PREPARATION OF

COMPUTER AIDED DESIGNED (CAD) DRAWINGS

FOR GOVERNMENT OWNED SHIPS

DRAWN BY: S. Guill	CHECKED BY: T. Gionis	DEPARTMENT OF THE NAVY **MILITARY SEALIFT COMMAND** WASHINGTON D.C. 20398-5540
APPROVED BY:	DATE	
APPROVED BY: A.Busk	DATE	MILITARY SEALIFT COMMAND COMPUTER AIDED DESIGNED (CAD) DRAWING STANDARD
APPROVED BY: N.Lichtenstein	DATE	
APPROVED BY: J. Gladson DIR. TECHNICAL DIVISION	DATE	
APPROVED FOR COMSC K. Baetsen	DATE	

SIZE	CAGE CODE	SWBS	DRAWING NO.	REV
A	94421	803	7080803	A

SCALE: NONE	STD PLAN	SHT 1 OF 33

REVISION SHEET

REV	REVISION DESCRIPTION	APPROVED
A	1. Revised in entirety. 2. Revised drawing format. 3. Added references (a) through (p) 4. Updated drawing format requirements, Section 2.1. 5. Changed drawing text size for A and B size drawing, Table 2-2. 6. Changed CAD layer colors, Tables 2-3 and 2-4. 7. Added symbol requirement, Section 2.7. 8. Removed the option for separate files for each sheet. All sheets are required to be in one file. 9. Revised revision procedure, Section 3.10. 10. Revised Appendix D. 11. Removed Drawing Types. 12. Added Metric Standards. 13. Added Requirement for Weight Control Data 14. Added Requirement for Electric Plant Impact Data 15. Added Requirement for HVAC Load Impact Data	**AJB 2Aug10**

References:

(a) MIL-PRF-28000, Digital Representations for Communication of Product Data: IGES Application Subsets and IGES application Protocols

(b) ASME Y14.100-2004, Engineering Drawing Practices

(c) ASME Y14.100, Appendix B, Non-Commercial Drawing Practices

(d) ASME Y14.100, Appendix C, Drawing Titles

(e) ASME Y14.100, Appendix D, Numbering, Coding and Identification

(f) ASME Y14.100, Appendix E, Markings on Engineering Drawings

(g) ASME Y14.24, Types and Applications Of Engineering Drawings

(h) ASME Y14.34M, Associated Lists

(i) ASME Y14.35M, Revision of Engineering Drawings and Associated Lists

(j) ASTM F 856 Standard Practice for Symbols – Shipboard Heating, Ventilation, and Air Conditioning (HVAC)

(k) S9086-RK-010-STM/CH505; Naval Ship's Technical Manual, Chapter 505; Piping Systems

(l) MIL-STD-25, Ship Structural Symbols For Use On Ship Drawings

(m) MSC Standard Drawing STD 803-7079667, Preparation of Selected Record Drawings (SRDs) for government owned Ships

(n) Naval Sea Systems Command's Ship Work Breakdown Structure For All Ships and Ship/Combat Systems (TMINS S9040-AA-IDX-020/SWBS 5D)

(o) MSC Standard Drawing 803-7081122; Military Sealift Command General Technical Requirements (GTRs)

(p) MSC Weight and Moment Engineering Process Instruction

Changes: Proposed changes to this drawing may be submitted to:

Military Sealift Command Technical Library
9276 3rd Ave, Bldg LP 26
Naval Station Norfolk
Norfolk VA, 23511
Attn: Dir. Technical Division Code N72
Ph: 202-685-5790

1. INTRODUCTION

This standard plan is intended to be used by all shipyards, design contractors, and MSC functional codes tasked with preparing, updating or reviewing Computer Aided Designed (CAD) drawings for government owned ships of the Military Sealift Command (MSC). This plan establishes a baseline for drawing format; content and development procedures for CAD generated drawings.

2. GENERAL

2.1. Drawing Format

CAD drawings shall be prepared using a vector format conforming to reference (a) Initial Graphics Exchange Standard (IGES) compatible with AutoCAD©. All CAD drawings submitted as a final submission shall be in AutoCAD© .dwg file format.

Selected MSC Standard Drawings, schedules, material/equipment listings, and calculations may be developed and submitted in either Microsoft Excel or Microsoft Word. Drawings developed and submitted in either Microsoft Excel or Microsoft Word shall be restricted to size A or B. All files of the drawing shall be in the same format. All files shall be backwards compatible to MS Office 2003 and AutoCAD 2004.

2.2. Drawing Standards

The following standards supplement this guide and should be considered the default for CAD drawing preparation for MSC:

- References (b) through (j)

New drawings for ships designed and built using the International System of Units (SI) shall be drawn and plotted in SI; new drawings for ships designed and built using Inch-Pound units shall be drawn and plotted in Inch-Pound units. Revisions to existing drawings shall use the system of units the drawing was originally prepared in. All dimensions in SI drawings shall be in millimeters and all dimensions in Inch-Pound drawings shall be in feet and inches. In certain cases exceptions are acceptable. For example, if an angle stiffener was originally rolled and dimensioned in Inch-Pound units is used as part of a structural revision of an SI designed ship, the angle can retain its Inch-Pound dimensions instead of artificially defining it in SI units with a hard conversion.

2.3. Standard Drawing Sizes

Drawing sizes shall be per reference (b). Drawings delivered to MSC shall be of sizes A, B or F. Size H may be used only where the requirements for complete decks to be shown without breaks and at specific scales, which makes the use of this size unavoidable. All sheets in multiple sheet drawings shall be the same size. See Table 2-1 for standard sizes.

Table 2-1. Standard Drawing Sizes

SIZE	WIDTH (INCHES)	LENGTH (INCHES)
A (HORIZONTAL)	8.5	11.0
A (VERTICAL)	11.0	8.5
B	11.0	17.0
F	28.0	40.0
H	28.0	44.0 (MIN)/143.0 (MAX)

SIZE	WIDTH (MM)	LENGTH (MM)
A4	210	297
A3	297	420
A2	420	594
A1	594	841
A0	841	1189

2.4. Color

The majority of MSC drawings are printed in black and white, the main exception being Fire Control Plans and Damage Control Display Plans. However, the use of color in a CAD drawing enhances both the CAD operator's and end user's ability to follow and understand the information contained on the CAD file. All colors assigned to a CAD file shall be done by Layer only. Use should be made of varied line widths and line types to indicate new items, existing items, and different systems on drawings. Wherever possible, line widths should be varied using Plines rather than pen widths to avoid problems with differing pen settings from user to user. Refer to Section 2.6 for specifics concerning MSC's Layering Convention for CAD drawings. All drawings shall be drawn on a black background.

2.5. Text Selection

The AutoCAD text font for MSC drawings shall be Romans for general text. Text for size A or B drawings produced in Microsoft Word shall be Times New Roman. Text for size A or B drawings produced in Microsoft Excel shall be Times New Roman. Note that examples herein are for illustration purposes and may not conform to these requirements due to reproduction limitations. The text size on full size drawings shall be as specified in Table 2-2, MSC Standard Letter Heights.

Table 2-2. MSC Standard Letter Heights

USE	LETTER HEIGHTS, INCHES	DRAWING SIZES
Size A drawings; Drawing Title	MS Word 16 point font or AutoCAD 0.16	Size A
Size A drawings; Size, Cage Code, SWBS, Drawing Number, Revision in title block, and general text	MS Word 12 point font or AutoCAD 0.12	Size A
Size A drawings; text inside tables	MS Word 10 point font or AutoCAD 0.10	Size A
Drawing Title, Size, Cage Code, SWBS, Drawing Number, and Revision in title block	0.188	All larger than Size A
Ship Name and Number, Scale, Drawing Type, Sheet Numbers, Approval Signatures and Dates in title block	0.125	
Section and Tabulation Letters	0.240	
Zone Letters and Numericals in border	0.175	
Dimensions, Tolerances, Limits, Notes, Subtitles for Special Views, Tables, Revisions and Zone Letters for the body of the drawings	0.125	Up to and including Size B
	0.150	All larger than Size B
All other Characters	0.125	All larger than Size A

2.6. Layering Convention

Layers, colors and line widths shall be used to separate entities in drawings both to make them easier to identify, and to make the future modification of drawings simpler. Subject geometry should be produced in full size (1:1 Scale) in model

space. Text, dimensioning, annotations, piece numbers, part callouts, etc. shall be produced in the paper space layout. Each sheet of the drawing shall be on a separate tab in paper space. Specific requirements for layers and line type for all MSC drawings are shown in Table 2-3. Table 2-4 provides additional examples of layers which can be used during drawing development. Readability of plotted and displayed drawings must be considered when selecting laying colors.

Table 2-3. Required CAD Layers

REQUIRED LAYERS			
LAYER	**COLOR**	**LINE TYPE**	**DESCRIPTION**
0	White	CONTINUOUS	AutoCAD Default, Blocks are Permitted.
FORMAT (Title Block and Border)	White	CONTINUOUS	Title blocks, Borders, Tables, References and Notes
TEXT	White	CONTINUOUS	Reference Text, Titles, Drawing Numbers, Revision Text, Title Block Text
CENTERLINE	YELLOW	CENTER	Centerline of Ship, Middle Line of Equipment

Table 2-4. Example CAD Layers

EXAMPLE CAD LAYERS			
LAYER	**COLOR**	**LINE TYPE**	**DESCRIPTION**
STRUCTURE or SHIP	White	CONTINUOUS	Structural elements of ship or the ship's hull form (Bulkheads, Decks, etc.)
FURNITURE	CYAN	CONTINUOUS	Furnishings & Outfitting
EQUIPMENT	GREEN	PHANTOM	Pumps, Engines, etc.
NEW	MAGENTA	CONTINUOUS	New additions or modifications to the drawing. Can be sub-layer to an existing layer. (i.e. New Equipment or System Mods)
FLUID SYSTEMS	Per reference (k), Table 505-7-1 within the practical limits of the CAD system.	VARIOUS	Each system to have separate line type and layer.

2.7. Symbols

Standard symbols and line types shall be used in all MSC drawings. Symbols and line types to be used in MSC drawings shall be per section 4.19 of reference (b) unless otherwise stated herein. All symbols used in MSC AutoCAD drawings during drawing development shall be inserted into the drawing as a block with a unique block name. Additional unique symbols may be added to drawings as circumstances demand. All symbols used in a drawing must be defined in the drawing, including standard symbols. See Section 3.11 for more information on symbols.

Symbols and line types to be used in ship's structural drawings shall be per reference (l). Symbols for Fire Control Plans shall be as directed in reference (m).

2.8. Reproduction Scale Bars

Reproduction scale bars, depicted in Figure 2-1, shall be shown on every sheet of all scaled drawings to assist users working with reduced size/odd size prints. Such bars are not to be added to non-scale drawings such as distributive system diagrams. A 10 ft (3 m) scale bar shall be added to arrangement drawings showing only one or two compartments; a 50 ft (15 m) scale bar shall be added to arrangement drawings showing a large portion of a deck, such as General Arrangement drawings.

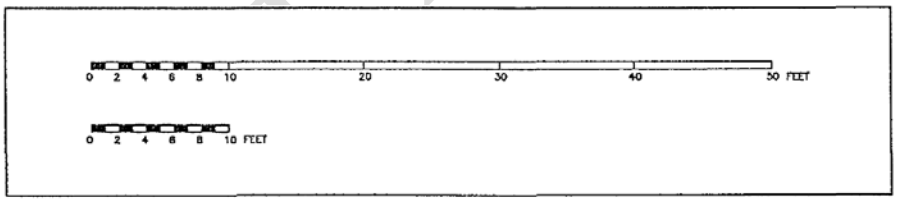


Figure 2-1. Reproduction Scale Bars (Feet Shown)

2.9. Delivery Requirements

2.9.1. Ship Work Breakdown Structure (SWBS) and Drawing Numbers

SWBS (or Group) and drawing numbers shall be assigned to all MSC drawings.

Ship Work Breakdown Structure (SWBS) numbers are three digit numbers used to identify a ship's system or drawing type. Refer to reference (m) for Selected Record Drawings SWBS numbers. All Function Design Drawings

shall have 800 SWBS numbers assigned. A complete listing of SWBS numbers can be found in reference (n).

Drawing numbers are a seven digit number assigned to each drawing for identification purposes. Drawing numbers are assigned by the MSC Technical Library. Contractors may request drawing numbers through their TPOC or directly from the MSC Technical Library. When contractors make requests directly, they shall include the TPOC in any email correspondence. All requests should, as a minimum, provide Ship or Ship class and the alteration title. If known, the request should also include System and proposed Drawing Title. The MSC Technical Library's email address is Email: MSCTECHLIBRARY@NAVY.MIL. Phone: 757-443-2627.

2.9.2. **Electronic Files**

All files delivered with an MSC assigned drawing number shall be in a single software format. For example, if a drawing is in AutoCAD then all sheets will be in the AutoCAD format with a ".DWG" file suffix. If the file is in EXCEL then all sheets including the cover sheet and revision sheets will be in the Excel format with ".XLS" file suffix. All files shall be backwards compatible to 2003 for MS Office and 2004 for AutoCAD files.

Drawings can be submitted on CD-ROM. Each drawing shall be stored in a directory named with the seven digit drawing number. The file shall include all sheets of the drawing and named with the seven digit MSC drawing number and Rev. For example, MSC Drawing No. 7654321 Rev C consisting of sheets 1C, 2A, 2A, 3B,… 115A would be stored and named as follows:

Directory: C:\7654321

With file: 7654321C

Existing drawings developed in CAD with each sheet as an individual file shall include seven digit drawing number, revision and sheet number. For example; Existing MSC Drawing No. 320-4569870 Rev D consisting of only one sheet of a multi-sheet drawing would be stored and named as follows:

Directory: C:\4567890

With file: 4567890D_SHT_2

All AutoCAD drawings delivered to MSC shall use only AutoCAD standard menus, line types and fonts as supported by a standard AutoCAD installation.

Custom menus, unique line types, etc., must be replaced before delivery. All drawings made using AutoCAD's XREF feature must have all the XREF's bound into the drawing prior to delivery.

3. DRAWING ELEMENTS

3.1. Format

Locations are assigned for the following standard drawings elements:

- Title Blocks
- Signature Blocks
- Drawing Border and Zone Markings
- Regulatory Body Approval Block
- References
- Reservations
- Security Notes
- General Notes
- Applicable Ships
- Revisions
- Symbols and Abbreviations
- Weight Control Data
- Electric Plant Distribution Impact Data
- HVAC Load Impact Data
- List of Abbreviations
- Key Plan/Elevation
- Revision Status of Sheets

Each of the above listed elements is discussed in the following subsections of this Guide. The arrangement of the elements on the drawing shall be as shown in Appendixes A, B, C, D and E. All documents assigned a MSC drawing number shall utilize this standard format.

AutoCAD block files for the above listed drawing elements are available upon request.

3.2. Title and Signature Blocks

The format for the Title Block and MSC Signature Block is shown in Figure 3-1. Areas shown as APPVD1, TITLE1, DRAWING, REV, etc., in Figure 3-1 are to be added using AutoCAD attributes to aid in modifying the drawing by MSC.

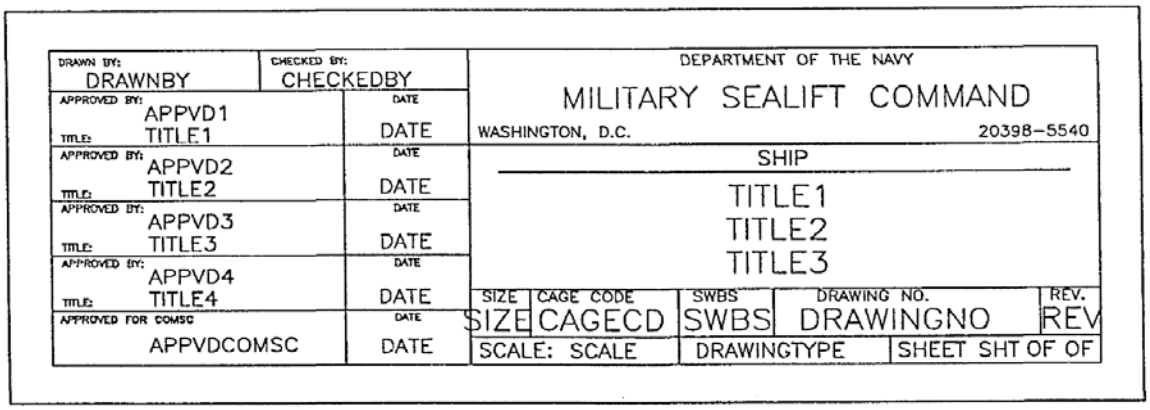


Figure 3-1. Title and Signature Blocks Template

3.2.1 Title Block

3.2.1.1 Drawing Title

The drawing title is a short description of the drawing's contents. For example, "General Arrangements and Profiles" would show the general arrangement and outboard/inboard profiles of a particular ship. If further explanation is required, a sub-title can be added to the drawing title; for example, "General Arrangements and Profiles – Arrangement of Main Deck". Use of Abbreviations is authorized in accordance with Reference (b).

The drawing title shall be located in the spaces indicated by "Title1, Title2, and Title3" in Figure 3-1. Drawing title text height shall be in accordance with Table 2-2. Drawing titles must be approved by the MSC Technical Point of Contact (TPOC) or Project Engineer.

3.2.1.2 Ship

The ship name and number or ship class shall be provided just above the drawing title as shown in Figure 3-1. Examples are USNS COMFORT (T-AH 20)" or "T-AH 19 CLASS". Text height shall be in accordance with Table 2-2.

3.2.1.3 Drawing Size

Indicate the drawing size of the drawing in the space marked "Size" in Figure 3-1. The drawing's size shall be indicated by a capital letter specifying the standard drawing size. Text height shall be in accordance

with Table 2-2. For example, a standard size F drawing would be indicated by a capital "F". See section 2.3 on drawing sizes.

3.2.1.4 Cage Code

The five digit Commercial and Government Entity (CAGE) Code for MSC is "94421". This shall be provided in the appropriate box of the title block. Text height shall be in accordance with Table 2-2.

3.2.1.5 SWBS Number

The three digit SWBS number shall be provided in this section of the title block. See section 2.9.1 for more information on SWBS numbers. Text height shall be in accordance with Table 2-2.

3.2.1.6 Drawing Number

The seven digit MSC Drawing number shall be provided in this section of the title block. See Section 2.9.1 for more information on drawing numbers. Text height shall be in accordance with Table 2-2.

3.2.1.7 Revision

The "REV" box shall show the identifying revision letter of the current page. The revision letter shall be shown by a capital letter and text height shall be in accordance with Table 2-2.

3.2.1.8 Revision Status of Sheets

The Revision Status of Sheets shall be shown on the first sheet. It is preferred to be above the title block and shall reflect all the sheets in the drawing and the present applicable revision letter.

3.2.1.9 Total Number of Sheets

For drawings developed as A and B size, the total number of sheets may be different than the actual last page number used. Individual pages are added to the body of the drawing with an numeric number followed by an alpha. For example there may be a sheet 4 and sheets 4A and 4B are added to the plan increasing the total number of pages by 2. Add the Total Number of Pages in the space below the title block under the type of drawing and shown in Figure 3-1. These added sheets shall also be reflected in the Revision Status of Sheets block Referenced in 3.2.1.8.

3.2.1.10 Scale

The drawing's scale shall be indentified in this location. If the drawing is not drawn to scale, the word "None" should be provided. Text height shall be in accordance with Table 2-2.

3.2.1.11 Drawing Type

The type of drawing shall be identified in this location. Text height shall be in accordance with Table 2-2. For example a Functional Design Drawing would have "Functional Design" listed under the SWBS number.

Standard drawing types are defined in MSC's Drawing GTRs.

3.2.1.12 Sheet Numbers

The sheet number is shown in the lower right corner of the title block. The first sheet is numbered "Sheet 1" or Sheet 1 of X," where X is the total number of sheets contained in a multiple sheet drawing. The following sheets shall show "Sheet Y of X," where Y is the specific sheet number. Text height for sheet numbers shall be in accordance with Table 2-2. Insert sheets should be labeled with a capital letter after the number. For example, insert sheet 2A.

3.2.2. MSC Signature Block

3.2.2.1. Final Approval

Once final MSC approval has been obtained, MSC approval signatures, titles and dates shall be entered into the drawing files as indicated below. Approval names, titles and dates shall be typed, with text height in accordance with Table 2-2, in the following manner:

- Approval Name: First initial and full last name; for example: J. Smith.
- Title: Approving person's title; for example: "Project Engineer."
- Date: Entered as MM/DD/YY; for example: 02/24/

3.2.2.2. Drawn By

Enter the initials of the person who developed the drawing. If the drawing is developed by a contractor, place "N/A" in this block and the contractor's signature block discussed in section 3.2.3 will apply

3.2.2.3. Checked By

Enter the initials of the person who checked the drawing. If the drawing is developed by a contractor, place "N/A" in this block and the contractor's signature block discussed in section 3.2.3 will apply.

3.2.2.4. Approved By

Enter the Names and Title of the approving personnel. The actual date of signature shall be entered for the approved date.

3.2.2.5. Approved By COMSC

Enter the Name and Title of the person signing for COMSC Approval. The actual date of signature shall be entered for the approved date.

3.2.3. Contractor Signature Block

Contractors developed drawings, with the exception of A size drawings, shall have a contractor signature block adjacent to the MSC signature block. The format of the contractor signature block is up to the contractor. However, the contractor's name, address, the names of contractor personnel drawing and approving the drawing, and appropriate approval dates shall be provided.

3.2.4. Continuation Sheet Title Block

On multiple sheet drawings, the continuation sheet title block is used on all following sheets (see Figure 3-2).

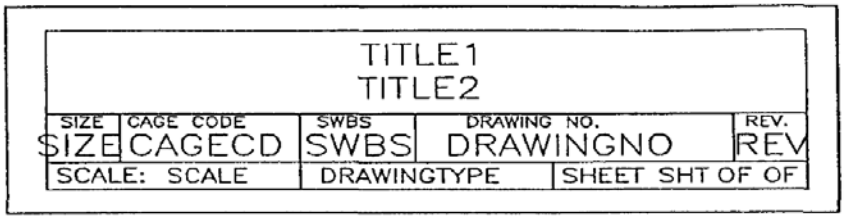


Figure 3-2. Continuation Sheet Title Block Template

3.2.4.1. Drawing Title

The first line of the title on the continuation sheet title block shall match the main title of the drawing (first line of sheet one). The second line can be a sub-title explaining the contents of the sheet. For example: "General Arrangements and Profiles – Arrangement of 01 & 02 Decks."

3.2.4.2. Sheet Numbers

The sheet number is shown in the lower right corner of the title block. Continuation sheets shall be numbered in the following format: "Sheet Y of X" where Y is the specific sheet number and X is the total number of sheets contained in a multiple sheet drawing.

3.2.5. Vertical Border Drawing Number Block

On all MSC drawings a vertical border drawing number block shall be provided in the right hand side border of the drawing. See Figure 3-3 for format.

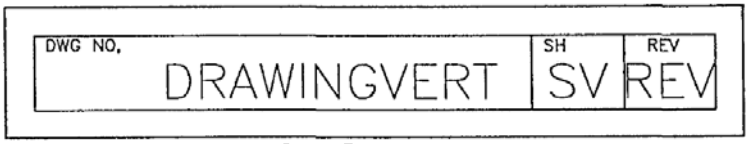


Figure 3-3. Vertical Border Drawing Number Block

3.3. Drawing Border and Zone Markings

All drawings shall have horizontal zones numbered from right to left starting at 1 on the first sheet and running continuously throughout the drawing. Letters shall be used for the vertical zone designations starting with A at the bottom of each sheet. Zones on continuation sheets shall be sequentially numbered. For example, the second sheet of an F size drawing will start with zone 9-A in the bottom right corner, sheet 3 will start with zone 17-A. If an insert sheet is added, the insert sheet shall have alphabetic zone designators continuing the lettering scheme of the sheet it is inserted after. For example, if sheet 3 is zoned 17-A through 24-H, then insert sheet 3A will be zoned 17-I through 24-P.

3.4. Regulatory Body Approval Block

If the drawing is submitted to a regulatory body for review and approval, an approval block must be included on the first sheet. The regulatory body approval block template is shown in Figure 3-4. Text height shall be in accordance with table 2-2.

- Submitted To – Name or abbreviation of the regulatory body the drawing was submitted to.
- Submit Date – Date of submittal letter to the regulatory body soliciting their review and approval.
- Re-submit Date – Date of the re-submittal letter to the regulatory body, if the first submittal of the drawing is not approved.
- Approval Date – Date stamped on the approved drawing.
- Approval Number – Approval number or reference number.

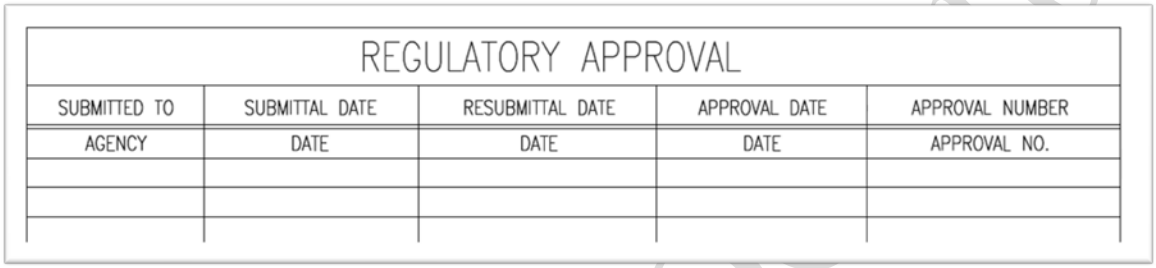


Figure 3-4. Regulatory Body Approval Block Template

3.5. References

The reference block template is shown in Figure 3-4. Each drawing reference must be referred to in the field of the drawing, or in a drawing note or general note, for example, "For location, see Ref. 1." Drawing references are often ship drawings depicting existing structure, systems, etc. which are being tied into by the subject installation or modification. When referencing a drawing, do not identify the drawing revision when writing out the reference, for example do not write "Rev. A". This is to avoid having to check and update all the drawing references if drawing revisions are later made. Text height shall be 0.125 inch.

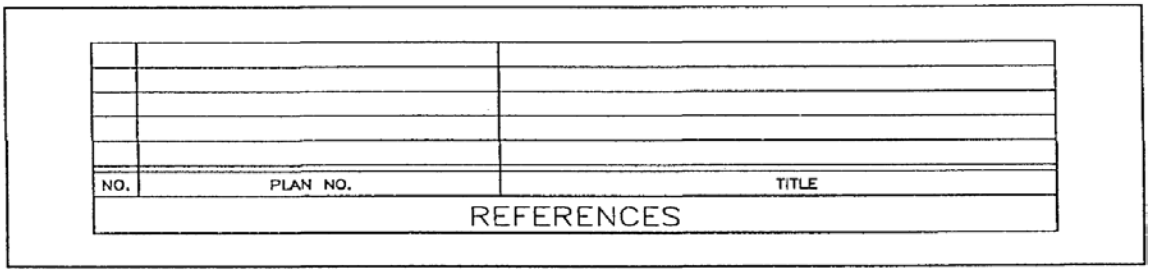


Figure 3-5. Reference Block Template

3.6. Reservations

The reservation block template is shown in Figure 3-6. A reservation is used to identify items on the drawing that need to be verified on a future shipcheck or are awaiting vendor information or approval by MSC. The reservation description must be terse. All reservations shall be cleared before final submittal of the drawing. Text height shall be 0.125 inch. Examples are "Verify Information" or "Waiting for Vendor Information." A cloud containing the Reservation Number shall be used to identify where each reservation applies in the body of the drawing. An example is shown in Figure 3-7. Final drawing should not be submitted with any reservations.

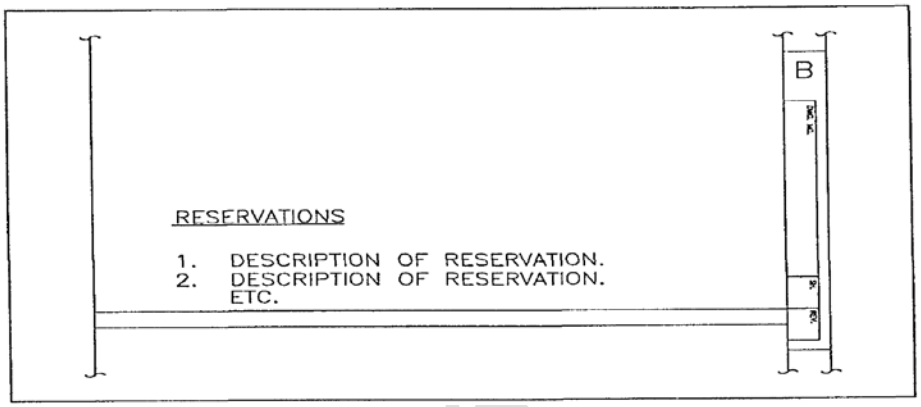


Figure 3-6. Reservation Block Template

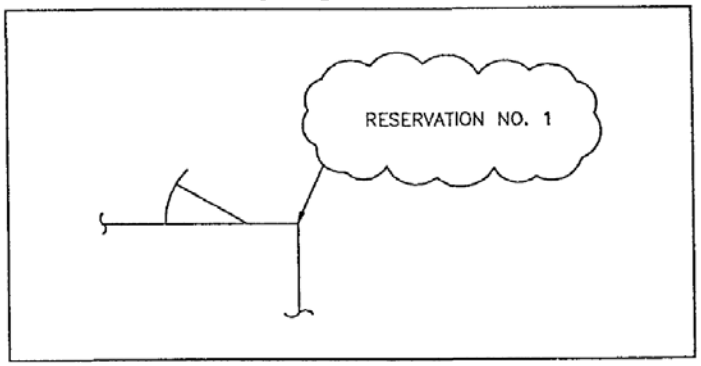


Figure 3-7. Example of Drawing Reservation

3.7. Security Notes

Space shall be provided in each drawing for any required security notes. Drawing classification, security notations, distribution statements, federal statute and group marking, and safety notes shall be addressed as applicable. The MSC TPOC shall determine if security notes are required and shall provide same. Text height shall be 0.125 inch.

3.8. General Notes

Each drawing shall include general notes which provide pertinent information. The template for the general notes block is shown in Figure 3-8. Specific notes may be required for certain types of drawings. For example, all Functional Design Drawings include the notes stating the drawing is for guidance only and are part of a work specification; all fluid system drawings include the note, "All dimensions are in inches. All sizes are nominal pipe size." Drawing notes which are tasking statements are not permitted. General notes which are broadly applicable to the drawing need not be referenced in the body of the drawing; these notes apply to the entire drawing. However, specific notes applicable to drawing details must be referred to in the body of the drawing at the locations to which they apply. Text height shall be 0.125 inch. General Notes shall not include tasking or specific work that needs to be accomplished.

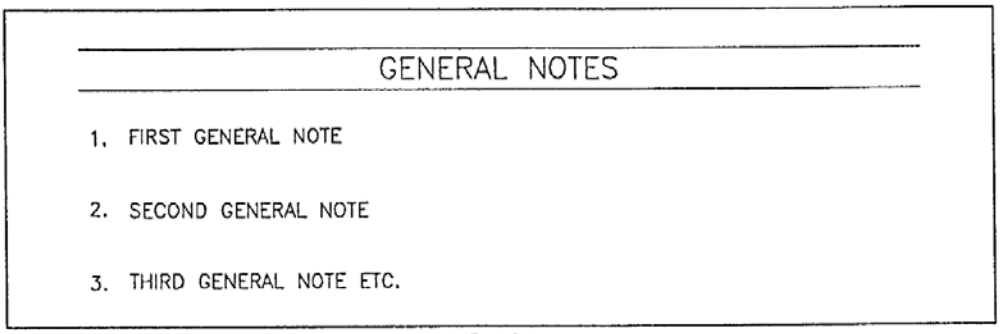


Figure 3-8. General Notes Block Template

3.9. Applicable Ships

Each drawing shall include an Applicable Ships table listing the ships covered by the drawing. The template for the Applicable Ships block is shown in Figure 3-9. The Ship's Name, Hull Number and Design Class shall be provided in the table. Text height shall be 0.125 inch. For example, USNS HENRY J. KAISER, T-AO187, T-AO 187 Class.

APPLICABLE SHIPS

NAME	NO.	CLASS
SHIPS NAME	T–SHIP NUMBER	CLASS OF SHIP

Figure 3-9. Applicable Ships Block Template

3.10. Revisions

Preliminary drawing revisions that are not yet approved shall use sequential alpha numeric numbers to denote preliminary revisions. Preliminary revisions shall follow a "-1" (Initial Issue), "-2", "-3", etc. numbering system. All changes made to preliminary drawings or "-2" and higher shall be documented in the Revision write-up block. Once the drawing or revision development and review is complete, and the final product is approved by the MSC TPOC the drawing revision shall be issued by the MSC TPOC. For example, a new drawing sequence would, in preliminary stages, be "Rev -1", "Rev -2", "Rev -3", etc until the original issues "Rev –"is issued. If the drawing was existing "Rev D" being revised to "Rev E", the sequence would be "Rev E1", "Rev E2", "Rev E3" and so on with the final issue being "Rev E". .If the drawing is new it shall be issued in accordance with the paragraph below. If the drawing is not new the next subsequent letter revision shall be added. For a new drawing all the preliminary revision write-ups shall be deleted and revision shall be noted per the paragraph below or "Rev –".

Initial drawings are issued as "Rev. –", this is the version which is signed and approved by MSC. Subsequent drawing revisions follow the A, B, C, etc. lettering system. Reference (i) shall be utilized for revision control. As such, letters I, O, Q, S, X and Z should not be used as revision letters. The drawing developer is permitted to make changes on his own during development of the preliminary drawing (see below). After the drawing is signed and approved, configuration control is strict and changes may only be made with MSC TPOC authorization.

The drawing revisions block template is shown in Figure 3-10. The following is a brief outline of procedures for incorporating drawing revisions.

- Revisions shall be made, within AutoCAD, by deletion, crossing-out, addition of information, or by redrawing. When the crossing-out method is used, a series of 45 degree parallel lines shall be drawn through the item being deleted. The spacing of the 45 degree parallel lines should be such that when the corresponding text is crossed out, it should be readable when printed on a reduced page. For example, "F" Size drawings are printed on 11" x 17" pager and the words shall be readable to the user. "F" Size drawings printed on any paper smaller than 11" x 17' paper does not need to be readable. The superseding data, if any, or reference to its location, shall be placed near the area crossed-out and shall be indicated by a revision letter contained within a triangle.

- A drawing revision may include multiple changes. If this is the case, each change shall be numbered to permit ready identification. These numbers shall be entered in the "description" column along with a brief description of each change per reference (b). All zones affected by each numbered change shall be noted in the "zone" column. Also, the revision letter and change number shall be indicated in the body of the drawing adjacent to each change location using a triangle with the revision letter inside and the change number noted as a superscript outside the triangle. An example of a revision triangle is shown in Figure 3-11.

- The change shall be briefly described in the form of "added…", "deleted…", "modified…", "changed…", "increased…" etc. Each entry shall provide sufficient information for a drawing reviewer or user to understand what was changed. For example – if the drawing changed a cable type. The revision write-up should say "1. CHANGE CIRCUIT (04-145-1)-1P-A CABLE TYPE (WAS LSDSGU-3). Adding "(WAS…)" is sufficient for the reader.

- When a drawing revision has been completed and approved by the MSC TPOC, the approval date is entered into the "date" column and the TPOC's first initial and last name are added to the "APPVD" column.

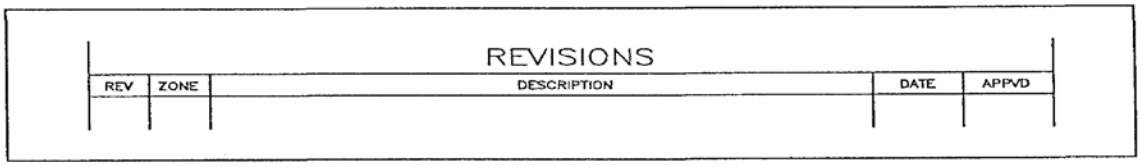


Figure 3-10. Revisions Block Template

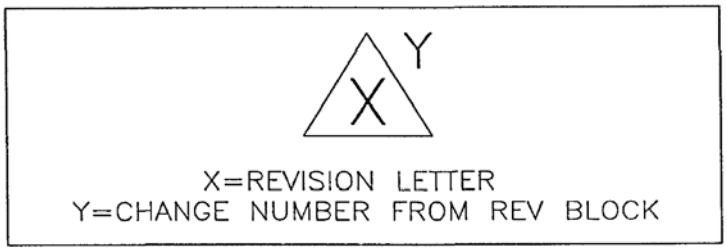


Figure 3-11. Revision Triangle Template

The revision status block template is shown in Figure 3-12. This block is used to note the current revision statues of each drawing sheet. All sheets of the drawing shall have their revision status changed. Thus if Sheets 4 and 5 of a 10-Sheet

"Rev. –" drawing are modified, all sheets shall become "Rev. A". The revision note shall state that "All sheets have been changed to the latest revision letter".

Refer to reference (b) when adding, replacing or deleting a sheet of an existing drawing. (NOTE: An existing sheet is never deleted, only superseded or replaced.)

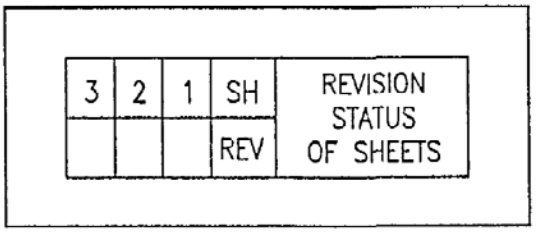


Figure 3-12. Revision Status Block Template

3.11. Symbols and Abbreviations

The standard symbols to be used in MSC drawings are addressed in Section 2.7. Additional unique symbols may be added to drawings as circumstances demand.

Each drawing shall list all symbols and abbreviations used in the drawing, even MSC standard symbols and those abbreviations which appear in reference (b). Do not include any symbols or abbreviations in the lists which do not appear in the drawing. The List of Symbols template is shown in Figure 3-13. An example of a List of Abbreviations is shown in Figure 3-14.

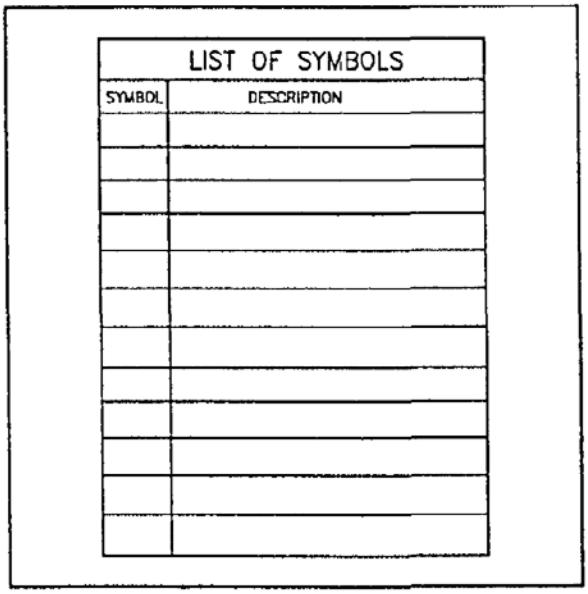


Figure 3-13. List of Symbols Template

LIST OF ABBREVIATIONS

FDP ---------- FUSED DISTRIBUTION PANEL
FIL ---------- FILTER
FWE---------- FURNISHED WITH EQUIPMENT
GCC---------- GROUP CONTROL CENTER
INST ---------- INSTANTANEOUS TRIP CENTER
LCP---------- LOAD CENTER PANEL
LLC---------- LIGHTING LOAD CENTER
LTD---------- LONG TIME DELAY TRIP SETTING
M---------- MOTOR
PWR PNL ---------- POWER PANEL
STD ---------- SHORT TIME DELAY TRIP SETTING
UVR---------- UNDER VOLTAGE RELEASE
GFI ---------- GROUND FAULT INDICATOR
PASS ---------- PASSAGE
U ---------- UNKNOWN

Figure 3-14. Example of List of Abbreviation

3.12. Weight Control Data

The Weight Control Data Block shall be utilized to track weight and moment changes resulting from changes depicted in the drawing. When no weight changes result from the drawing in question, "NC" for No Change shall be applied to each of the fields in the first row above the column names. An example of a Weight Control Data Block Template is shown in Figure 3-15. Additional guidance regarding weight control is available in reference (p).

SWBS NUMBER	WEIGHT (lbs)	VERTICAL CENTER (ft ABL)	VERTICAL MOMENT (ft lbs)	LONG. CENTER (ft AFP)	LONG. MOMENT (ft lbs)	TRANSVERSE CENTER (ft, + stbd)	TRANSVERSE MOMENT (ft lbs)

WEIGHT CONTROL DATA

Figure 3-15. Example of Weight Control Data Block Template

3.12.1. SWBS Number

The SWBS number assigned shall be based on the individual systems being modified. A complete listing of SWBS numbers can be found in reference (n).

3.12.2. Weight

Total weight, in pounds or kilograms, computed from the Functional Design Drawings. This calculation requires calculating the weight of each item required by the list of material

3.12.3. Vertical Center

The vertical distance, in feet or meters above the baseline of the ship to the center of gravity of an item

3.12.4. Vertical Moment

Value obtained by multiplying the weight times the vertical center

3.12.5. Longitudinal Center

The horizontal distance, in feet or meters forward or aft from the ship's forward perpendicular to the center of gravity of an item.

3.12.6. Longitudinal Moment

Value obtained by multiplying the weight times the longitudinal moment.

3.12.7. Transverse Center

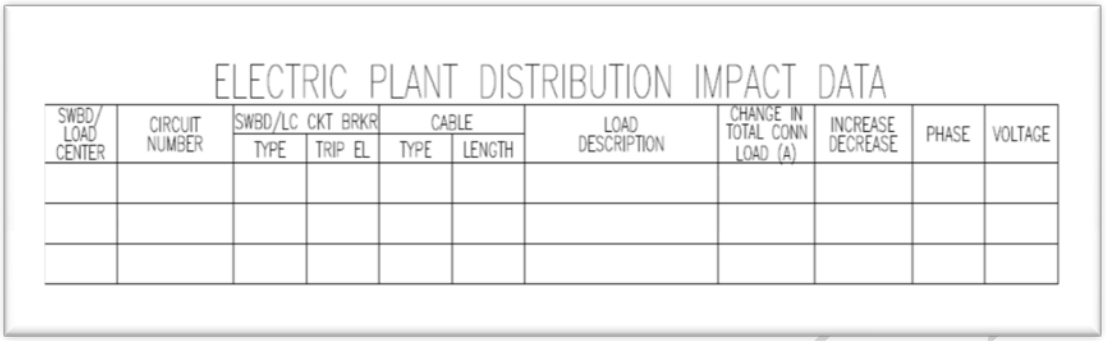
The horizontal distance, in feet or meters from the ship's centerline to the center of gravity of an item.

3.12.8. Transverse Moment

Value obtained by multiplying the weight times the distance to the transverse center.

3.13. Electric Plant Load Impact Data

The Electric Plant Load Impact Data Block shall be used to calculate all changes to the Electrical load changes resulting from changes depicted in the drawing. An example of an Electric Plant Load Impact Data Block is shown in Figure 3-16


ELECTRIC PLANT DISTRIBUTION IMPACT DATA

SWBD/ LOAD CENTER	CIRCUIT NUMBER	SWBD/LC CKT BRKR		CABLE		LOAD DESCRIPTION	CHANGE IN TOTAL CONN LOAD (A)	INCREASE DECREASE	PHASE	VOLTAGE
		TYPE	TRIP EL	TYPE	LENGTH					

Figure 3-16. Example of Electric Plant Distribution Impact Data Block Template

3.13.1. Switchboard (SWBD)/Load Center

The switchboard or load center that the subject electrical load emanates from and impacts**.**

3.13.2. Circuit (CKT) Number

The switchboard or load center circuit number that the subject electrical load is designated as.

3.13.3. SWBD/Load Center (LC) CKT BRKR

3.13.3.1. Type

Manufacturer or style/type of circuit breaker being added by subject electrical load.

3.13.3.2. Trip Element

Size in amps of circuit breaker trip element or continuous current setting.

3.13.4. Cable

3.13.4.1. Type

Type of cable being installed to support the subject electrical load.

3.13.4.2. Length

Type of cable being installed to support the subject electrical load.

3.13.5. Load Description

Description of subject electrical load.

3.13.6. Change in Total Conn Load

Variance in amperage directly related to subject electrical load.

3.13.7. Increase or Decrease

Indicate if the variance in amperage form paragraph 3.13.6 is an increase or decrease in electrical loading.

3.13.8. Phase

Indicate if 1-phase or 3-phase electrical load.

3.13.9. Voltage

Indicate voltage of subject electrical load.

Heating, Ventilation and Air Conditioning (HVAC) load Impact Data – UNDER DEVELOPMENT

3.14. Key Plan/Elevation

Where necessary for clarity, a key plan or key elevation shall be provided on a complex drawing to illustrate the area on the ship affected by the drawing. One or more adjacent spaces in all directions surrounding the affected area may also be shown. The key plan scale shall normally be 1/8 inch or 1/16 inch equals one (1) foot in Inch-Pound units and 1:100 or 1:200 in SI units. The area on the ship affected by the drawing shall be shown in a phantom line. Section lines in key plans shall be shown with bold poly lines and labeled following standard drawing practiced. The ship's centerline, baseline and other reference lines and frame numbers shall be shown in addition to all accesses to compartments and compartment names and numbers. The key plan or key elevation shall be oriented in the same direction as other views shown on the drawing to the extent practicable. Since the purpose of a key plan or elevation is to orient the drawing user, it is not intended to be scaled. Thus, the scale of the key plan/elevation shall not be noted nor shall a reproduction scale bar be added to the key plan/elevation. Examples of a key plan and a key elevation are shown in Figures 3-15 and 3-16, respectively.

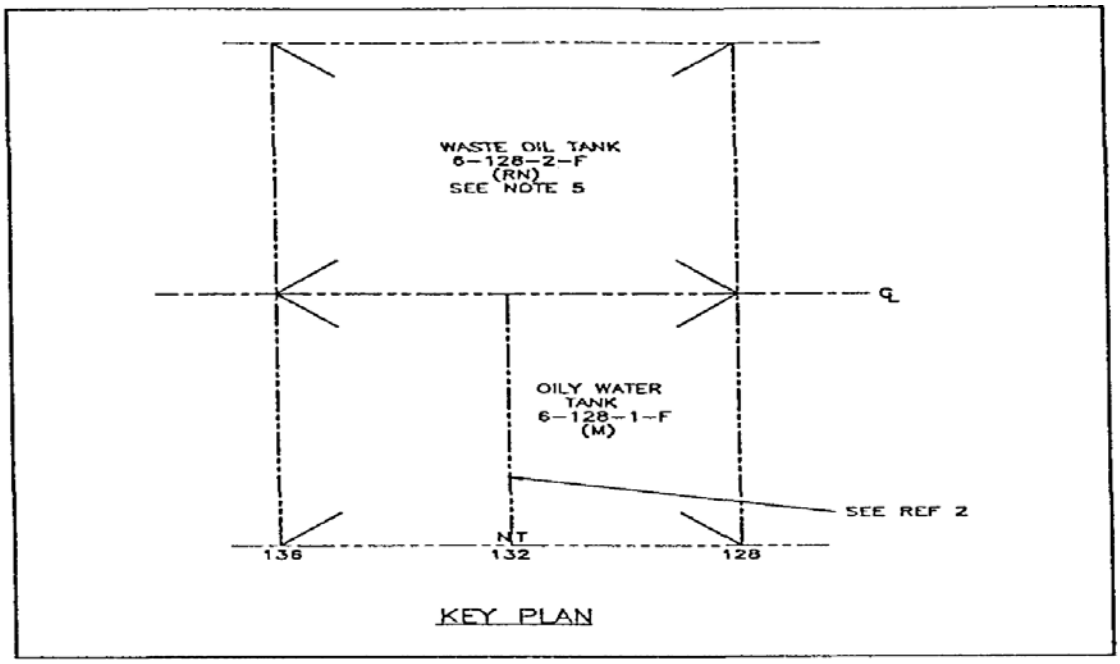


Figure 3-17. Example of Key Plan

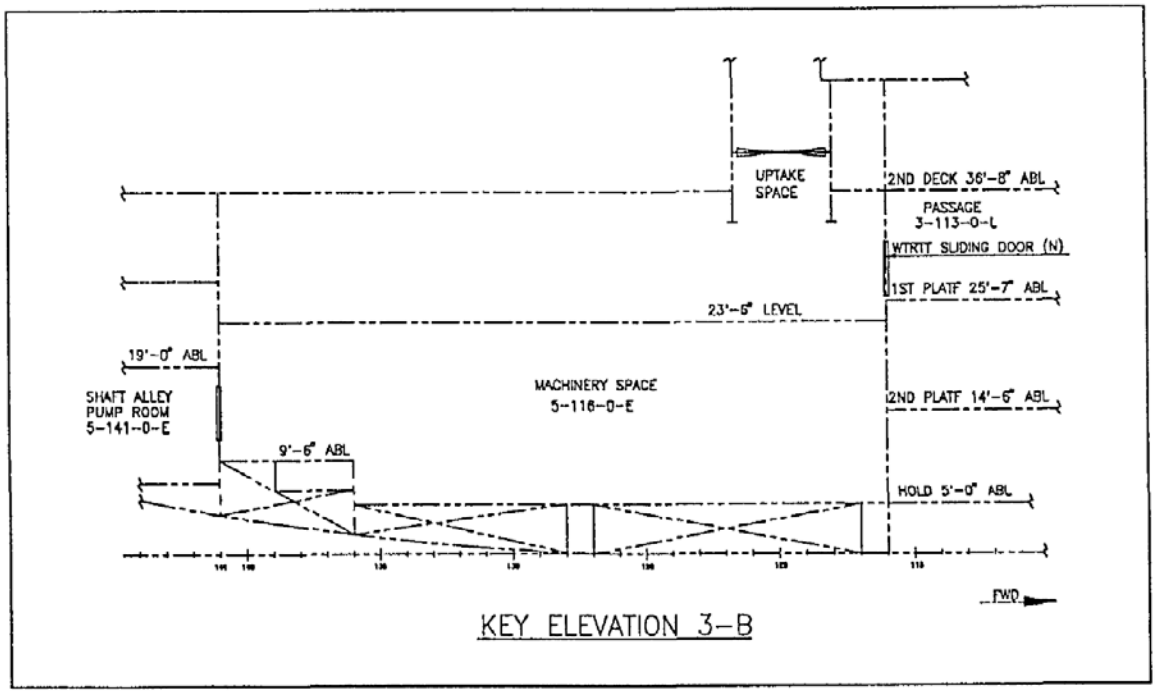
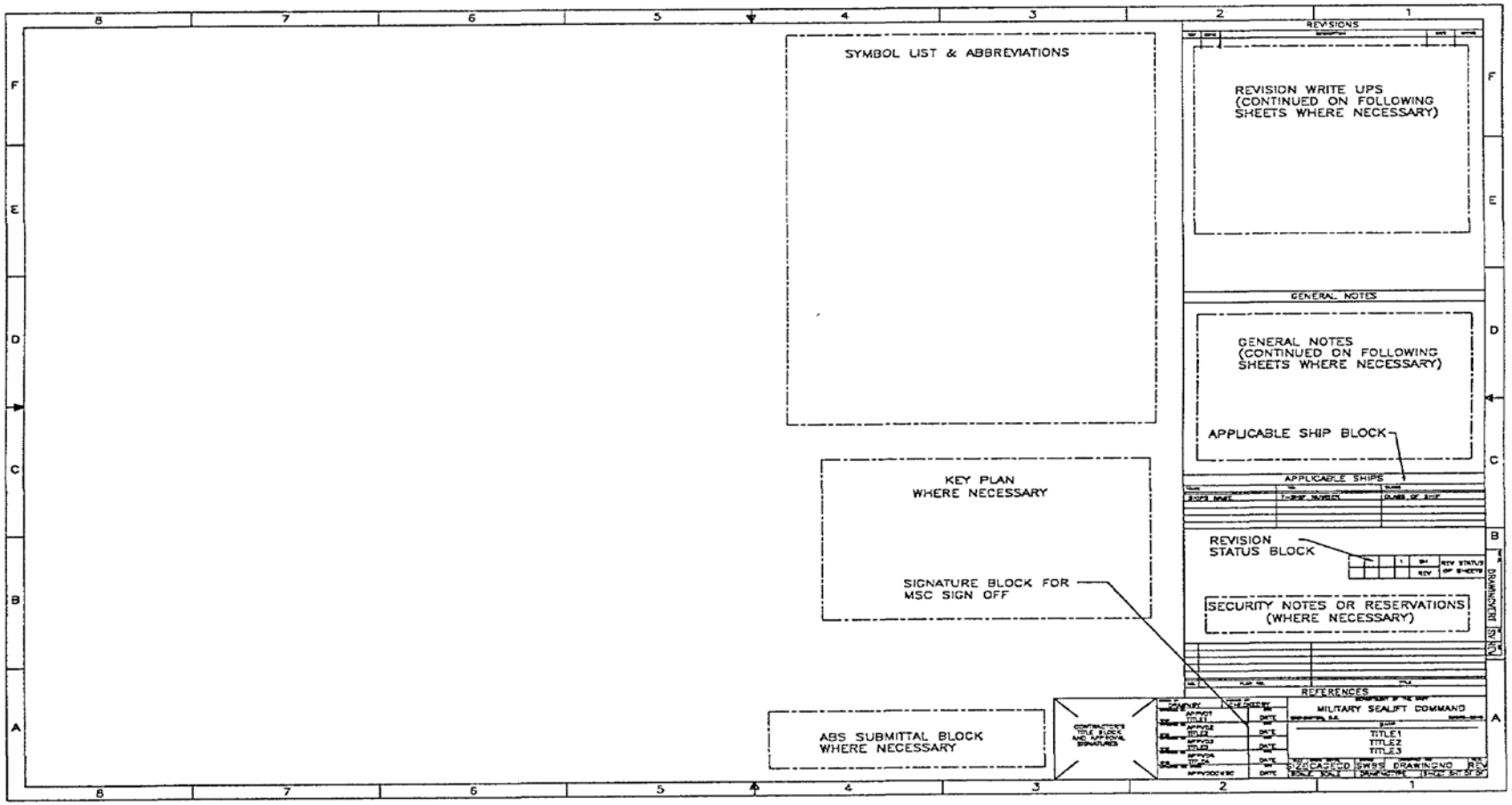
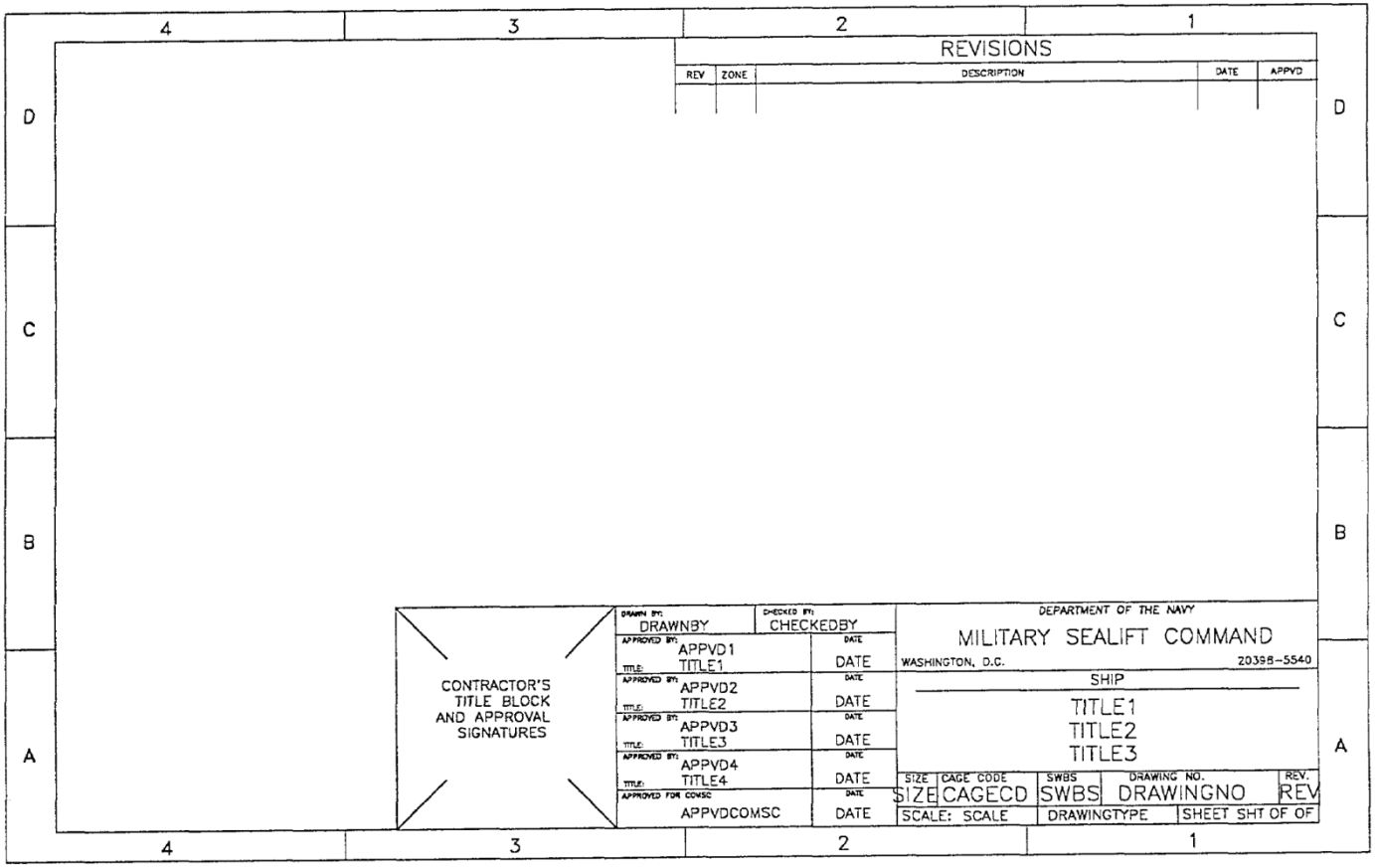


Figure 3-18. Example of Key Elevation

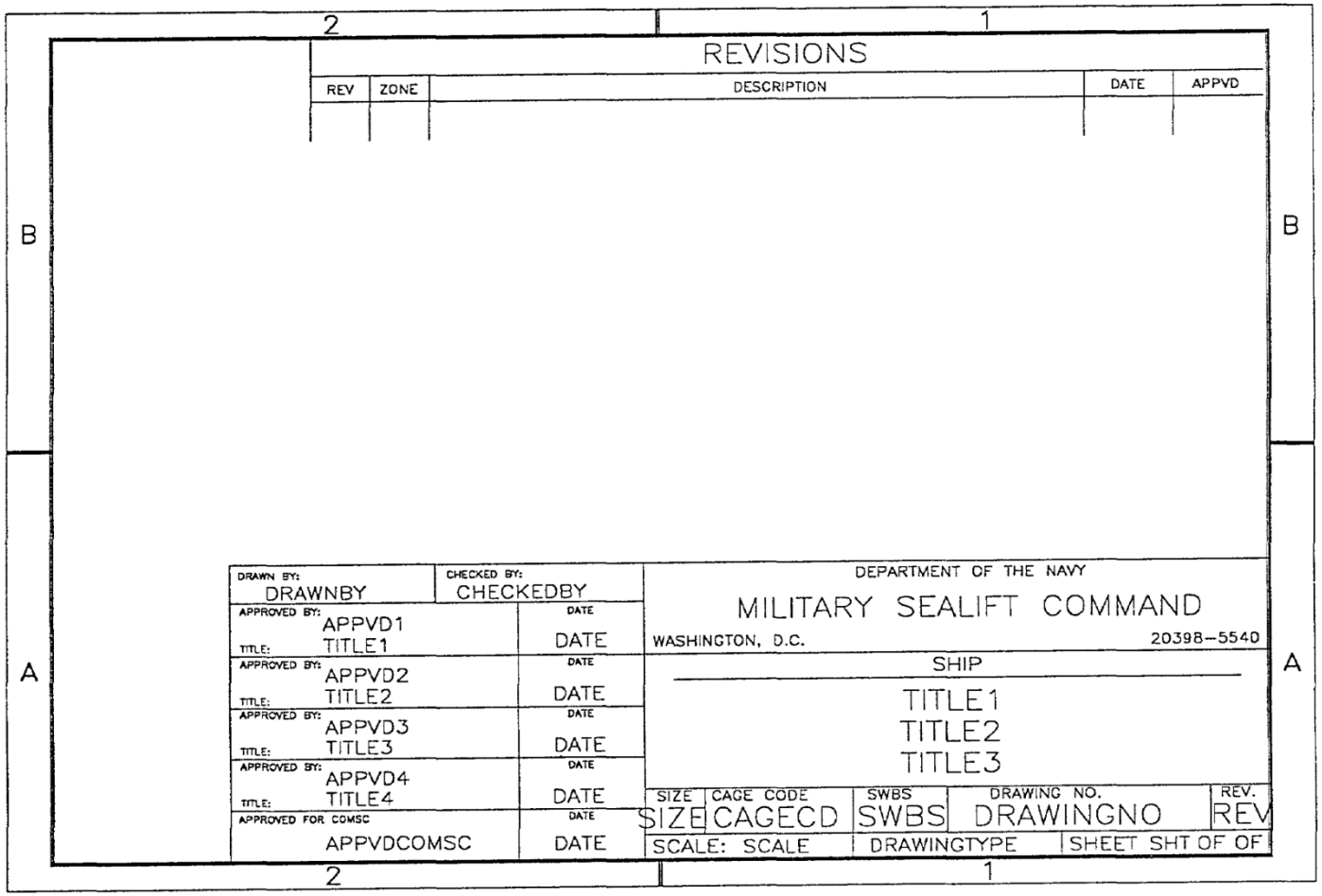
Appendix A – Drawing Layout for F and H Size Drawings



Appendix B – Drawing Layout for B Size Drawings



Appendix C – Drawing Layout for A Size Drawings (Horizontal Orientation)



Appendix D – Drawing Layout for A Size Drawings (Vertical Orientation)

PREPARATION OF

COMPUTER AIDED DESIGNED (CAD) DRAWINGS

FOR GOVERNMENT OWNED SHIPS

DRAWN BY: / CHECKED BY:		DEPARTMENT OF THE NAVY **MILITARY SEALIFT COMMAND** WASHINGTON D.C. 20398-5540
APPROVED BY: PROJECT ENGINEER	DATE	
APPROVED BY: HD LOGISTICS ENGN & ANALYSIS	DATE	MILITARY SEALIFT COMMAND COMPUTER AIDED DESIGNED (CAD) DRAWING STANDARD
APPROVED BY: DIR. ENGN MGT SYSTEMS DIV	DATE	
APPROVED BY: DIR. TECHNICAL DIVISION	DATE	
APPROVED FOR COMSC	DATE	

SIZE	CAGE CODE	SWBS	DRAWING NO.	REV
A	94421	803	XXXXXXX	A

SCALE: NONE	STD PLAN	SHT 1 OF 25

REVISION SHEET

REV	REVISION DESCRIPTION	APPROVED
A	1. Revised drawing format. 2. Added references (a) through (u). 3. Updated drawing format requirements. 4. Changed drawing text size for A and B size drawing, Table 2-2. 5. Changed CAD layer colors, Tables 2-3 and 2-4. 6. Added Trim and Stability Booklet to SRD list, Table 1 and page 9. 7. Added Fire Symbol requirement, page 13.	

Appendix E – Drawing Layout for A Size Drawings (Vertical Orientation) (Alternate)