referencing this specification).
- b. Type and quantity of the manual required (see 1.1).
- c. Issues of documents to be cited in the solicitation (see 2.2.1 and 2.3).
- d. Type and quantity of deliverable products (see 3.3).
- e. Indicate format items, if other than specified (see 3.4).
- f. Page size (see 3.4.5).
- g. Color in illustrations, if other than specified (see 3.4.12 and MIL-DTL-24784).
- h. Arrangement other than standardized format (see 3.5).
- i. Packaging requirements (see 5.1).

6.3 Technical manual acquisition. This specification (or a TMCR based on this specification) must be listed on the Contract Data Requirements List (DD Form 1423) in order to acquire the TMs described by this specification. An alternate acquisition strategy should be devised by contracting officers for those solicitations or contracts which are exempted from using the Uniform Contract Line Item Numbering System (UCLINS).

6.4 Definitions. The words or phrases used throughout this specification sheet are defined in MIL-DTL-24784.

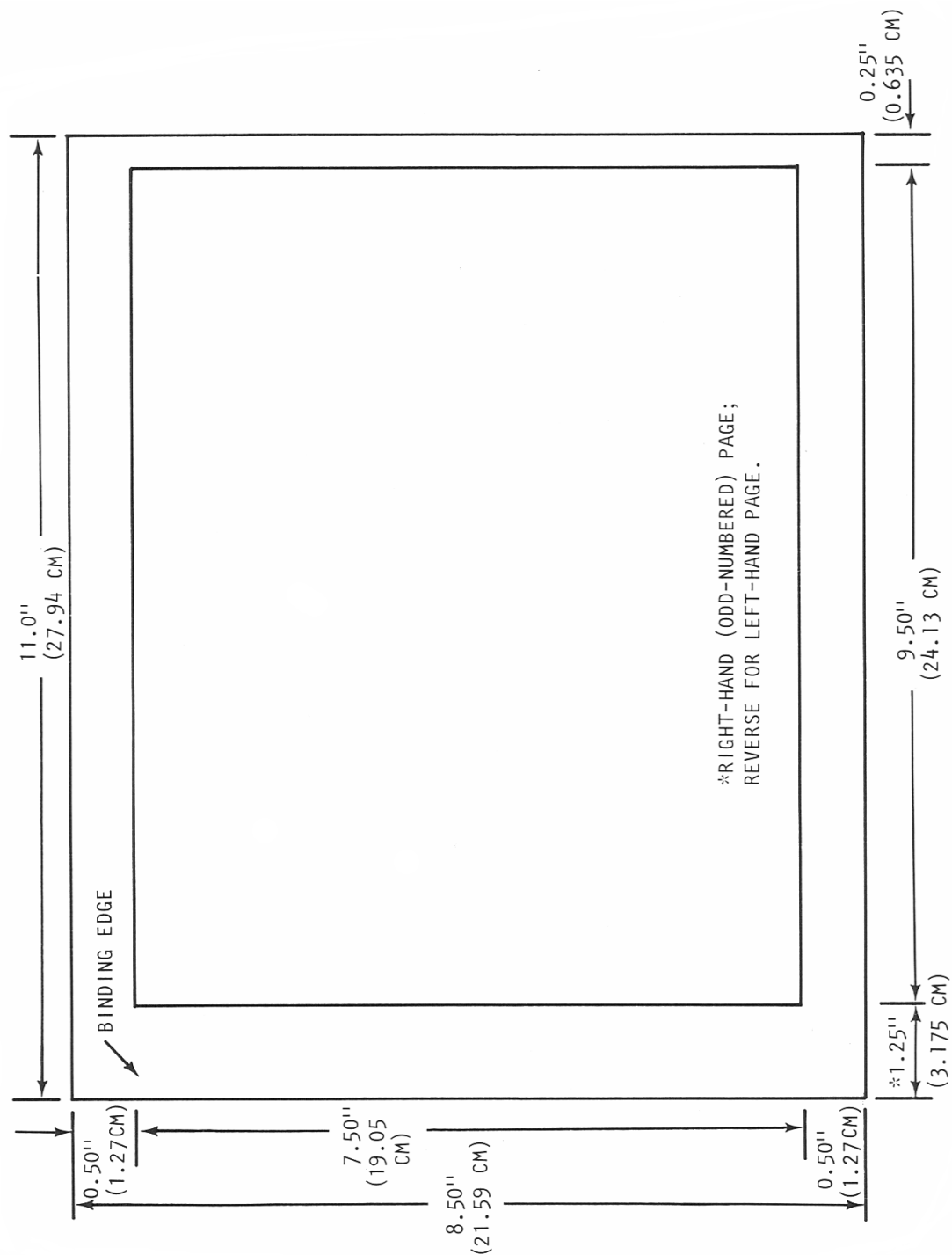
6.5 Subject term (key word) listing.

Equipment

Pictorial

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

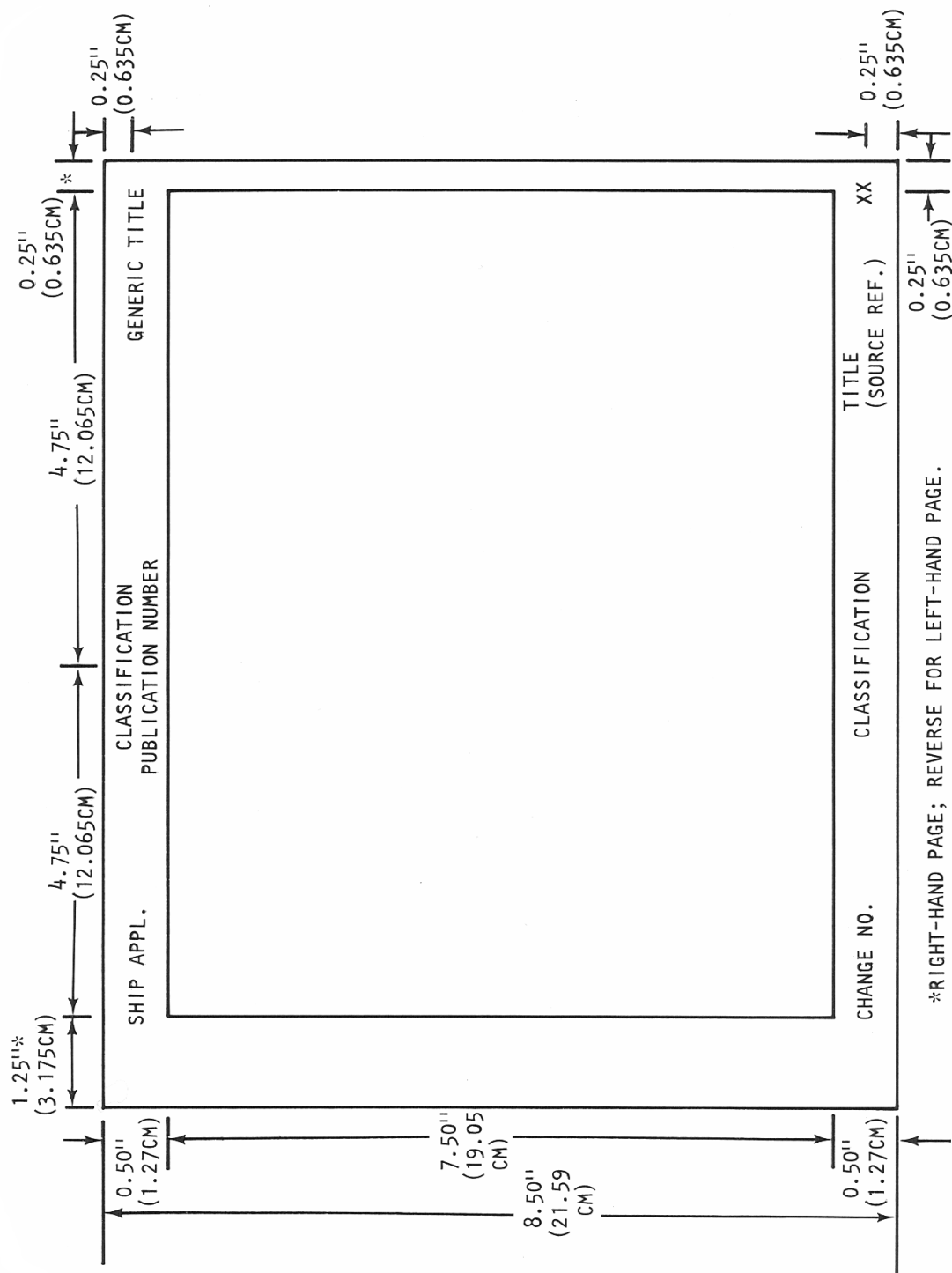
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Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 1. Page size and format.

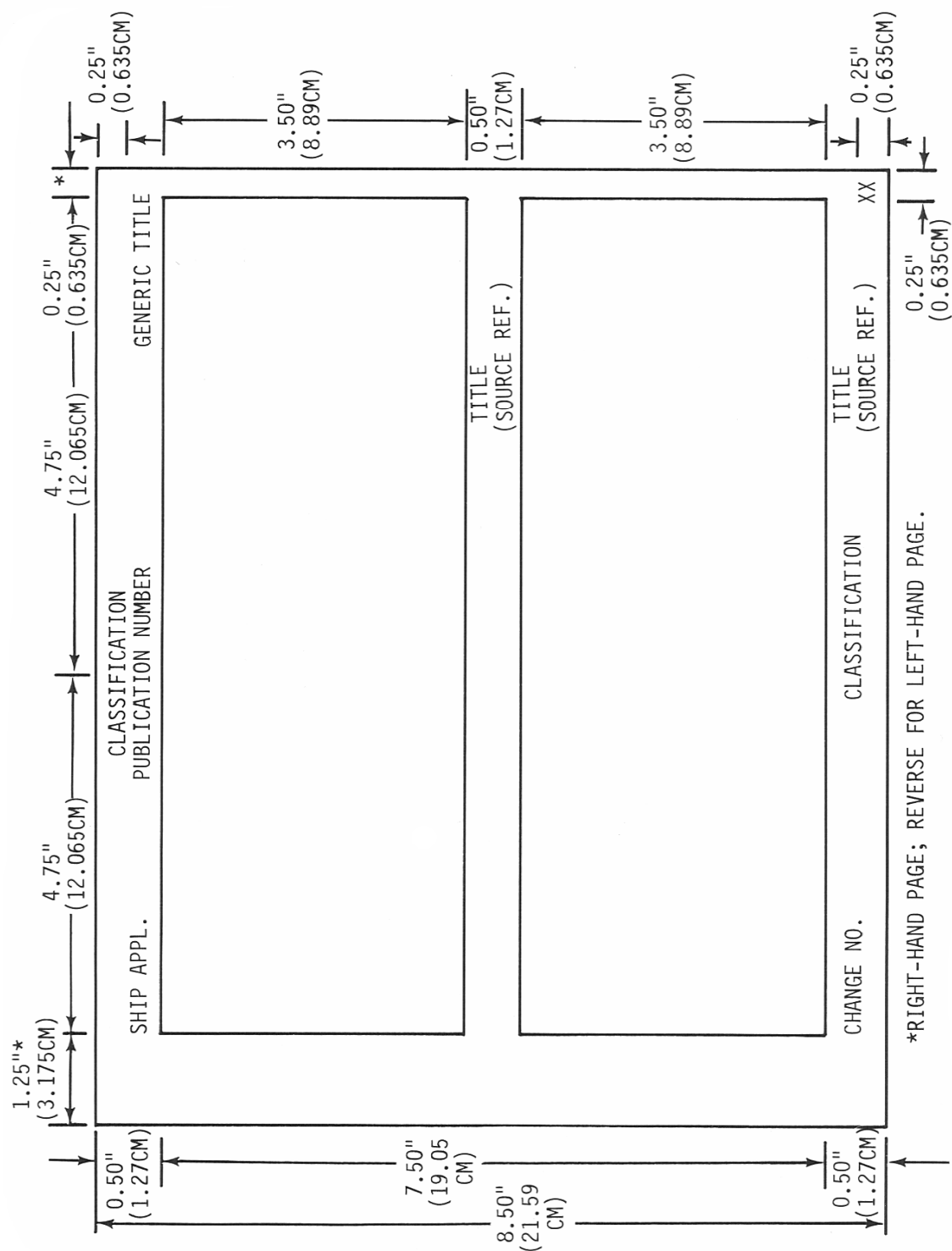
MIL-DTL-24784/10C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 2. Single illustration page layout and dimensions.

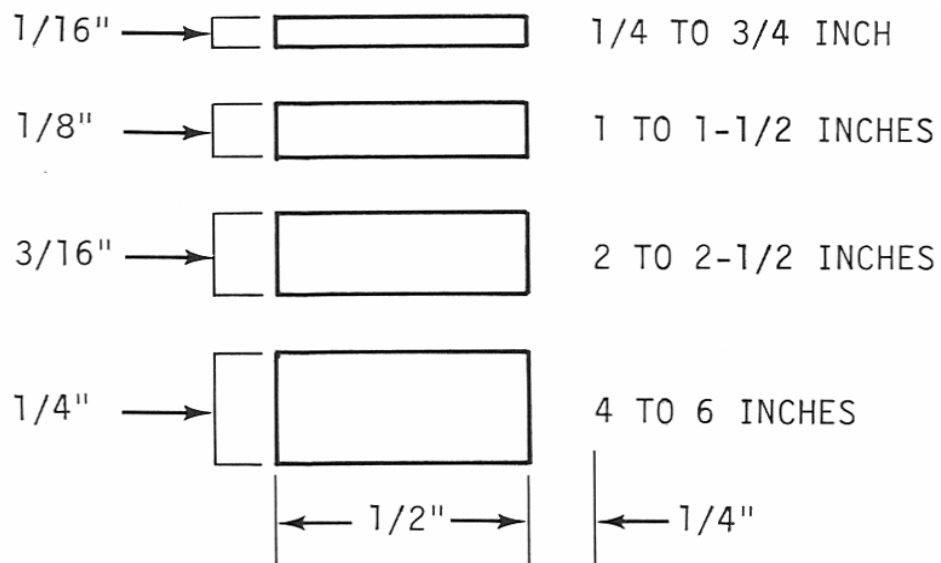
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Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 3. Double illustration page layout and dimensions.

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## NOTE

PIPE SIZING IS SUBJECT TO VARY, AS IT IS DEVELOPED FROM THE PIPE SIZES THAT ARE INDICATED ON THE SYSTEM DIAGRAM BEING USED.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 4. Recommended pipe size scale.

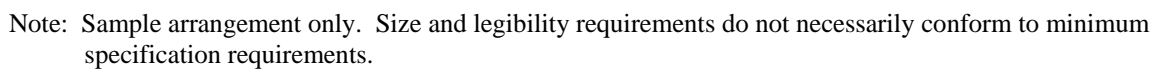


FIGURE 5. Perspective and plan views (sample).





FIGURE 6. Functional schematic diagram (sample).

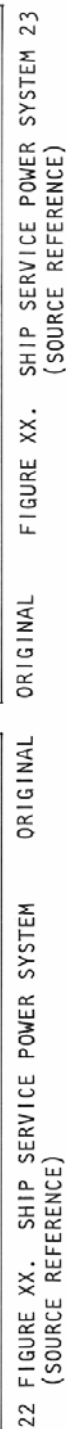


FIGURE 7. Functional schematic diagram, 2-page spread (sample).

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Custodian:

Navy – SH

Preparing Activity:

Navy – SH

(Project TMSS-N246-000)

Review Activity

Navy – EC

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.