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MIL-STD-772C (SHIPS)  
23 JULY 1971  

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SUPERSEDING  
MIL-STD-772B (SHIPS)  
30 NOVEMBER 1966  
(SEE 10.2)

**MILITARY STANDARD**

**DAMAGE CONTROL BOOKS  
FOR WARSHIPS AND  
MISCELLANEOUS LARGE SHIPS,  
PREPARATION OF**



FSC TMSS

MIL-STD-772C(SHIPS)  
23 July 1971

DEPARTMENT OF THE NAVY  
NAVAL SHIP ENGINEERING CENTER  
HYATTSVILLE, MARYLAND 20782

Damage Control Books for  
Warships and Miscellaneous  
Large Ships, Preparation of  
MIL-STD-772C(SHIPS)

1. This standard has been approved by the Naval Ship Engineering Center and is published to establish the requirements for damage control books (diagrams, text and tables) for warships and miscellaneous large ships where the diagrams are lithographed in color.

2. This Military Standard is mandatory for use by all activities under the cognizance of the Naval Ship Systems Command. Whenever referenced in a Ship Specification or contract, the use of this standard is also mandatory by ship construction or conversion contractors.

3. Recommended corrections, additions or deletions should be addressed to the Commander, Naval Ship Engineering Center, Department of the Navy, Center Building, Prince George's Center, Hyattsville, Maryland 20782.

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## 1. SCOPE

1.1 This standard covers the requirements for preparation and distribution of damage control books (diagrams, text and tables) for all warships and miscellaneous large ships, where the diagrams are lithographed in color.

## 2. REFERENCED DOCUMENTS

2.1 The issues of the following documents in effect on the date of invitation for bids form a part of this standard to the extent specified herein.

### GOVERNMENTAL

#### SPECIFICATION

L-F-340 - Film, Sensitized, Wash-Off Process; Duzotype, Moist and Dry Process; Brownprint; Roll and Sheet.

#### STANDARD

MIL-STD-784 - Damage Control Book for Surface Ships, Revision of.

#### PUBLICATIONS

0901-290-0002 - Naval Ships Technical Manual, Weights, Stability and Integrity (Seaworthiness).  
0901-881-0002 - Naval Ships Technical Manual, Section I - Damage Control.  
0901-882-0002 - Naval Ships Technical Manual, Section II - Damage Control.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

#### POST OFFICE DEPARTMENT

Postal Manual Regulations

(Application for copies should be addressed to the Post Office Department, Washington, D.C. 20360.)

## 3. DEFINITIONS

3.1 Color guide print. A color guide print is a contact print made from an individual plastic negative and hand colored to indicate the required colors for lithography.

3.2 Composite print. A blue or black line print made by contact from two or more negatives.

3.3 Direct reading. Direct reading applies to reading from left to right on the emulsion side of a plastic positive. Plastic positives shall always be direct reading.

3.4 Drafting plastic sheet. An unsensitized translucent plastic sheet with a toothed surface which is receptive to ink. This material is used for drafting and overlays.

3.5 Group master copy plastics. A set of contact plastic positives from the master copy for each following yard and succeeding ships of lead building yard.

3.6 Klirtype. A special name adopted for material having names, numbers, and symbols printed on a Mylar or acetate sheet. The sheet shall be backed by an adhesive that will not be affected by heat, will not deteriorate with age, and will permit easy removal of the images.

3.7 Master copy. A set of black line plastic positives for the first ship to be delivered that is intended to be used for the class.

3.8 Nonreproducible. An image on plastic that will not reproduce. Nonreproducible plastics of ships' structure provide guide lines for preparation of systems, shadings, flooding effect and liquid loading. When a negative is made, only the inked lines and applied Klirtype will reproduce.

3.9 Plastic negative sheet. A sensitized plastic sheet which is exposed by contact with a positive. This material is used for making all duplicate positives. The image on the emulsion side is reverse reading.

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3.10 Plastic positive sheet. A black or blue image of the original matter with a clear background on a sheet that was exposed by contact with a negative. The image on the emulsion side is direct reading. The material is used for the following:

- (a) For nonreproducible images (blue line).
  - (1) On diagrams for bulkhead and deck shading, and solid tint areas for flooding effect and liquid loading diagrams.
- (b) For reproducible images (black line).
  - (1) For all final diagrams.

3.11 Reverse reading. Reverse reading applies to reading from right to left, as observed in a mirror, on the emulsion side of a plastic negative. Plastic negatives shall always be reverse reading.

3.12 Sensitized plastic sheet. A plastic sheet which is coated with an emulsion sensitive to light.

3.13 Set of plastic diagrams. A set of plastics for all required diagrams.

3.14 Ship's master copy plastics. The plastic positives of the damage control diagrams for an individual ship.

3.15 Supervisor of Shipbuilding. The term "Supervisor of Shipbuilding" as used in this standard shall be understood to apply to the Government activity responsible for the building of the ship, such as the Supervisor of Shipbuilding, Conversion and Repair, USN or Commander of a Naval Shipyard.

#### 4. GENERAL REQUIREMENTS

4.1 Building yard. Where a yard is building a ship to previously approved plans for another ship, it may obtain and use a set of group master copy plastics and text prepared by the other yard and modify to suit their ship.

4.2 Damage control book. The requirements for the damage control book apply only to the systems, components, and circuits contained herein that are part of the ship's installation or specifications.

4.2.1 Damage control book components. A set of damage control book components shall consist of the following:

- (a) Damage control diagram plastic positives (ship's master copy).
- (b) Color guide prints.
- (c) Uncolored prints made from each plastic.
- (d) Composite prints.
- (e) Original typewritten copy for text and tables.
- (f) Duplicate copy of text and tables.

4.2.2 Plastics composing a set of diagrams. A set of diagram plastics shall consist of the following:

- (a) Flooding effect and liquid loading. Flooding effect (if required) and liquid loading shall consist of one plastic positive for base (ship structure) and one for each color except green. Compartments requiring green shall appear on the yellow and blue plastics since the yellow and blue will produce the required green.
- (b) Subdivision.
  - (1) One or more plastic positives for base (ship structure) with separate bulkhead and deck shading plastic positives to suit the bases.
- (c) Systems.
  - (1) One plastic positive for black and gray base (ship structure, compartment names and numbers and deck titles that apply to all systems diagrams).
  - (2) One plastic positive for bulkhead shading.
  - (3) Piping, ventilation, and electrical systems consisting of one plastic (systems, services, legend, fitting numbers, title and miscellaneous services) for each system or group of systems.
- (d) Plastic grid for vital damage control electrical equipment and power supply chart.
- (e) Plastic grid for communication directory.

4.3 Diagrams and text distribution. Diagrams and text shall be furnished to the Supervisor of Shipbuilding of the building yard for distribution. Diagram distribution shall be in accordance with figure 1. Text distribution shall be in accordance with figure 2.

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STEP	LEAD BUILDING YARD	FORWARD TO
	All material to be delivered as indicated two months prior to commissioning	
1	PLASTIC NEGATIVES Produce from "Master Copy" working positives. Use for making "Ships Master Copy Plastics", "Group Master Copy", and "B/W Prints" as required	RETAIN
2	SHIPS MASTER COPY PLASTICS The plastic positives used for an individual ship. From step 1	NAVSEC
3	GROUP MASTER COPY PLASTICS Provide if required, for each following yard and for the second ship of the lead building yard. These are working positives. From step 1	FOLLOWING YARDS
4	B/W PRINT OF EACH PLASTIC One B/W print of each plastic. Hand colored as required. From step 1	NAVSEC
5	B/W COMPOSITES One set uncolored. From step 1	NAVSEC
6	B/W COMPOSITES Five sets for the individual ship One set colored Four sets uncolored (From step 1)	SHIP
7	B/W COMPOSITES Two sets for each following yard One set colored One set uncolored (From step 1)	FOLLOWING YARDS
8	LITHOGRAPHIC COPIES Receive two copies from NAVSEC (step 2 above). Revise to suit delivery of ship	OUTFITTING ACTIVITY
9	SECOND SHIP AT LEAD BUILDING YARD Follow same procedure as for "Each Following Yard".	---
STEP	EACH FOLLOWING YARD	FORWARD TO
	All material to be delivered as indicated two months prior to commissioning	
1-A	FIRST SHIP AT FOLLOWING YARD Correct "Group Master Copy" to suit individual ship. This becomes the working positives	RETAIN
2-A	PLASTIC NEGATIVES Produce from working positives. Use for making "Ships Master Copy Plastics", "Group Master Copy", and "B/W Prints" as required	RETAIN
3-A	SHIPS MASTER COPY PLASTICS The plastic positives used for an individual ship. From step 1-A	NAVSEC
4-A	GROUP MASTER COPY Provide as required for the second ship building at yard. These are working positives from step 2-A	RETAIN
5-A	B/W PRINTS AND COMPOSITES From step 2-A. Color and distribute as noted in steps 4, 5 and 6.	---
6-A	LITHOGRAPHIC COPIES Receive two copies from NAVSEC (step 3-A above). Revise to suit delivery of ship	OUTFITTING ACTIVITY
7-A	SECOND SHIP AT EACH FOLLOWING YARD Follow same procedure, step 1-A through 6-A under "Each Following Yard". Repeat for any subsequent ships.	---
STEP	OUTFITTING ACTIVITY	FORWARD TO
	All material to be delivered as indicated prior to departure of ship	
1-B	LITHOGRAPHIC COPIES MARKED UP Receive two marked-up lithographic copies of ship at delivery. Add outfitting changes	SHIP PSA
STEP	POST SHAKEDOWN ACTIVITY	FORWARD TO
	All material to be delivered as indicated prior to departure of ship	
1-C	LITHOGRAPHIC COPIES MARKED UP Receive two marked up lithographic copies. One from ship and one from outfitting. Add PSA changes	SHIP PHILADELPHIA

KEY: --- Flow. Processed from B/W black and white.

NOTES: 1. The "Master Copy" working plastics with Airtype shall be destroyed after step 1, or 1-A plastic negatives have been processed and new plastic positives without Airtype have been produced.

2. Flooding effect and liquid loading diagram shall be colored on print from base plastic. Prints from tints, cyanides and duck marking plastics are not required.

Figure 1 - Flow chart for damage control diagram plastics and prints.

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<b>LEAD BUILDING YARD</b>		
STEP	All material to be delivered as indicated two months prior to commissioning	FORWARD TO
<b>TYPEWRITTEN "MASTER COPY" CLASS TEXT</b>		
	Reproduce and distribute as follows:	
	a. One reproduced copy (if required)	FOLLOWING YARDS
	b. Five reproduced copies	SHIP
	c. Typewritten "Master Copy" class text	NAVSEC
<b>PRINTED COPIES OF "MASTER COPY" CLASS TEXT</b>		
	Receive two copies of printed "Master Copy" class text from NAVSEC. Proceed as follows:	
	a. Mark-up printed copies of text to suit delivery of ship.	
	b. Type new "Master Copy" pages as required to incorporate the changes made in the printed copies of the text.	
2	c. Reproduce and distribute as follows:	
	1. Two reproduced copies. Insert into the printed copies of the text	OUTFITTING
	2. Five reproduced copies	SHIP
	3. Typewritten "Master Copy" delivery changes	OUTFITTING
<b>SECOND SHIP AT LEAD BUILDING YARD</b>		
1	Follow same procedure as for each following yard	---
<b>EACH FOLLOWING YARD</b>		
STEP	All material to be delivered as indicated two months prior to commissioning	FORWARD TO
<b>PRINTED COPIES OF "MASTER COPY" CLASS TEXT</b>		
	Receive two copies of printed "Master Copy" class text from NAVSEC. Proceed as follows:	
	a. Mark-up printed copies of text to suit the individual ship.	
	b. Type new "Master Copy" pages as required to incorporate the changes made in the printed copies of the text.	
1-A	c. Reproduce and distribute as follows:	
	1. Two reproduced copies. File with the printed copies of the text	RETAIN PENDING PRINTED MATERIAL
	2. Five reproduced copies	SHIP
	3. Typewritten "Master Copy" changes	NAVSEC
<b>PRINTED COPIES OF "MASTER COPY" CHANGES</b>		
2-A	Receive two copies of printed "Master Copy" changes to individual ship from NAVSEC. Insert into text. Continue as noted in step 1 of Lead Building Yard.	---
<b>SECOND SHIP AT EACH FOLLOWING YARD</b>		
3-A	Follow same procedure step 1-A through 2-A under "Each following Yard". Repeat for any subsequent ship.	---
<b>OUTFITTING ACTIVITY</b>		
STEP	All material to be forwarded as indicated prior to departure of ship.	FORWARD TO
<b>SHIPS MASTER COPY TEXT</b>		
	Receive two copies of the individual ship "Master Copy" text from building activity together with the typewritten "Master Copy" changes to time of delivery of ship. Proceed as follows:	
	a. Mark-up "Master Copy" to suit outfitting changes.	
	b. Type new "Master Copy" pages as required to incorporate the changes made in the "Master Copy" text.	
1-B	c. Reproduce and distribute as follows:	
	1. One reproduced copy. Insert into "Master Copy" text	PSA
	2. Five reproduced copies	SHIP
	3. Typewritten "Master Copy" outfitting changes. Collate with typewritten "Master Copy" delivery changes	PSA
<b>POST SHAKEDOWN ACTIVITY</b>		
STEP	All material to be delivered as indicated prior to departure of ship	FORWARD TO
<b>SHIPS MASTER COPY TEXT</b>		
	Receive one copy of the individual ships "Master Copy" text from outfitting activity together with the typewritten "Master Copy" changes to time of outfitting. Proceed as follows:	
	a. Mark-up "Master Copy" to suit PSA changes.	
	b. Type new "Master Copy" pages as required to incorporate the changes made in the "Master Copy" text.	
1-C	c. Reproduce and distribute as follows:	
	1. Five reproduced copies	SHIP
	2. Typewritten "Master Copy" PSA changes. Collate with typewritten "Master Copy" received from outfitting	PHILADELPHIA

KEY: --- Flow. PSA post shakedown activity.

- NOTES: 1. All material from steps:
- 1 or 1-A is due 60 days prior to commissioning of the ship.
  - 2 or 2-A is due upon delivery of ship.
  - 1-B or 1-C is due prior to departure of ship.
2. The PSA shall assemble in numerical order all typewritten "Master Copy" pages having changes since original issue of text.
3. The PSA may destroy the "Master Copy" text after ascertaining that the typewritten "Master Copy" of each page has been received by Philadelphia Ave. Shipyard.

Figure 1 - Flow chart for damage control text.

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#### 4.4 Diagrams.

4.4.1 Plastic material sheets. Diagrams shall be prepared on plastic sheets. All of the material, for positives and negatives for any one job, shall be from the manufacturer and shall be in accordance with the following:

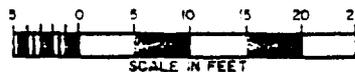
- (a) Sensitized plastic sheet. Type I, subtype A or B, class 2, style 1A, 0.007 inch thick of L-F-340.

4.4.2 Format and content. Format and content of diagrams shall be as specified in 4.4.2.1 through 4.4.2.3:

4.4.2.1 Plan layout. A plan layout indicating final size of diagrams, with arrangements of decks for subdivision and piping systems, shall be submitted to the Supervisor of Shipbuilding of the building yard for approval. The liquid loading diagram, cross curves of stability and draft diagram and functions of form, require the approval of the Naval Ship Engineering Center (NAVSEC).

4.4.2.2 Isometric drawing. All diagrams, except flooding effect, and liquid loading diagrams, vital damage control electrical equipment and power supply chart and communication directory, shall be three-dimensional isometric projections. Diagrams of ships shall be drawn with the bow to the right using a horizontal line to represent the longitudinal base line or other longitudinal line. A transverse line shall be represented by a line at 60 degrees and a vertical line shall be represented by a line at 120 degrees, measuring counter-clockwise from the horizontal. To simplify drafting, camber may be neglected but sheer shall be shown.

4.4.2.3 Scale. A scale, similar to figure 3, shall be shown in the lower right hand corner of the plastic below the date. It shall be the same as the scale used in preparing the diagrams.



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Figure 3 - Scale.

4.4.2.4 Size. Overall sizes of diagrams shall be as follows:

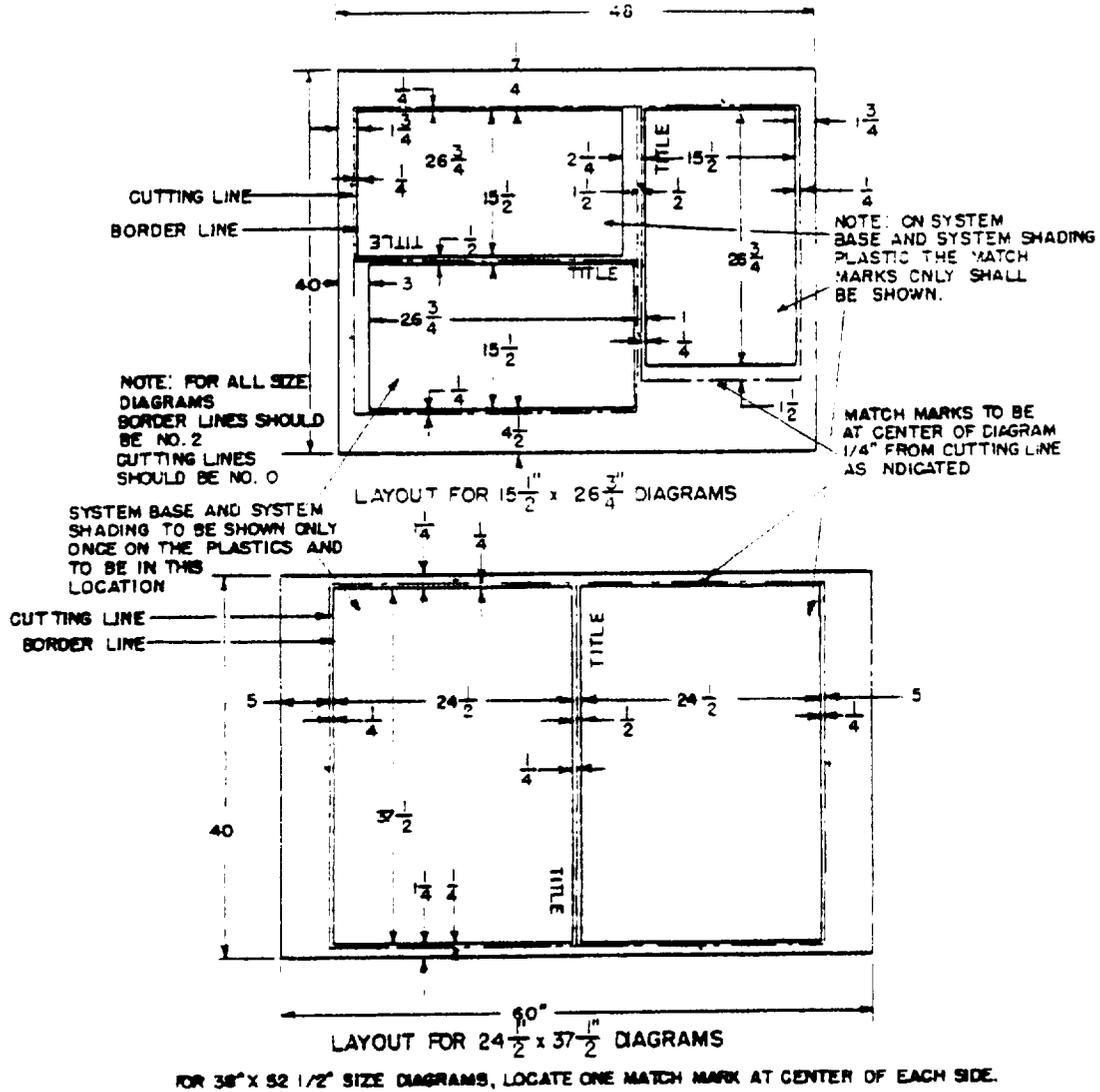
- (a) For aircraft carriers, cruisers, and miscellaneous large ships. 38-1/2 by 53 inches except for the following:  
 (1) Vital damage control electrical equipment and power supply charts - 38-1/2 by 26-1/4 inches.  
 (2) Communication directory - 38-1/2 by 26-1/4 inches.  
 (3) Liquid loading diagram - either 10-1/2 by 26-1/4 inches or 10-1/2 by 53 inches.
- (b) For destroyer leaders and comparable size ships larger than destroyers and smaller than cruisers. 25 by 38 inches.
- (c) For destroyers and other types of comparable size. 16 by 28-1/2 inches.
- (d) Miscellaneous sizes. Miscellaneous sizes and variations of the above sizes shall be referred to NAVSEC for approval.

4.4.2.5 Cutting line guide. Cutting line guide shall be indicated on 53 inch long plastic diagrams for guidance in cutting lithographed copies in two equal parts so that laminated copies may be stowed in damage control cabinets and hinged leaf units. This cutting guide shall consist of an upper line and a lower line 3/8 inch long, extending in from border line.

4.4.2.6 Match marks. For proper registration of plastics, match marks shall be provided on all plastics as shown on figure 4.

4.4.2.7 Preparing plastic for drafting. Before drawing on plastic, the surface shall be cleaned with freon TF or other solvent, and then rubbed with pounce. The entire plastic shall be covered with a sheet of clear cellophane to keep the surface clean. The cellophane shall remain on the plastic when delivered to the Supervisor of Shipbuilding of the building yard.

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Figure 4 - Plastic layout and match marks.

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4.4.2.8 Printing and overhaul record blocks. A printing record block and overhaul record block shall be provided in Klrtype on the plastics as shown on figure 5 and as follows:

- (a) Printing record block.  
 (1) On flooding effect and liquid loading diagram base, liquid loading diagram base, subdivision diagram base, and each system, locate in lower left hand corner inside of border line.  
 (2) On vital damage control electrical equipment and power supply chart, and the communication directory, locate in right hand corner above lower title block.
- (b) Overhaul record block. On flooding effect and liquid loading diagram base, liquid loading diagram base, subdivision diagram base, each system, vital damage control electrical equipment and power supply chart, and communication directory, locate in upper right hand corner, above title block, close to border line.

CONTRACT NO.	J.O.	REVISED BY
PRINTING RECORD		OVERHAUL RECORD

Figure 5 - Printing record and overhaul record blocks.

4.4.2.9 Ink. Only black ink, that will adhere to the plastic, will not flake off, and will reproduce a good image shall be used.

4.4.2.10 Weight of lines. The weight of lines shall be as shown in table I.

Table I - Weight of line.

Line width number <sup>1/</sup>		Applicable to
For 16 by 28-1/2 inch and 25 by 38 inch diagrams	For 38-1/2 inch by 53 inch diagrams	
3	4	Watertight and oiltight boundaries.
1	2	
0	0	Airtight, fumetight, and nontight boundaries.
4	5	Intersection of horizontal level with vertical bulkhead. (These shall be dot-dash lines.)
4	5	Main line or loop piping for drainage, fire-main, fuel oil and JP-5 transfer systems.
4	5	Connecting lines between pumps and main loops.
4	5	Cableways and watertight ventilation ducts.
2	3	Miscellaneous piping and nontight ventilation ducts.
0	0	Connecting lines between decks and leader lines (except for main loop connections).
2	2	Bottom of bulkhead or snell at deck.

Line width number	Width, inches
0	0.015
1	.019
2	.023
3	.029
4	.036
5	.045

4.4.2.11 Klrtype (letters and numbers) (by printing process). All letters, words and numbers shall be Klrtype. The size and type of Klrtype shall be as follows and as shown in table II:

- (a) NG - News gothic  
 (b) MG - Monotone gothic  
 (c) LG - Lining gothic

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Table II - Lettering, size and style.

Legend	Size and style
Upper title block:	
"Confidential" (Omit if unclassified)	10MG
Ship Number	24LG
Ship Class	10MG
"DAMAGE CONTROL DIAGRAM"	10MG
Diagram number	36LG
Diagram name	14MG
(Chart 1 of 2)	10MG
Lower Title Block:	
"PREPARED BY"	8NG
Activity	12MG
"FOR	8NG
NAVSEC"	12MG
Date	8NG
Scale or scale legend	6NG
"CORRECT LITHOGRAPHIC COPIES FOR REVISIONS"	8NG
Miscellaneous:	
Frame numbers	8NG
Compartment names	6NG
Compartment numbers	6NG
Fitting numbers	6NG
Titles-deck, enlarged view	18MG
Small deck titles (at upper and lower deck edge levels)	10MG
"KEY"	12MG
Description (key)	6NG
"NOTE"	12MG
Description (Note)	6NG
Notes (miscellaneous and references)	6NG
Capacities (list and trim figures)	8NG
Information under vital chart and directory headings	6NG

4.4.2.12 Klirvtype (alternate to printing process). The following varityper fonts and headliner typemasters may be used for the corresponding size and style of printing process:

6NG - Varityper font - 2000-6C - Copper plate Gothic  
 8NG - Varityper font - 660-8C - Sans Serif medium  
 10MG - Varityper font - 670 - 12A - Sans Serif Bold  
 12MG - Headliner typemaster - V12 - 121 - News Gothic  
 14MG - Headliner typemaster - V14 - 121 - News Gothic  
 18MG - Headliner typemaster - V18 - 121 - News Gothic  
 24LG - Headliner typemaster - V24 - 121 - News Gothic  
 36LG - Headliner typemaster - V36 - 121 - News Gothic

4.4.2.12.1 Equipment required. The equipment required shall be as follows:

- (a) Varityper model 704 or equivalent.
- (b) Headliner model 860 or equivalent.
- (c) Diazo machine - most yards have dry type ammonia developing machines in their blue print rooms.

4.4.2.12.2 Material required. The material required shall be as follows:

- (a) Cellulose acetate film, 1.5 mil (Lumarith P912 A78).
- (b) Diazo sensitized adhesive backed dri-print film 0.002 matte surface (Mylar) Dietzgen GF247-E-8-1/2 by 11 inches.
- (c) 35 mm printing film, plain.
- (d) Varityper ribbon #1900.
- (e) Fonts for varityper.
- (f) Typemaster for headliner.
- (g) Headliner developing powder and hypo fixer.
- (h) Backing sheet varityper paper 1111 or 1202.

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4.4.2.12.3 Processing. Figure 6 is the flow chart for preparation of Klrtype by varitype or headliner methods.

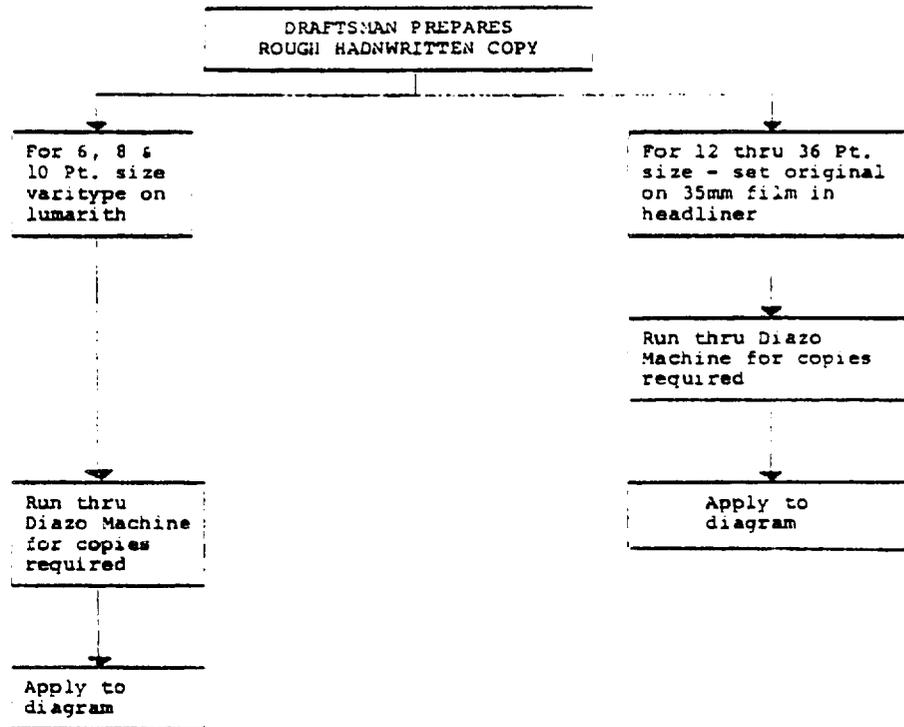


Figure 6 - Flow chart for preparation of Klrtype.

4.4.2.13 Klrtype (shading). Klrtype for bulkhead and deck shadings shall be solid red.

4.4.2.14 Klrtype (flooding effect and liquid loading diagram). Klrtype for flooding effect and liquid loading diagram shall be solid red or striped red, as required. The stripes shall be 3/32 inch wide with 3/32 inch spaces in between.

4.4.2.15 Klrtype (symbols). Symbols for all diagrams shall be Klrtype. Symbols shown in table III shall be used on the damage control diagrams. The Commander, Philadelphia Naval Shipyard will furnish a sample sheet of all symbols upon request.

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Table III - Symbols

Symbol	Symbol key	Symbol	Symbol key
	Air escape return bend		Fan having contr another compartment
	Arch or opening		Fan having controller in same compartment
	Bilge or drainage suction		Filter
	Bulkhead penetration		Foam proportioner (shaded portion is outlet)
	Ballast connection (on liquid loading diagram)		Foam proportioner turbine pump (shaded portion is discharge)
	Compressor, air		Hatch
	Cylinder or tank, air		Hatch (operable from above and below)
	Deck drain		Hatchway
	Deck drain valve		Hatch with scuttle
	Door, flame-tight, fire retarding, or nontight		Hose connection or drain pipe with cap
	Door, quick-acting flame- tight, fire-retarding or nontight		Hose valve or fire plug
	Door, quick-acting water- tight or airtight (weight of bulkhead line indicates type of door)		Hose stop check valve - arrow indicates direction of flow
	Door, watertight or airtight (weight of bulkhead line indicates type of door)		Jackbox (figure indicates number of jacks)
	Eductor (jet pump)--flow is in direction of apex		Manhole
			Valves in manifold

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Table III - Symbols (continued).

Symbol	Symbol key	Symbol	Symbol key
	Valves (interlocking) in manifold		Sea chest
	Meter		Sounding tube with cap or sounding tube deck plate (figure indicates compartment sounded).
	Monitor, swivel		Sounding tube with valve (figure indicates compartment sounded and valve number)
	Outlet, multipurpose		Special for miscellaneous use as required
	Overboard discharge connection for portable pump		Spectacle flange
	Plug cock		Switchboard, power panel, power transfer panel or lighting transformer junction box
	Pump (shaded portion is discharge) (function and number should be indicated on diagram) as follows: F & B #1 (adjacent to pump) F & B = Fire & Bilge (in key)		Terminal, (in bulkhead)
	Rack for portable cable stowage		Terminal
	Remote control station (figures indicate valve, fan or fitting operated)		Valve check (includes all check valves not having external means of positioning the disk). Shaded portion is outlet.
	Scupper or overflow discharge connection		Valve, combined reducing and automatic stop. (Shaded portion is outlet)
	Scuttle, dogged type		Valve, lift-check (check valve with external means of lifting disk but not of closing valve). Shaded portion is outlet
	Scuttle, passing, in door.		
	Scuttle, passing (P.S. with scuttle number)		
	Scuttle, quick-acting		

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Table III - Symbols (continued).

Symbol	Symbol key	Symbol	Symbol key
	Valves, mechanically interlocked. (Valve in system being shown on plate is to be numbered and colored as usual; interlock shall be shown for lithographing in black; other valve numbered with a letter reference to key note giving its system and shown in same color as on its system or in black).		Valve, stop-lift check (stop check valve whose external closing means will also lift the disk). Arrow indicates direction of flow.
	Valve, pressure reducing. The change in pressure between the intake and discharge sides shall be noted at the valve. (Shaded portion is outlet.)		Ventilation closure fitting (flow is in direction of apex)
	Valve regulator		Ventilation closure fitting (operated from station on another deck or separated by one or more compartments)
	Valve, pressure relief or spring loaded check valve. (Shaded portion is outlet.)		Ventilation closure fitting (operated from adjoining compartment on same deck level)
	Valve, remotely operated		Ventilation damper (mechanically operated)
	Valve, spring loaded lift check		Ventilation damper (operated from adjoining compartment on same deck level)
	Valve, stop (including manually operated gate, and globe).		Washdown spray nozzle. Flow is in direction of apex.
	Valve, stop check (check valve with external means of closing but not opening the valve). (Arrow indicates direction of flow.)		Direction of flow shall be indicated in a line, adjacent to valve, when check feature is included with valve. It shall also be indicated in a line when no valve exists and flow is only in one direction.

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4.4.2.16 Color requirements. Each plastic containing two or more color requirements shall have a color guide. The colors indicated on the prints shall be in conformance with the colors specified herein. No substitution or change in color will be permitted. However, the item requiring the most color shall be left uncolored. Items to be lithographed in black shall be colored in purple. A note shall be added on the print indicating the color in which the uncolored item shall be lithographed. For example, in the case of the firemain and sprinkler systems diagram the note shall read "All uncolored lines and so forth shall be lithographed in red." The sprinkler system shall be colored blue.

4.4.2.16.1 Two or more colors. Where two colors such as red and orange, or blue and green, are required on a color guide, they shall be such that they will be discernible under darkened room conditions during lithography.

4.4.2.16.2 System base colors. System base colors shall be as follows:

- (a) Upper and lower title blocks, compartment numbers, frame numbers, and deck titles shall be colored in purple and marked for lithographing in black.
- (b) Compartment lines, and titles (excepting repair station titles), shall be uncolored and marked for lithographing in gray.

4.4.2.16.3 Special compartment titles. Damage control central, secondary damage control and repair station titles shall be lithographed in black.

4.4.2.16.4 Pierce points. Pierce points shall be the color of the system.

4.4.2.16.5 System fittings. All numbers for valves and fittings, and notes pertinent to particular parts of systems, shall be same color as systems.

4.4.2.16.6 Remote control symbol and station. Remote control symbol and station shall be as follows:

- (a) Remote control station for a group of valves having a location number, such as 72P or 3-39-1, the location number, symbol and indicating line or bracket shall be marked for printing in black.
- (b) Remote control symbol, indicating line and valve number, not combined on a group control panel, shall be marked for printing in color to suit the respective systems.

4.4.2.16.7 Title and key. Title block, key, symbols and other identification shall be provided on the right hand side of the diagrams.

4.4.3 Final "Ship's Master Copy Plastics". Upon completion of the work on the "Ship's Master Copy Plastics", a new set of "Ship's Master Copy Plastics" without Klirtype shall be prepared. Upon completion, the original plastics with Klirtype shall be destroyed. The "Ship's Master Copy Plastics" shall be legible and the weight of lines, the symbols, letters and numbers shall conform with this standard.

4.4.4 Revision date for post-shakedown activity. The revision date (year only), including the post-shakedown activity name, shall be entered on each overhaul block of the damage control diagrams on both the "Master Copy" litho, which will be forwarded to Philadelphia Naval Shipyard (Code 243) and the duplicate copy to be returned to the ship. The year in the overhaul block shall correspond to the date of revision on the text.

## 5. DETAIL REQUIREMENTS FOR DIAGRAMS

### 5.1 Flooding effect and liquid loading diagram.

5.1.1 General requirements. Flooding effect and liquid loading diagram shall be prepared in accordance with figure 7. A flooding effect and liquid loading diagram shall be prepared for the following:

- (a) Cruisers
- (b) Small carriers
- (c) Destroyers
- (d) Destroyer escorts
- (e) Ships converted from the types shown in (a) through (d).

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FLOODING EFFECT AND LIQUID LOADING

DRAWING - BLACK INK
DECK VIEWS - SECTIONS WITHOUT LETTERING
FILM NEGATIVE REDUCED TO LITHO SIZE
CUT-REASSEMBLE (IF NECESSARY) ON CLEAR PLASTIC - OPAQUE
BLACK LINE PLASTIC POSITIVE
TOUCH UP - ESTABLISH MATCH MARKS
PLASTIC NEGATIVE
OPAQUE - DESTROY PLASTIC POSITIVE MADE ABOVE

—WORKING PLASTICS DESTROY—

—WORKING PLASTICS DESTROY—

BLACK LINE PLASTIC POSITIVE	NONREPRODUCTIBLE PLASTIC POSITIVE	NONREPRODUCTIBLE PLASTIC POSITIVE	NONREPRODUCTIBLE PLASTIC POSITIVE
APPLY KLRTYPE	APPLY RED CELLO- PHANE TO ALL COM- PARTMENTS TO BE PRINTED PINK	APPLY RED CELLO- PHANE TO ALL COM- PARTMENTS TO BE PRINTED YELLOW AND GREEN	APPLY RED CELLO- PHANE TO ALL COM- PARTMENTS TO BE PRINTED BLUE AND GREEN
PLASTIC NEGATIVE	PLASTIC NEGATIVE	PLASTIC NEGATIVE	PLASTIC NEGATIVE
SHIP'S MASTER COPY PLASTIC POSITIVE	SHIP'S MASTER COPY PLASTIC POSITIVE	SHIP'S MASTER COPY PLASTIC POSITIVE	SHIP'S MASTER COPY PLASTIC POSITIVE

SEE FLOW CHART FOR HANDLING

Figure 7 - Flow chart for preparation of flooding effect and liquid loading diagram on plastic.

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5.1.1.1 Frame numbers. Frame numbers shall be shown horizontally at bottom of all transverse bulkheads.

5.1.1.2 Compartment numbers. Compartment numbers shall be indicated in the center of the compartment. If necessary, the number may be placed outside with an indicating line.

5.1.2 Flooding effect portion of diagram. Flooding effect diagram shall contain a series of plan views of the ship at various levels, up to one level above the damage control deck, showing all oiltight, watertight, airtight, and fumetight subdivisions.

5.1.2.1 Unsymmetrical compartments. Compartments that are unsymmetrical with respect to the center line of the ship shall be indicated as follows:

- (a) A heavy solid line for watertight and oiltight compartments.
- (b) A heavy dot-dash line for airtight and fumetight compartments.

5.1.2.2 Symmetrical compartments. Compartments that are symmetrical with respect to the center line of the ship shall be indicated as follows:

- (a) A thin solid line for watertight and oiltight compartments.
- (b) A thin dot-dash line for airtight and fumetight compartments.

5.1.2.3 Compartment information.

5.1.2.3.1 Weight of sea water. The following permeabilities shall be used in determining the weights of sea water:

	<u>Percent</u>
Enginerrooms	85
Firerooms	90
Auxiliary machinery spaces	85
Pump rooms	90
Shops	90
Living spaces	95
Ammunition spaces	95
Storerooms	95
Voids	95
Tanks	100

5.1.2.3.2 Stability figures. Figures shall be shown in the corners of the compartment as follows:

- (a) Upper left. For each compartment, the weight of sea water in tons required to fill the compartment.
- (b) Lower right. For each unsymmetrical compartment, the transverse moment of the weight in foot-tons about the center line of the ship. Entries shall be in multiples of 5 foot-tons. If the direction of transverse moment is not readily apparent, the letters P or S shall be added to indicate port and starboard moments.

5.1.2.4 Center of gravity. The assumed height of the center of gravity of the ship will be as specified by NAVSEC.

5.1.2.5 Flooding. Flooding of a compartment shall be considered to have "no appreciable effect on stability" when increase or decrease is so slight that time and effort spent in immediately draining or flooding it for stability improvement, even when stability is critical, is not warranted. A compartment shall not be considered to be ineffective only because of its small size since the improvement, per ton of water handled, would be the same as for a large compartment of the same width at the same level. For the purpose of this diagram, airtight and fumetight structure shall be considered to be capable of restricting flooding.

5.1.2.6 Key. A key shall be provided on the diagram to indicate significance of each color used, and to illustrate the convention used for showing capacity and transverse moment of unsymmetrical compartments.

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5.1.2.7 Notes. The following notes, and such other notes as may be appropriate, shall appear on the diagram:

- (a) "Spaces having a heavy outline are unsymmetrical with respect to center line of ship."
- (b) "Complete flooding of unsymmetrical compartments will produce heeling moments as indicated. An adjustment of this moment should be made if space is not completely flooded. For tanks having liquid before flooding occurred adjustment shall also be made."
- (c) "Dot dash lines indicate airtight, fumetight bulkheads 5 pounds per square foot and heavier fitted with tight doors."

5.1.2.8 Colors. Colors shall be as follows:

- (a) All lines, lettering, and numbers shall be black.
- (b) The coloring shall be based on the assumption that all compartment boundaries are intact:
  - (1) Compartments, where flooding results in a decrease in stability because of added high weight, free surface effect, or both, shall be pink.
  - (2) Compartments, where flooding will improve stability, even though a free surface exists, shall be green.
  - (3) Compartments, where flooding will improve stability if the compartment is completely filled, but impair stability when a free surface exists, shall be yellow.
  - (4) Compartments where flooding will have no appreciable effect on stability, shall be uncolored.
  - (5) In certain cases, stability may be improved by flooding a deep compartment to a low level, but be impaired as flooding continues to a higher level. If the effect in such case is substantial, green shall be used for the lower level and pink for the higher level or an appropriate note added. If the effect in one of these cases is not appreciable, it shall be ignored and the compartment colored the same throughout.

5.1.2.9 Liquid loading portion of diagram. This portion of the diagram shall be prepared similar to that required for a liquid loading diagram.

5.1.3 Liquid loading diagram. Only a liquid loading diagram shall be prepared for snips other than those listed in 5.1.1. The diagram shall be prepared in accordance with figure 7. It shall consist of a composite plan view of the ship showing all tanks and voids in which liquids are carried or which are fitted for carrying liquids. Upper levels, on which only a few minor tanks exist, may be omitted. Where the composite view would not indicate clearly the full extent of the boundary of a tank, more than one view will be necessary. In addition, the tanks which are on upper levels shall be shown off to one side. No subdivision, other than tank boundaries and main transverse bulkheads in way of tanks, is required.

5.1.3.1 Compartment information. A figure shall be shown in each of the four corners of the tank as follows:

- (a) Upper left. Capacity of tank in tons. This capacity shall be 95 percent full for oil tanks and 100 percent full for fresh water tanks. For ballast tanks or voids fitted for ballasting, the weight of sea water, 100 percent full, shall be shown except that when ballasting of voids with fresh water is specified, the weight of fresh water shall be used. Figures for lube oil tanks for ship's own use, and day tanks, shall not be shown. Gravity filled tanks shall be filled to the normal operating water line.
- (b) Upper right. Change in list, caused by filling tank to above capacity, to nearest 0.1 degrees.
- (c) Lower left. Change in draft, aft, to nearest inch, caused by filling tank to capacity.
- (d) Lower right. Change in draft forward, to nearest inch, caused by filling tank to capacity.

5.1.3.2 List and trim figures. Figures for change of list and trim shall be based on figures of moment to trim, moment to heel, tons per inch immersion, and position of longitudinal center of flotation as furnished by NAVSEC.

5.1.3.3 Liquid loading instructions. Liquid loading instructions as furnished by NAVSEC shall appear on the liquid loading diagram.

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5.1.3.4 Key. a key shall be provided on the diagram to indicate significance of colors or patterns used; the symbols for tanks having ballasting connections, and convention used for snowing capacity, change in list, and change in drafts.

5.1.3.5 Colors. Coloring shall be as follows:

- (a) All lines, lettering, and numbers shall be black.
- (b) Fresh water tanks shall be blue.
- (c) Fuel oil service tanks and settling tanks shall be oblique yellow stripes (from lower left to upper right).
- (d) Fuel oil tanks not required to be ballasted shall be yellow.
- (e) Fuel oil tanks to be ballasted shall be yellow over green.
- (f) Gasoline tanks shall be yellow over pink.
- (g) JP-5 tanks not required to be ballasted shall be pink.
- (h) JP-5 tanks to be ballasted shall be pink over blue.
- (i) JP-5 service tanks shall be oblique pink stripes (from lower left to upper right).
- (j) Reserve feed water tanks shall be oblique blue stripes (from lower left to upper right).
- (k) Voids not required to be ballasted shall be green.
- (l) Voids to be ballasted shall be green over blue.
- (m) Where two colors are specified in (a) through (l), the division between colors shall be on a diagonal line from lower left to upper right hand corners.
- (n) Stripes shall be indicated at a 60 degree angle.

5.1.3.5.1 Additional patterns. Additional patterns may be required when the liquid loading instructions specify the sequence for draining tanks or ballasting, in which case information on coloring to be used will be furnished with the liquid loading instructions.

5.1.3.6 Compartment names. The compartment names shall be shown outside of the ship's structure for fuel oil, and JP-5 overflows, contaminated oil, and service tanks, in addition to the required colors.

5.1.3.7 Compartments with ballast connections. Compartments with ballast connections shall be designated by a small solid black triangle within the compartment.

5.2 Cross curves of stability. The original plan shall be as follows:

- (a) On form 9881/1 or 10 for 8 by 10-1/2 inch text or form 9881/18 or 26 for 10-1/2 by 16 inch text (see table VIII). If additional space is necessary, due to variation in scale of righting arm, and the form sheet is not long enough, the plan may be prepared on tracing cloth. For text 8 by 10-1/2 inches the length may be increased overall by increments of 6-1/2 inches; for text 10-1/2 by 16 inches the length may be increased overall by increments of 9 inches.
- (b) Margins shall be 1-1/2 inches on left side for binding, 1/4 inch at top and right side, 1 inch at bottom.
- (c) Prepare from NAVSEC cross curves and abbreviate to cover range of operating displacements.
- (d) Scale of righting arms shall be 1 inch equals 1 foot, if practicable.
- (e) The axis assumed in preparing the cross curves, and the number of the drawing from which the data was taken shall appear on the plan.

5.3 Draft diagram and functions of form. The original plan shall be as follows:

- (a) On form 9881/1 or 10 for 8 by 10-1/2 text or form 9881/18 or 26 for 10-1/2 by 16 inch text (see table VIII). If additional space is necessary, and the form sheet is not long enough, the plan may be prepared on tracing cloth. In this case the length may be increased overall in increments of 6-1/2 inches.
- (b) Margins shall be 1-1/2 inches on left side for binding, 1/4 inch at top and right side, 1 inch at bottom.
- (c) Any convenient scale may be used both horizontally and vertically.
- (d) The number of the drawing from which the data was taken shall appear on the diagram.

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**5.3.1 Draft marks and locus of longitudinal center of flotation.** Draft marks and locus of longitudinal center of flotation shall be as follows:

- (a) All draft marks and locus of longitudinal center of flotation shall be shown for even keel drafts in their proper relative positions on a contracted longitudinal scale, together with scales for the following functions:
  - (1) Displacement in sea water.
  - (2) Transverse metacenter above keel.
  - (3) Moment to trim 1-inch.
  - (4) Tons per inch immersion.
  - (5) Longitudinal center of buoyancy.
- (b) Arabic or Roman numerals shall be used for draft marks, to correspond to figures on the ship. Draft scales shall be subdivided at half-foot intervals. Forward draft marks shall be shown at the right of the diagram and after draft marks at the left. Midship draft marks may be omitted if they conflict with other scales.

**5.3.2 Displacement scales.** Displacement scale shall be located along left side of longitudinal center of flotation, and scale for transverse metacenter along right side. Scale for moment to trim 1-inch shall be plotted along a vertical line between displacement and after draft marks. Scales for tons per inch immersion shall be plotted along a vertical line to the right of the transverse metacenter scale. The longitudinal center of buoyancy shall be plotted to the left of the forward draft marks. Curve representing longitudinal center of flotation shall be so labeled and a scale provided at the bottom of the diagram to indicate its distance from the midship perpendicular. Each scale shall be plotted so that values of functions, read on a horizontal line at any draft, will correspond to values shown on the ship's curves of form (or displacement and other curves) for that draft. Scales for all functions shall be plotted for range of operating drafts. Scales for forward and after drafts shall extend 3 feet above and below scales of the functions to allow for trim. Light horizontal lines shall be drawn connecting forward and after draft marks at each foot of draft within range of the other scales.

**5.3.3 Notes.** The following note shall appear on the diagram:

"Displacement and transverse metacenter are read directly at point where a straight line connecting drafts forward and aft crosses these scales. Other functions are read on a horizontal line through this point."

**5.4 Subdivision and system diagrams.**

**5.4.1 General requirements.** All compartments (including trunks, hoists and elevators) shall be shown, labeled and numbered. Intersections of main transverse watertight and oil-tight bulkheads with shell shall be shown by solid lines. Hidden boundaries shall be shown, only to clarify location of access, by a dotted line.

**5.4.1.1 Fittings.** All fittings shall be shown in their true location. They shall be shown solid where visible and dotted where hidden.

**5.4.1.2 Frame numbers.** Frame numbers shall be shown horizontally at the upper edge of all transverse watertight and oiltight bulkheads below the main deck. Frame numbers shall be shown, at approximately every 10 frames or closer, on and above the main deck.

**5.4.1.3 Damage control deck.** The fore and aft extent of the damage control deck shall be noted below the deck title on the applicable subdivision diagram.

**5.4.1.4 Lines, lettering and symbols.** Lines, lettering and symbols shall be not closer than 1/16 inch to the item.

**5.4.1.5 Deck labeling.** Each deck shall be labeled at forward end only. Where a cutting mark is indicated for cutting the diagram in half, each deck shall be labeled at both the forward and after ends. Each intersection of deck or platform with shell shall be labeled at the forward and after ends. A line with an arrow head shall point to the intersection.

**5.4.1.6 Diagrams to be cut into halves.** Diagrams having cutting marks for guidance in cutting into halves shall conform to the following:

- (a) Fittings, valve numbers, lettering and vertical lines shall be located clear of cutting line.
- (b) Ship identification number, diagram number, security classification and the title shall be shown in the upper left hand corner. These are in addition to those on the upper right hand corner.

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5.4.1.7 Security classification. Damage control diagrams are either "Unclassified" or "Confidential". For damage control diagrams that are classified "Confidential", the word "CONFIDENTIAL" shall be shown as follows:

- (a) For diagrams not to be cut in half
  - (1) In the upper right hand corner, inside of border line, to the right of the overhaul record block.
  - (2) In the lower left hand corner, inside of border line, to the right of the printing record block except for the vital damage control electrical equipment and power supply chart, and the communication directory.
  - (3) For the vital damage control electrical equipment and power supply chart, and the communication directory, inside of the bottom border line, to the left of the words "CORRECT LITHOGRAPHIC COPIES FOR REVISIONS".
- (b) For diagrams to be cut in half
  - (1) In the upper right hand corner, inside of border line, to the right of the overhaul record block.
  - (2) In the lower left hand corner, inside of border line, to the right of the printing record block.
  - (3) Inside of the bottom border line, to the left of the words "CORRECT LITHOGRAPHIC COPIES FOR REVISIONS".
  - (4) In the upper left hand corner inside of border line.
- (c) For all diagrams
  - (1) On each damage control plastic and print, outside of the cutting line.

#### 5.4.2 Subdivision diagrams.

5.4.2.1 General requirements. Subdivision diagrams shall be prepared in accordance with figure 8.

5.4.2.1.1 Deck level layouts. One layout of all levels is preferable. In any case, the number shall be kept to a minimum. For each level, all bulkheads, doors, hatches, manholes, scuttles, arches and ladders shall be shown.

5.4.2.1.2 Grating levels. Grating levels shall be indicated by dot-dash lines.

5.4.2.1.3 Decks and platforms. Each deck or platform shall be shown and labeled as a separate level. Compartments extending for two or more decks in height shall be shown as one compartment extending from the lowest level.

5.4.2.1.4 Fitting numbers. All access fittings, except nontight fittings and bolted plate manholes, shall be numbered on the diagram.

5.4.2.1.5 Miscellaneous features. Prominent topside features, such as smoke pipes, stacks, catapults, and masts shall be shown, but not in detail. Gun mounts, directors, missile launchers, torpedo tubes, and cranes shall be indicated only by a center line mark. The type and number of the piece of equipment shall be indicated.

5.4.2.1.6 Tightness level. The extent for the tightness level for bulkheads shall be noted on the subdivision diagram, d.g., W.T. 5 feet above deck - A.T. over.

5.4.2.1.7 Compartment numbers. Compartment numbers shall be placed inside the compartment, on the plane of the compartment overhead, at the center and parallel to the transverse bulkhead. Where the compartment is too narrow, the number shall be placed parallel to longitudinal bulkhead. If the compartment is too small, the number shall be shown outside.

5.4.2.1.8 Compartment names. All compartment names shall be placed outside the shell of the ship at the same angle as transverse bulkheads, with a line and arrow pointing to the outboard bulkhead of the particular compartment.

5.4.2.1.9 Shading. Prepare transverse bulkhead shading and deck shading plastics. Shading shall be as follows:

- (a) Klrtype shall fit the base.
- (b) Omit shading from doors and arches.

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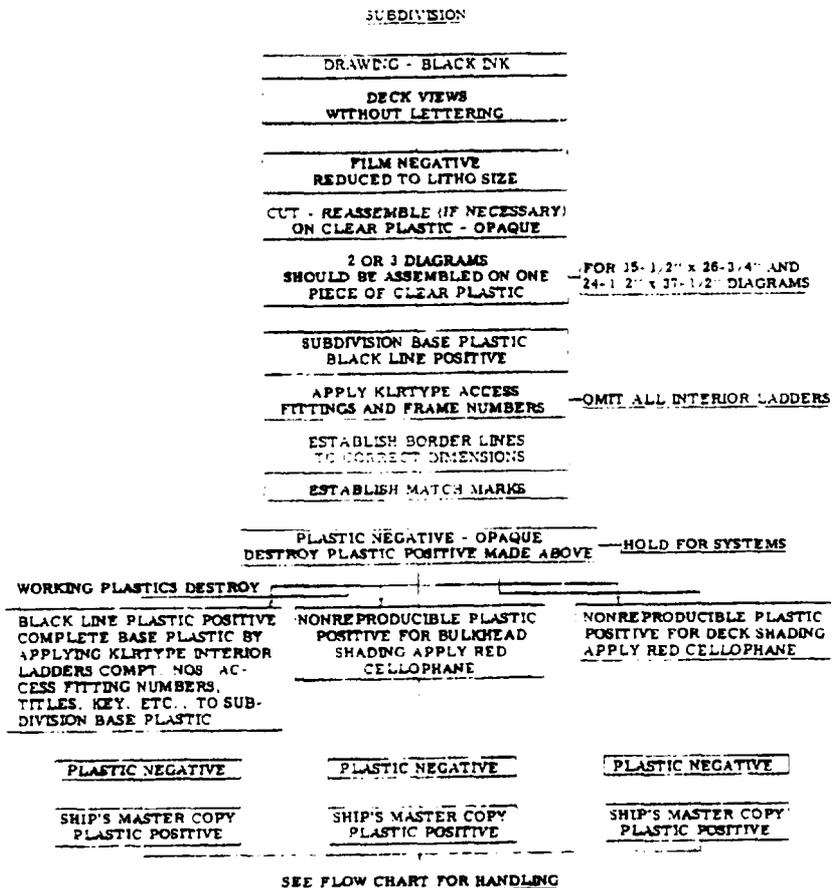


Figure 8 - Flow chart for preparation of subdivision damage control diagrams on plastic.

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5.4.2.1.10 Titles (underscoring). Title for central control station, secondary damage control station and repair station shall be underscored.

5.4.2.1.11 Fire-zone bulkheads. The letters FZ shall be shown horizontally at the upper edge of all transverse fire-zone bulkheads.

5.4.2.1.12 Color. Subdivision base will be lithographed in red and black. The upper edge of fire-zone bulkheads shall be red. The remainder in black.

#### 5.4.3 System diagrams.

5.4.3.1 General requirements. System diagrams shall be prepared in accordance with figure 9. If more than one diagram is required due to congestion add the letter A, B, C, etc. to the diagram number beginning with the lowest level.

5.4.3.1.1 System base. The system base shall be developed from the subdivision diagram base and shall be used for all systems. It shall contain information that is common to all system diagrams.

5.4.3.1.2 Intermediate levels (no decks). Compartments extending two or more decks in height shall be shown on each deck level. A wavy line shall be shown on each deck level where bulkhead or deck is broken.

5.4.3.1.3 Gratings and partial platforms. Compartments extending two or more decks in height, and having gratings and partial platforms, the gratings and platforms shall be shown, by a dot-dash line, with the deck level corresponding to the horizontal level for compartment numbering.

5.4.3.1.4 Enlarged views. Enlarged views shall be shown on the system plastic for lithographing in black. No scale or shading is required.

5.4.3.1.5 Compartment names and numbers. All compartment names and numbers shall be placed horizontal and outside the shell. The compartment numbers shall be adjacent to the names and the names shall be listed first.

5.4.3.1.6 Shading. Prepare transverse bulkhead shading plastic. Shading shall be as follows:

- (a) Klrtype shall fit the base.
- (b) Include Klrtype on doors and arches.

5.4.3.1.7 Ducts and piping. Ducts and piping shall be as follows:

- (a) All ducts and piping shall be shown in their true location. Ducts and piping shall be shown solid where visible and dotted where hidden. A jumper shall be shown where ducts and piping cross and are not connected.
- (b) Pierce points, where piping and ducts pierce bulkheads.

5.4.3.1.8 Numbers for valves, fittings and notes. All numbers for valves, fittings, and notes pertinent to particular parts of systems, shall be shown. The notes shall be placed as close as possible to the points to which they apply and an indicating line shall connect the note with the point.

5.4.3.1.9 Spurs and branches. All spurs and branches for systems not shown on the individual diagram shall be shown as far as the first cut-out valve. These spurs and branches only, for "other services" to be lithographed in black, shall have a capital letter referring to the key note giving the system. The "key" note shall indicate the applicable system diagram referred to; for example,

- A - See firemain system diagram.
- B - See fuel system diagram.

5.4.3.1.10 Fittings to be omitted. Take offs to gages, pet cock drains, bleeders, strainers, and separators shall not be shown.

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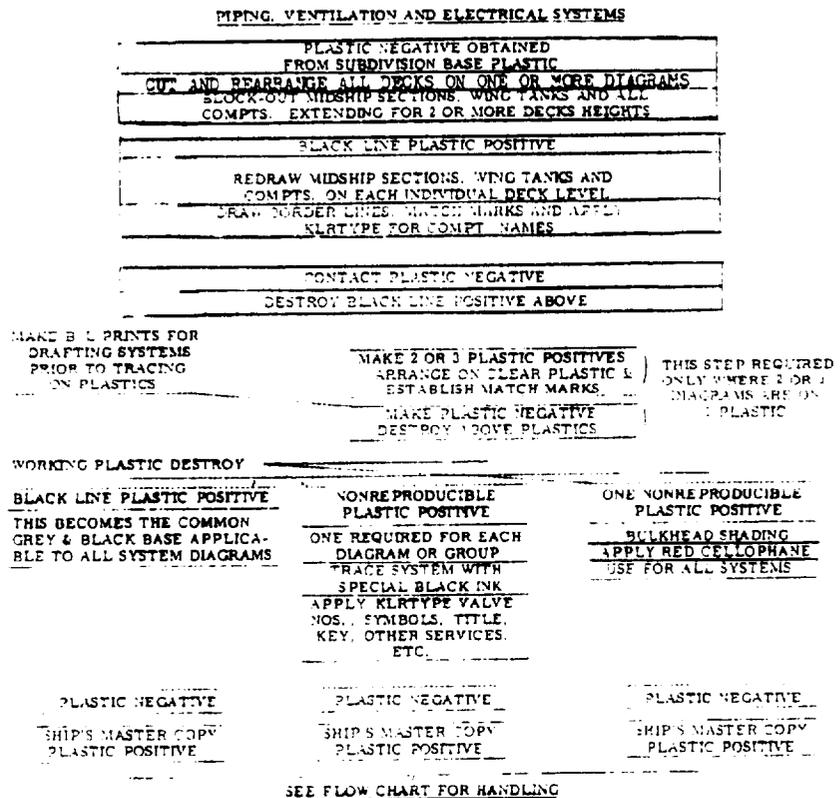


Figure 9 - Flow chart for preparation of piping, ventilation and electrical systems damage control diagrams on plastic.

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5.4.3.1.11 Remote control stations. All remote control stations shall be shown. There shall be an individual symbol for each valve when the remote control symbol does not represent a panel containing a location number. Wherever any system extends on two or more sheets, the remote control valve shall be listed in table form. The table shall contain the valve number, station number (if assigned) and location. This applies to all remote control valves whether or not they have station numbers. This table is in addition to specification requirements for indicating the remote control locations of valves.

#### 5.5 Drainage, ballasting and list control systems.

5.5.1 Main and secondary drainage systems. The diagram shall show the following:

- (a) Piping, pumps, eductors and attached piping, valves and fittings.
- (b) Piping, valves and fittings to which portable pumps or hose may be connected.
- (c) Semi-permanently installed pumps, piping and valves.
- (d) Firemain cut-out valves to eductors shall be shown as "Other services".

5.5.1.1 Deck drains. Deck drains with valves that empty into tanks or bilge wells that are in turn drained by a pumping system shall be shown. Drains with or without closures in decks and bulkheads from ammunition spaces, handling rooms, cofferdams, and miscellaneous spaces (including plumbing deck drains) shall be shown.

5.5.1.2 Overboard discharge connections. Overboard discharge connections shall be shown and numbered.

5.5.1.3 Scuppers. Spaces drained by scuppers shall be indicated by a marginal note at each scupper only when no cut-out valve control is provided for the scupper. Complete leads of piping to scuppers shall not be shown.

5.5.1.4 Sounding tube deck plates and sounding tubes with valves. Sounding tube deck plates and sounding tubes with valves for voids, water tanks, and miscellaneous spaces shall be shown.

5.5.1.5 Air escape piping. Air escape piping shall be shown only if it is fitted with operable valves.

5.5.1.6 Plumbing vent valves. Plumbing vent valves shall not be shown, but shall be included in valve list. The following note shall appear on the diagram:

"For plumbing vent closure fittings, see text."

5.5.1.7 Gravity and miscellaneous drains. To avoid congestion, gravity and miscellaneous drains, and sounding tube deck plates for voids and water tanks, may be shown on a separate diagram.

5.5.2 Ballasting and list control systems. All ballasting and list control systems that are installed primarily for stability control ballasting, or torpedo protection shall be shown, from the sea chest or firemain, where flooding supply is taken to the overboard discharge connection. Piping, valves, fittings and pumps shall be indicated.

5.5.3 Colors. The following colors are required for the drainage, ballasting and list control systems diagram:

- (a) Main and secondary drainage; green.
- (b) Gravity and miscellaneous drains (drainage systems to which a hose may be attached for connection to main drainage, scuppers, deck drains terminating in bilges but not tied into pumping system, also drains from handling rooms, ammunition spaces, trunks, overboard discharge connections and miscellaneous drains, connected to pumps, which are not part of main or secondary drainage); orange.
- (c) If gravity and miscellaneous drain systems are on a separate diagram; green.
- (d) Ballasting and list control systems; blue.
- (e) Air escapes with stop valves; red.
- (f) Sounding tube valves and fittings (voids, water tanks and miscellaneous spaces); green.
- (g) Other services; black.

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5.6 Tank stripping system. A tank stripping system shall be prepared for all ships, except cruiser and carrier hulls. The diagram shall show all piping, valves, and pumps. This shall include portions of fuel and drainage if necessary, in order to show a complete system. If however the tank stripping system is comprised of 75 percent or more of the fuel or drainage system then the remaining portion of the tank stripping system should also be included on the applicable diagram and the title of the affected diagram modified to suit.

5.6.1 Colors. The following colors are required for the tank stripping system diagram:

- (a) Tank stripping; red.
- (b) Other services (parts of fuel or drainage); black.

5.7 Firemain, sprinkling, foam and washdown systems.

5.7.1 Firemain systems. The firemain systems diagram shall show the following:

- (a) Firemain piping, valves, fittings, and pumps used for supplying water to sprinkler, foam and washdown systems.
- (b) Branches from firemain system for miscellaneous services, such as flushing system and machinery cooling, shall be shown as far as cut-out valves. The diagram shall specify the exact use of these branches.

5.7.2 Sprinkling systems. Sprinkling systems shall be shown as far as the cut-out valve within the compartment. Where large spaces, such as hangar spaces, are served by several controls, the piping for the areas sprinkled by each valve shall be shown.

5.7.3 Fixed fog nozzle system. The sea water fixed fog nozzle system shall show the piping, pumps and valves.

5.7.4 Foam system. The foam system shall show the piping, stations, pumps and proportioners, valves and foam service outlets.

5.7.5 Washdown system. The washdown system shall show the fixed and portable piping, washdown spray nozzles, valves and hose connections. The fixed piping shall be indicated by straight line; the portable piping by wavy line.

5.7.6 Colors. The following colors are required for firemain, sprinkler, foam and washdown systems diagram:

- (a) Firemain; red.
- (b) Sprinkler; blue.
- (c) Sea water fog (fixed nozzles); blue.
- (d) Foam; green.
- (e) Washdown; orange.
- (f) Other services; black.

5.8 Fuel (Navy special fuel oil/Navy distillate fuel) (NSFO/NDF), filling, transfer and overflow systems.

5.8.1 General requirements. The fuel filling, transfer, and overflow systems diagram shall show the following:

- (a) Fuel filling, transfer and overflow piping, valves, fittings and pumps.
- (b) Sounding tube deck plates and sounding tubes with valves.
- (c) Air escapes and vents.

5.8.2 Colors. The following colors are required for the fuel filling, transfer and overflow systems diagram:

- (a) Fuel filling and transfer; blue.
- (b) Overflow; orange.
- (c) Sounding tube deck plates, and sounding tubes with valves; blue.
- (d) Fuel stripping; red.
- (e) Other services; black.

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- (a) JP-5 filling, transfer, including aviation fuel and de-fueling stations, auxiliary service, and overflow piping, valves and pumps.
- (b) Sounding tube deck plates and sounding tubes with valves.
- (c) Air escapes and vents.

**5.9.2 Colors.** The following colors are required for the JP-5 filling, transfer and overflow systems diagram:

- (a) JP-5 filling and transfer (including service); green.
- (b) Overflows, air escapes and vents; orange.
- (c) Sounding tube deck plates and sounding tubes with valves; green.
- (d) JP-5 stripping; red.
- (e) Other services; black.

**5.10 Aviation and automotive gasoline systems.****5.10.1 General requirements.** The aviation and automotive gasoline systems diagram shall show the following:

- (a) All gasoline stowage tank piping, valves, fittings, pumps, overflows, and sounding tube deck plates, used for fueling and de-fueling. The inert gas system shall be shown from the cofferdam, pipe casing, and purging to first cut-off valve from producer and properly labeled. In the event that the inert gas system is not extensive, the diagram shall be included in with the text.
- (b) Gage cut-out valves.
- (c) Complete sea-water systems and sources of compensating water (firemain or special pumps) and valves. Firemain valves shall be identified.
- (d) Sea water hose connections and the location numbers of the nearest fireplugs to which they may be connected.

**5.10.2 Colors.** The following colors are required for the aviation and automotive gasoline systems diagram:

- (a) Automotive gasoline; blue.
- (b) Aviation gasoline; red.
- (c) Inert gas; green.
- (d) Sea water; black.

**5.11 Ventilation systems.****5.11.1 General requirements.** The ventilation system diagram shall be shown on two separate diagrams; one for supply and air conditioning systems; the other for exhaust systems. The diagrams shall show the following:

- (a) All ducts within the ship through which water, gas, smoke, or fire may enter the ship and pass from one compartment to another. This includes all ducts installed between the weather and watertight compartments and all ducts of recirculating systems that pierce bulkheads. Only one spur shall be shown in a compartment even though two or more terminals are provided.
- (b) All ventilation and recirculating closure fittings, fans, and distant operation stations.
- (c) All mechanically operated fire zone dampers.
- (d) Remote operations of ventilation closures and fan controllers.
- (e) Fans without any ductwork piercing bulkheads shall not be shown.

**5.11.2 Colors.** The following colors are required for the ventilation systems diagram:

- (a) Mechanical supply (including fans and closures); blue.
- (b) Mechanical exhaust (including fans and closures); green.
- (c) Natural supply and exhaust (including closures); orange.
- (d) Recirculating system; red.

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- 5.12 Chilled water system.
- 5.12.1 General requirements. The chilled water system diagram shall show the following:
- Piping, valves, fittings and pumps used for supplying chilled water to unit coolers and coils.
  - Branches from the unit coolers and coils shall be shown into the compartments served. A triangular symbol shall be used to represent the coolers and coils.
- 5.12.2 Colors. The following colors are required for chilled water system diagrams:
- Chilled water; green.
  - Other services; black.
- 5.13 Compressed air system.
- 5.13.1 General requirements. The compressed air systems diagram shall show the following:
- Compressors, air cylinders, piping, valves and fittings.
- 5.13.2 Branches.
- 5.13.2.1 Branches (off main). Branches shall be shown up to the service outlet and properly labeled. Strainers, separators, and gauges shall not be shown.
- 5.13.2.2 Branches (starting air). Branches that are used for starting air on diesel-electric or diesel driven ships shall be shown up to the engines.
- 5.13.3 Colors. The following colors are required for the compressed air systems diagram:
- High pressure (over 1000 p.s.i.); red.
  - Medium pressure (150 p.s.i. to 1000 p.s.i.); green.
  - Low pressure (below 150 p.s.i.); blue.
- 5.14 Oxygen and nitrogen systems.
- 5.14.1 General requirements. The oxygen and nitrogen systems diagram shall show the following:
- All oxygen and nitrogen stowage tanks, piping, valves, fittings, compressors, and pumps used for producing and supplying oxygen and nitrogen.
- 5.14.2 Colors. The following colors are required for the oxygen and nitrogen systems diagram:
- Oxygen; red.
  - Nitrogen; blue.
  - Other services; black.
- 5.15 Voice and pneumatic tubes, and message passing facilities. The diagrams for voice and pneumatic tubes, and message passing facilities shall be prepared on form 9881/1 or 10 for 9 by 10-1/2 inch sheets or form 9881/18 or 26 for 10-1/2 by 16 inch sheets (see table VIII). The diagrams shall show runs of the tubes between terminals of voice tubes, pneumatic tubes, and the location of message passing scuttles.
- 5.16 Casualty power supply and casualty communication systems.
- 5.16.1 Type of ship required for. A casualty power supply and casualty communication system diagram shall be prepared for the following types of ships:
- Carriers
  - Cruisers
  - Frigates
  - Destroyers
  - Esorts
  - All conversions from types specified in (a) through (e).
  - Other types longer than 350 feet overall.

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5.16.2 General requirements. The casualty power supply and casualty communication systems diagram shall show the following:

- (a) Location of switchboards.
- (b) All power panels equipped with casualty power terminals.
- (c) Riser and bulkhead terminals.
- (d) Cable racks, including location marking, permanently installed risers and cables.
- (e) Portable casualty power cable runs including cable rack and length.
- (f) Multi-purpose outlets including location numbers used for submersible pumps, welding outfits and sterilizers. (Wiring between multi-purpose outlets shall not be shown.)
- (g) Casualty communication circuit (X40J) permanent cable runs, and permanently installed sound powered telephone jackboxes including their location numbers.
- (h) A note concerning the type and length of casualty communication portable cables and stowage locations.

5.16.3 Colors. The following colors are required for the casualty power supply and casualty communication systems diagram:

- (a) Permanent casualty power system; green.
- (b) Switchboard, power panel, and controller; green.
- (c) Terminal; green.
- (d) Portable casualty power supply system; red.
- (e) Cable rack for casualty power supply system; red.
- (f) Permanent casualty communication circuit (X40J) cables; blue.
- (g) Jackboxes; blue.
- (h) Multipurpose outlets; orange.

5.17 Vital damage control electrical equipment and power supply chart.

5.17.1 Type of ship required for. A vital damage control electrical equipment and power supply chart shall be prepared for the following types of ships:

- (a) Carriers
- (b) Cruisers
- (c) Frigates
- (d) Destroyers
- (e) Escorts
- (f) All conversions from types specified in (a) thru (e)
- (g) Other types longer than 550 feet overall

5.17.2 General requirements. The chart shall be a tabulation on a plastic grid of the vital damage control equipment and systems, with their identification numbers, power supplies and controls. Blank spaces shall be uniformly spread throughout the data on the chart.

5.17.3 Equipment and systems. The chart shall indicate the following vertical headings:

- (a) Line numbers
- (b) Panels
- (c) Switches
- (d) Energized from
- (e) Ventilation systems
- (f) Multi-purpose outlets
- (g) Pumps
- (h) Gun mounts and missile launchers
- (i) Directors
- (j) Electronics
- (k) Elevators
- (l) Hoists
- (m) Circuits
- (n) Miscellaneous
- (o) Valves

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5.17.4 Information to be listed. Equipment, systems, circuits, location numbers, etc. shall be listed under the vertical column headings. In addition, the following I.C. systems shall be included:

- (a) CA - Collision alarm
- (b) DG - Remote draft indicator
- (c) 1F - High temperature alarm
- (d) 4F - Combustible gas and smoke detector
- (e) 9F - High temperature alarm ASROC
- (f) FC - Flight crash signal
- (g) FD - Flooding alarm
- (h) FH - Sprinkling alarm
- (i) FR - CO<sub>2</sub> release alarm
- (j) FZ - Security alarm
- (k) G - General alarm and chemical attack alarm
- (l) L - Rudder order
- (m) LB - Steering emergency signal
- (n) LC - Gyro compass
- (o) MB - Engine order or motor order
- (p) 3MB - Engine control order
- (q) N(IN-4N) - Rudder angle indicator
- (r) 5N - Emergency rudder angle indicator
- (s) VS - Valve position indicator

5.17.5 Color. Lettering and grid will be lithographed in black. No color guide required.

5.18 Communication directory.

5.18.1 Type of ship required for. A communication directory shall be prepared for the following types of ships:

- (a) Carriers
- (b) Cruisers
- (c) Frigates
- (d) Destroyers
- (e) Escorts
- (f) All conversions from types specified in (a) through (e)
- (g) Ships longer than 550 feet overall.

5.18.2 General requirements. The directory shall be a tabulation on a plastic grid of the circuits, used in the control of damage, with their location and identification numbers. Stations shall be listed in alphabetical sequence. Spaces shall be left after each alphabetical group for future additions. A note shall be included on the chart, referring to the casualty power supply diagram, for information pertaining to the casualty communication circuit (X40J)

5.18.3 Headings and circuits. The chart shall indicate the following vertical headings:

- (a) Station
- (b) Location (level, compartment, frame)
- (c) Aircraft control, service and aviation fuel control circuits (1JG, 3JG, 4JG, X1JG)
- (d) Announcing systems (1MC, 3MC, 4MC, 21MC, 26MC) units located in compartment that have outlets for other circuits included in (c) through (j)
- (e) Captain's battle circuits (JA and XJA)
- (f) Damage control and repair circuits (2JG thru 12JG, X2JG)
- (g) Dial telephone system (J)
- (h) Engineer's circuits (1JV, 2JV, 3JV, 4JV, 5JV, X1JV)
- (i) Foam circuit (X50J)
- (j) Selective switches (S.S.)

5.18.4 Information to be listed. Station location of outlets and selective switches shall be listed for all sound-powered telephone circuits listed under the vertical column headings. Stations and locations of intercommunication units, reproducers, transmitters, and the directory number of dial telephone sets (except for staterooms), shall be listed.

5.18.5 Color. Lettering and grid will be lithographed in black. No color guide required.

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## 6. REQUIREMENTS FOR TEXT AND TABLES

6.1 General requirements. The text and tables shall be prepared to supplement the diagrams and shall be in complete agreement with the diagrams. Text and tables shall include the following:

- (a) A list of valves shall follow the text for each system. Valves shall be listed beginning with the lowest deck, reading forward to aft, and ending on the highest deck. Remote control valves for piping systems shall be identified by a symbol outside the left hand borderline. The type of operation for remote control valves shall be included in the "Size and Type" column, for example, "3 Gate-elect".
- (b) Remote control location for ventilation fans and closure fittings shall be included in the "Location" column, for example "controlled from 3-18-1-A".
- (c) Where compartments are mentioned in the valve lists, the number shall be listed first and the name below it.
- (d) Closure classification letters, as finally approved, shall be included in the tables. The column headed "Division Responsible" shall be left blank.

6.2 Text and table contents. A guidance text for content and format shall be provided if requested. Requests should be forwarded to NAVSEC, Hyattsville, Maryland 20782.

6.2.1 Principal characteristics. Ship characteristics shall be listed, such as length overall, length between perpendiculars, extreme breadth, molded depth at side to main deck, frame spacing, main engines, propeller, and armament data.

6.2.2 Shoring. The text shall give a brief description pertaining to shoring.

6.2.3 Steering gear. A brief description of steering gear and a list of locations of steering stations shall be included in this section.

6.2.4 Towing. The text shall contain a brief description of towing equipment onboard ship.

6.2.5 Ammunition and missile handling. The text shall contain a brief description of ammunition and missile handling.

6.2.6 Medical. Text shall contain a brief description of the facilities including number and location of medical storerooms, battle dressing stations, and surgical spaces. The total quantity of first-aid boxes, portable medical lockers, and medical supply lockers shall be stated. Locations are not required.

6.2.7 Personnel protection. The text shall contain a brief description of decontamination stations, including equipment available, such as protective clothing and gas masks. Only the equipment stowed shall be listed.

6.2.8 Aircraft launching and handling. The text shall contain a brief description of aircraft launching and handling gear including nonmanned craft such as "DASH".

6.3 Stability and loading section. Part II (a) of the text shall be based on the latest weight estimates or inclining experiment data and conform to these requirements.

6.3.1 Introduction. The introduction shall recommend the study of "Damage Control", as set forth in Chapter 9881, Naval Ships Technical Manual (NAVSHIPS 0901-881-0002). Information on stability and loading in the damage control book is intended to show the specific application of information in that publication to the particular ship or class of ships. A general discussion of the stability characteristics shall be included and, if possible, broad statements shall be made to define conditions under which stability will not be critical or conditions under which stability will not be adequate. Any outstanding or unusual conditions applicable to the ship shall be noted.

6.3.2 Stability provided.

6.3.2.1 Factors affecting required stability. Under this heading, the considerations upon which "required stability" is based shall be outlined. Only those hazards which are significant for the ship under discussion shall be included. Possible hazards are flooding, wind, high speed turning, lifting weights, heel due to passengers, and icing of topsides.

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6.3.2.2 Curves of statical stability (intact). A sketch shall be included showing the curves of statical stability for the Light Condition, Full Load Condition and Minimum Operating or Optimum Battle Condition Curves for other conditions shall be added if they are of particular importance for the ship under consideration. A brief discussion of the significance of these curves shall be given.

6.3.2.3 Heeling effect of beam winds, turning, etc. The heeling effect of beam winds shall be illustrated by a sketch showing the statical stability curve for the least favorable loaded condition, together with the heeling arms produced by a beam wind as specified by tables IV and V. This sketch may be omitted if the heeling effect is so small, in relation to the righting arms, that beam winds are not important, in which case a statement to this effect shall be made. The area between the righting arm curve and the heeling arm curve for the specified wind shall be cross hatched and a statement included to indicate that this area is a measure of the residual dynamic stability for the specified beam wind. If the effect of this beam wind is considered to be dangerous in the least favorable condition of load, the curve of wind heeling arms shall be drawn for the maximum beam wind velocity which the ship can safely withstand, and the limitations of the ship with respect to beam winds shall be discussed with particular reference to the possibility of higher acceptable beam wind velocity in the more favorable conditions of load. Additional sketches shall be shown as necessary to illustrate the discussion. If there are other influences which might produce a relatively large heeling arm for the ship under consideration, such as high speed turning, lifting weights, or movement of passengers, each shall be discussed in a separate paragraph. The discussion shall be generally similar to that described for beam winds, illustrated by statical stability and heeling arm curves.

Table IV - Wind velocities.

Service	Minimum wind velocity for design purposes, knots	Minimum acceptable wind velocity in service, knots
<u>Ocean</u>		
(a) Ships which must be expected to weather full force of tropical cyclones. This includes all ships which will move with the amphibious and striking forces.	100	90
(b) Ships which will be expected to avoid centers of tropical disturbances.	80	70
<u>Coastwise</u>		
(a) Ships which will be expected to weather full force of tropical cyclones.	100	90
(b) Ships which will be expected to avoid centers of tropical disturbances but to stay at sea under all other circumstances of weather.	80	70
(c) Ships which will be recalled to protected anchorages if winds over force 8 are expected.	60	50
<u>Harbor</u>	60	50

Table V - Heeling moments (foot-tons) per square foot for a nominal 100-knot-wind.

Height above W.L., ft	Center of lateral resistance below waterline, ft.																	
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0-5	0.4	0.05	0.06	0.07	0.07	0.08	0.09	0.10	0.11	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19
5-10	0.11	0.12	0.14	0.15	0.16	0.18	0.19	0.20	0.20	0.22	0.23	0.24	0.26	0.27	0.28	0.29	0.31	0.32
10-15	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.30	0.32	0.33	0.34	0.35	0.37	0.38	0.40	0.41	0.43	0.44
15-20	0.30	0.32	0.33	0.34	0.36	0.37	0.39	0.41	0.42	0.44	0.45	0.46	0.48	0.49	0.51	0.53	0.54	0.56
20-25	0.40	0.41	0.43	0.45	0.46	0.47	0.49	0.51	0.53	0.54	0.56	0.58	0.60	0.60	0.62	0.64	0.66	0.67
25-30	0.50	0.52	0.54	0.55	0.57	0.59	0.60	0.62	0.64	0.65	0.67	0.69	0.71	0.73	0.74	0.75	0.77	0.79
30-35	0.61	0.62	0.64	0.66	0.68	0.70	0.72	0.73	0.75	0.77	0.79	0.80	0.82	0.84	0.86	0.87	0.89	0.91
35-40	0.72	0.73	0.75	0.77	0.79	0.81	0.83	0.85	0.86	0.88	0.90	0.92	0.94	0.96	0.98	1.00	1.01	1.03
40-45	0.83	0.85	0.86	0.88	0.90	0.92	0.94	0.96	0.98	0.99	1.01	1.03	1.05	1.07	1.09	1.11	1.13	1.15
45-50	0.95	0.97	0.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.13	1.15	1.18	1.20	1.22	1.24	1.26	1.27
50-55	1.06	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.26	1.27	1.30	1.31	1.34	1.36	1.38	1.40
55-60	1.18	1.20	1.22	1.24	1.26	1.27	1.30	1.32	1.34	1.36	1.38	1.39	1.41	1.43	1.46	1.48	1.50	1.52
60-65	1.30	1.32	1.34	1.36	1.38	1.39	1.41	1.44	1.46	1.48	1.50	1.52	1.53	1.56	1.58	1.60	1.62	1.64
65-70	1.41	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58	1.60	1.62	1.65	1.66	1.68	1.70	1.72	1.75	1.77
70-75	1.54	1.56	1.58	1.60	1.62	1.65	1.66	1.68	1.70	1.73	1.75	1.77	1.79	1.80	1.83	1.85	1.87	1.89
75-80	1.66	1.67	1.70	1.72	1.74	1.76	1.79	1.80	1.82	1.84	1.87	1.89	1.91	1.93	1.95	1.97	1.99	2.01
80-85	1.79	1.80	1.82	1.84	1.87	1.89	1.91	1.93	1.95	1.97	1.99	2.02	2.04	2.06	2.07	2.10	2.12	2.14
85-90	1.91	1.92	1.94	1.96	1.89	2.01	2.03	2.06	2.07	2.09	2.11	2.14	2.16	2.18	2.20	2.22	2.24	2.26
90-95	2.02	2.05	2.06	2.08	2.11	2.13	2.15	2.18	2.19	2.21	2.23	2.26	2.28	2.30	2.32	2.34	2.36	2.39
95-100	2.14	2.17	2.18	2.20	2.23	2.25	2.27	2.29	2.32	2.33	2.35	2.38	2.40	2.42	2.45	2.46	2.48	2.51

NOTE: To obtain the total heeling moment from this table, procedure is as follows:

- (a) Divide sail area into 5-foot layers, starting from waterline.
- (b) Determine number of square feet in each layer.
- (c) Multiply area of each layer by appropriate figure from table and add products. This is heeling moment for a 100-knot wind.
- (d) For wind velocities other than 100 knots, multiply moment by  $(V/100)^2$ .

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6.3.2.4 Curves of statical stability after extensive damage. A statement shall be included to indicate the approximate extent of damage and flooding which the ship may be expected to survive provided instructions regarding ballasting and limiting drafts are followed. Statical stability curves shall be provided to illustrate the righting arms after such damage for the critical flooding case in the Minimum Operating Condition or Optimum Battle Condition and the Full Load Condition, together with the corresponding curves for the intact ship. Similar curves for other conditions of loading shall be included if they are of particular significance. Curves of righting arms in the damaged conditions shall be as realistic as possible, including such factors as probable unsymmetrical flooding. This information will be furnished by NAVSEC as soon as requested.

6.3.3 Measures to safeguard stability.

6.3.3.1 Liquid loading instructions. The liquid loading instructions for the ship under consideration shall be given in detail together with the reasons to the specified procedure, or reference shall be made to the liquid loading instructions given on the liquid loading diagram.

6.3.3.2 Precautions to be taken against cross-connection of tanks. A warning against cross-connecting tanks on opposite sides of the ship, either by connecting port and starboard tanks to the same system at the same time or through open sluice valves, shall be included. The danger of such cross-connection, i.e., the aggravation of any list which may develop, and the difficulty of detecting this condition shall be brought out.

6.3.3.3 Watertight integrity. It shall be pointed out that the proper maintenance of watertight integrity, as provided in the design of the ship, is essential in developing full resistance to underwater damage, and is the responsibility of the Commanding Officer. Reference shall be made to the Naval Ships Technical Manual, NAVSHIPS 0901-190-0002 for information on the established procedure for maintenance of watertight integrity. An inboard profile with plan views, if necessary, shall be included in the text, indicating by heavy lines the main transverse subdivision of the ship, with particular attention to stepped bulkheads and the level to which the bulkheads are watertight. An appropriate discussion of this sketch shall be included, stressing the importance of keeping these bulkheads tight.

6.3.4 Minimum acceptable stability. The type of hazard, such as underwater damage, wind, etc. which governs the minimum acceptable stability in normal operation shall be discussed. Where applicable, a curve shall be included to indicate the maximum allowable height of the ship's center of gravity (which will be furnished by NAVSEC on request) for displacement within the normal operating range, at which the ship will have acceptable stability characteristics with respect to the most critical hazards. This shall be followed by a discussion of limitations in loading imposed by less critical but more prevalent hazards in order to permit the Commanding Officer to use sound judgment in exceeding the allowable height of center of gravity under conditions where the desirability of carrying unusual loads may justify accepting the risk of the more critical hazards.

6.3.4.1 Procedure after damage. It shall be pointed out that strict adherence to the liquid loading instructions prior to damage will be of great value after damage. Reference shall be made to the general instructions on this subject in Naval Ships Technical Manual, Section I, NAVSHIPS 0901-881-0002 and these instructions expanded to apply to the individual ship. Complete and detailed instructions shall be included, covering the action to be taken after damage and methods of evaluating the situation. The aspects of the problem shall be included in the discussion.

- (a) Establishing flooding boundaries.
- (b) Preventing progressive flooding through nontight structure, if possible, by heeling the ship to bring such structure above the waterline.
- (c) Evaluating residual stability by observation of nature and extent of flooding, condition of loading at time of damage, nature of roll and tendency to list to either side.
- (d) Available methods of improving stability.
- (e) Action to be avoided.
- (f) Procedure for reducing list, with particular reference to danger of over-compensating for unsymmetrical weight when the possibility of negative metacentric height exists.

This material shall be arranged in the most logical manner possible with separate discussions covering critical stability and noncritical stability. Procedures shall be given in the optimum chronological order.

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6.3.5.1 Limiting values assigned. The limiting draft values and locations shall be quoted and a statement included to the effect that the installation of a distinctive mark (or marks) on the ship has been authorized as a guide against overloading.

6.3.5.2 Basis of assignment. The factors which entered into the establishment of the limiting draft shall be enumerated.

6.3.5.3 Danger of overloading. The adverse effects of exceeding the limiting drafts shall be discussed. The effects shall be listed under two headings, (a) those affecting safety and power of survival (reserve buoyancy, stability and strength), and (b) those affecting performance (speed, radius and dryness), as applicable to the particular ship.

\* 6.3.6 Standard conditions of loading. For each of the standard conditions of loading (as defined by Naval Ships Technical Manual, NAVSHIPS 0901-290-0002) which are significant for the particular ship, the following data shall be included:

- (a) A brief description of the condition of loading.
- (b) A summary of the weight and longitudinal moments of the light ship displacement and the items of load.
- (c) The draft, the vertical positions of the transverse metacenter and center of gravity, metacentric height, trim and drafts fore and aft.
- (d) The details of each item of load included under (b) above (weight, vertical center of gravity, vertical moment, and longitudinal centers of gravity and moments).

6.3.6.1 Tank capacity data. A tabulation shall be prepared, including each of the ship's tanks and the following data:

- (a) Capacity in gallons and tons and height of center of gravity above keel when 95 percent full for each oil tank.
- (b) Capacity in gallons and tons and height of center of gravity above keel when 100 percent full for each fresh water tank, ballast tank and fuel oil tank which is fitted for ballasting.
- (c) Longitudinal distance of the center of gravity of each tank from amidships.

6.3.7 Discussion of diagrams. A discussion of each of the following diagrams shall be included, where applicable:

- (a) Flooding effect diagram
- (b) Liquid loading diagram
- (c) Cross curves of stability
- (d) Draft diagram and functions of form

The discussion shall explain the application of the diagrams, and their use shall be illustrated by examples when necessary.

6.3.8 Submission and approval. This section (stability and loading) shall be delivered to the Supervisor of Shipbuilding for forwarding to NAVSEC. Time of submission shall be such as to enable a minimum of 4 weeks time for review and approval by NAVSEC. The approved section will then be returned by NAVSEC to the contractor for typing and inclusion in the Master Copy Class Text of the Damage Control Book as shown on figure 2.

6.4 Subdivision and access. Reference shall be made to the applicable damage control diagram. The text shall contain description of the principles of subdivision, access, watertight integrity, nomenclature of decks, description of access openings and material conditions of readiness. A paragraph shall be included stating that compartments that are normally closed, such as, voids and wiring trunks that contain piping (as firemain), shall be periodically checked for leaks in systems.

6.4.1 Access fittings. The following watertight, airtight, oiltight, and fumetight fittings shall be listed:

- (a) Doors
- (b) Hatches
- (c) Manholes
- (d) Scuttles, dog type
- (e) Scuttles, passing
- (f) Scuttles, quick acting
- (g) Miscellaneous (such as windows, and airport lens frames and covers).

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6.5 Drainage, ballasting and list control systems.

6.5.1 General requirements. The text for drainage, ballasting and list control systems shall contain methods of operation to obtain efficiency in damage control.

6.5.2 Main and secondary drainage systems. The text for the main and secondary drainage systems shall contain the following:

- (a) Reference to applicable damage control diagram
- (b) Description of the system
- (c) Segregation of the system under battle conditions
- (d) Size of main line or loop piping
- (e) Table indicating pump number, type, capacity and location of each pump; also suction and discharge valves.
- (f) Clogging of pump suction.
- (g) Additional table indicating individual pumping capacity (including capacities for each pump and eductor) and capacity of main circulating pumps available for damage control. (This table shall not include portable pumps.)
- (h) List of valves.

6.5.3 Gravity and miscellaneous drain systems. The text for the gravity and miscellaneous drain systems shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of piping.
- (c) Description of scuppers.
- (d) Description of cofferdam drainage.
- (e) List of deck drain valves (except plumbing).
- (f) Plumbing drain valves (at the scuppers, in decks and in piping lines).
- (g) Miscellaneous drain valves including scupper valves not listed with plumbing.

6.5.4 Portable pumps. The text for portable pumps shall contain the following:

- (a) Description of the engine driven fire pumps and electrical submersible pumps.
- (b) List of number of each type of pump and stowage locations.

6.5.5 Sounding tube deck plates and sounding tubes with valves. The text for sounding tube deck plates and sounding tubes with valves shall contain the following:

- (a) Description of sounding tube piping.
- (b) List of valves and fittings.

6.5.6 Air escapes. The text for air escapes shall contain the following:

- (a) Description of piping.
- (b) List of valves.

6.5.7 Plumbing vents. The text for plumbing vents shall contain the following:

- (a) Description of plumbing vents.
- (b) List of plumbing vents, that terminate on or below the damage control deck, that are fitted with gate valves.
- (c) A note that the valves are not shown on the diagram.

6.5.8 Ballasting and list control systems.

6.5.8.1 Ballasting system. The text for the ballasting system shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of arrangements for ballasting voids and fuel tanks.
- (c) Table showing time required to ballast the damage control voids.
- (d) List of fuel oil ballasting valves.
- (e) List of void tank ballasting valves.

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6.5.8.2 List control system. The list control system text shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of the system.
- (c) Table showing time required to ballast the list control tanks.
- (d) List of valves.

6.6 Tank stripping system. The tank stripping system text shall contain the following:

- (a) Reference to applicable damage control diagram, if required.
- (b) Description of the system.
- (c) List of valves, only if diagram is required.

6.7 Firemain, sprinkling, foam, wasndown and chemical fire systems.

6.7.1 General requirements. The text for the firemain, sprinkling, foam, wasndown and chemical fire systems shall contain methods of operation to obtain efficiency in damage control.

6.7.2 Firemain system. The text for the firemain system shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of the system.
- (c) Segregation of the system under battle conditions.
- (d) Size of main line or loop piping.
- (e) Table indicating pump number, type, capacity and location of each pump; also suction and discharge valves.
- (f) Location of remote and automatic controls for pump.
- (g) List of firemain system valves (including cut-out to ammunition spaces, sprinkling, eductor, flushing and miscellaneous sea water service).
- (h) Fireplugs.

6.7.2.1 Firemain segregation diagrams.

6.7.2.1.1 General requirements. Firemain segregation diagrams, for conditions X-RAY, YOKE and ZEBRA, shall be prepared and shall be in complete agreement with the firemain system diagram and text. The diagrams shall be on plastic with Klirtype symbols, letters, and numbers. The line width shall be number 3 (see 4.4.2.10).

6.7.2.1.2 Required information. The diagram shall be a composite view showing the following:

- (a) Main line or loop.
- (b) Cross connections.
- (c) Take-offs for hanger sprinkling control valves.
- (d) Branches from two or more sections of the segregated main for sprinkling.
- (e) Pump (type, operation and the pump number).

6.7.2.1.3 Format. The diagram format for the title, key, lists of pumps on each segregation, and X-RAY, YOKE and ZEBRA valves, shall be similar to those in the type book.

6.7.2.1.4 Size and page numbering. The size of the diagrams shall be the same as the text pages and shall be assigned text page numbers. A space of 1-1/2 inches shall be left clear for binding in the book.

6.7.2.1.5 Firemain segregation; single line (no loop). The diagrams, consisting of a single line (no loop), shall be indicated as follows:

- (a) Firemain segregation in two parts--forward section a dotted line; aft section a solid line.
- (b) Firemain segregation in three parts--forward section a dotted line; mid section a solid line; aft section a dot-dash line.

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6.7.2.1.6 Color guides. Color guides shall be as follows:

- (a) Single line (no loop) - None required.
- (b) Loop
  - (1) X-RAY - red.
  - (2) YOKE-port, red; starboard, blue.
  - (3) ZEBRA - forward port, red; forward starboard, blue; aft port, orange; aft starboard, green; dry piping, black.
  - (4) If six sections are provided, the aft port, red; aft starboard, blue.

6.7.3 Sprinkling systems. The text for sprinkling systems shall contain the following:

- (a) Reference to the applicable damage control diagram.
- (b) Description of the systems for ammunition spaces, hangar, and miscellaneous spaces (including drain cocks).
- (c) Table of firemain cut-out indicating grouping of ammunition spaces, the identifying numbers of firemain cut-out valves, group control valves, and ammunition spaces cut-out valves.
- (d) List of valves.

6.7.4 Fixed fog nozzle system. The text for sea water fixed fog nozzle system shall contain the following:

- (a) Reference to the applicable damage control diagram.
- (b) Description of the system.
- (c) List of fixed fog nozzle fittings.

6.7.5 Foam system. The text for the foam system shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of the system, including station, pump and proportioners.
- (c) Description of system for helicopter hangar.
- (d) List of foam valves.
- (e) List of foam service outlets.

6.7.6 Washdown system. The text for washdown system shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of system.
- (c) List of group control valves and the area washed down.
- (d) List of valves.

\* 6.7.7 Chemical fire systems. The text for chemical fire systems shall contain the following:

- (a) Description of the CO<sub>2</sub> systems.
- (b) Total number of fixed fire extinguishers (CO<sub>2</sub>) and a list of locations.
- (c) Total number of portable CO<sub>2</sub> fire extinguishers, without listing their locations.
- (d) Total number of portable dry powder fire extinguishers without listing their locations.

6.8 Fuel (NSFO/NDP), filling, transfer and overflow systems.

6.8.1 General requirements. The text for the fuel filling, transfer and overflow systems shall contain methods of operation to obtain efficiency in damage control.

6.8.2 Fuel filling and transfer systems. The text shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of all arrangements and valves for filling and transfer.
- (c) Segregation of the system under battle conditions.
- (d) Size of main line or loop piping.
- (e) Methods of operation of the systems.
- (f) Table indicating pump number, type, capacity and location of each pump; also suction and discharge valves.
- (g) List of valves.

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6.8.3 Overflows. The text for overflows shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of overflows.
- (c) List of valves.

6.8.4 Air escapes. The text for air escapes shall contain the following:

- (a) Description of air escapes.
- (b) List of valves.

6.8.5 Sounding tube deck plates and sounding tubes with valves. The text for sounding tube deck plates and sounding tubes with valves shall contain the following:

- (a) Description of the piping.
- (b) List of sounding tube valves and fittings.

6.9 JP-5 filling, transfer and overflow systems.

6.9.1 General requirements. The JP-5 systems text shall contain methods of operation to obtain efficiency in damage control.

6.9.2 JP-5 filling and transfer systems. The text shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of all arrangements and valves for filling, transfer and auxiliary service.
- (c) Segregation of the system under battle conditions.
- (d) Size of main line or loop piping.
- (e) Methods of operation of the systems.
- (f) Table indicating pump number, type, capacity and location of each pump; also suction and discharge valves.
- (g) List of valves.

6.9.3 Overflows. The text for overflows shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of overflows.
- (c) List of valves.

6.9.4 Air escapes. The text for air escapes shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of air escapes.
- (c) List of valves.

6.9.5 Sounding tube deck plates and sounding tubes with valves. The text for sounding tube deck plates and sounding tubes with valves shall contain the following:

- (a) Description of the piping.
- (b) List of sounding tube valves and fittings.

6.10 Aviation and automotive gasoline systems.

6.10.1 General requirements. The text for the aviation and automotive gasoline, sea water and inert gas systems shall contain methods of operation to obtain efficiency in damage control.

6.10.2 Gasoline systems. The text shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of fueling, de-fueling and sea water systems.
- (c) Segregation of the system under battle conditions.
- (d) Size of main line piping.
- (e) Table indicating pump number, type, capacity and location of each pump; also suction and charge valves.
- (f) List of aviation gasoline system valves.
- (g) List of automotive gasoline system valves.
- (h) List of sea water system valves.

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6.10.3 Overflows. The text for overflows shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of overflows.
- (c) List of valves.

6.10.4 Sounding tube deck plates and sounding tubes with valves. The text for sounding tube deck plates and sounding tubes with valves shall contain the following:

- (a) Description of the piping.
- (b) List of sounding tube valves and fittings.

6.10.5 Inert gas system. The text for inert gas system shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Size of piping.
- (c) Source of supply.
- (d) List of valves.

6.11 Ventilation systems.

6.11.1 General requirements. The text for ventilation systems shall contain the following:

- (a) Reference to applicable damage control diagrams.
- (b) Description of systems.
- (c) Methods of operation to obtain efficiency in damage control.

6.11.2 Ventilation systems. The text for the systems shall contain the following:

- (a) Reference to applicable damage control diagrams.
- (b) Description of all arrangements, including number and type of supply, exhaust and recirculating fans.
- (c) Description of ventilation arrangement for spaces fitted with CO<sub>2</sub> system.
- (d) Discussion of recirculating systems that pierce bulkheads.
- (e) Discussion of ventilation in relation to water-tight integrity, stressing hazard to water-tight integrity and spread of noxious gases, smoke, and flame.
- (f) Discussion of proper setting in material conditions, remote control operations of system including location of power panels and their sources of power.
- (g) Discussion of the importance of maintenance and keeping systems free of dirt and debris which may be attracted.
- (h) A listing of the following:
  - (1) Fans.
  - (2) Fans (without any duct work piercing bulkheads or decks).
  - (3) Controllers and power panels for fans (when a Vital Damage Control Electrical Power Supply chart is not required).
  - (4) Closure fittings of ventilation and recirculating systems including mechanical fire zone dampers.

6.12 Chilled water system. The text for the chilled water system shall contain the following:

- (a) Reference to manuals.
- (b) Description of system.
- (c) List of valves which are numbered and assigned closure classification in operating manual.
- (d) Size of main line or loop piping.
- (e) Table indicating pumps and chillers, type, capacity and location.
- (f) List of chilled water system valves (including cut-out to miscellaneous service). Form 9881/3 or 12 for 8 by 10-1/2 inch text or form 9881/20 or 28 for 10-1/2 by 16 inch text should be used for this listing (see table VIII).

6.13 Compressed air systems.

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6.13.1 General requirements. The text for compressed air systems shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of systems.
- (c) Methods of operation to obtain efficiency in damage control.

6.13.2 Compressed air systems. The text shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of high, medium, and low and ship service systems.
- (c) Number, location and capacity of compressors.
- (d) Methods of operation, and segregation of systems under battle conditions.
- (e) List of valves.
  - (1) High pressure
  - (2) Medium pressure
  - (3) Low pressure

6.14 Oxygen and nitrogen systems.

6.14.1 General requirements. The text for the oxygen and nitrogen systems shall contain the following:

- (a) Reference to the applicable damage control diagram.
- (b) Description of the systems.
- (c) Methods of operation to obtain efficiency in damage control.

6.14.2 Oxygen and nitrogen systems. The text shall contain the following:

- (a) Reference to applicable damage control diagram.
- (b) Description of the systems.
- (c) Number, location and capacity of compressors.
- (d) Methods of operation and segregation of system under battle conditions.
- (e) List of valves.
  - (1) Oxygen.
  - (2) Nitrogen.

6.15 Fresh water system. The text for the fresh water system shall contain the following:

- (a) Description of system.
- (b) Method of operation of system.
- (c) Number, location, and capacity of pumps, hot water heaters and tanks.
- (d) List of root valves and their closure classification.

6.16 Flushing system. The text for the flushing system shall contain the following:

- (a) Brief description of system.
- (b) Brief description of method of operation of system.
- (c) Reference to firemain flushing cut-out valves.
- (d) Reference to flushing pumps.

6.17 Voice and pneumatic tubes and message passing facilities. The text for voice and pneumatic tubes and message passing scuttles shall describe the following:

- (a) Method of operation.
- (b) Size of tubing.

6.18 Lubricating oil system. The text for all lubricating oil systems shall contain the following:

- (a) Description of system.
- (b) Method of operation.
- (c) Number, location and capacity of pumps.
- (d) Location of filling station.
- (e) List of damage control valves, only where the system penetrates watertight bulkheads or deck.

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6.19 Power and lighting. The text shall contain information which provides a general knowledge of the ship's electrical systems. It shall contain the following:

- (a) Reference to Vital Damage Control Electrical Equipment and Power Supply Chart, if one is required.
- (b) Reference to "Ship's Information Book" for description of systems.
- (c) A brief description of systems to indicate that they have been designed with a high degree of flexibility, reliability, and inherent damage control features to obtain a continuity of power supply under casualty conditions.

6.19.1 Design arrangements. The text for design arrangements shall contain a discussion of design features of electric system that provided inherent damage control features, such as provision made in distribution system to cope with derangements and casualty conditions. Typical examples are, steering gear, which is provided with at least two sources of electric power arranged through different parts of the ship and in some cases with emergency electro-hydraulic pumps; power supply to ordnance equipment; bus ties provided to interconnect switchboards; and separation between generator plants.

6.19.2 Generating plant (including ship service and emergency switchgear). The text for the generating plant shall contain data on plant, number, rating, location of generators and associated switchgear.

6.19.3 Power distribution system. The text for power distribution system shall contain the following:

- (a) Description of specific design features of system provided for inherent damage control functions, such as selective tripping of protective devices.
- (b) Table giving a list of auxiliaries that have more than one power supply feeder and indicate the source of the normal, alternate, and emergency supplies.
- (c) Outline of switchgear bus tie arrangements, sources of power supply, method of transferring load from one power supply to another, and general location of various cable runs.
- (d) Schematic wiring diagrams illustrating typical methods used for transferring loads from one power source to another, and switchgear interconnections.
- (e) Information on the following power circuits:
  - (1) Catapult machinery
  - (2) Damage control valves
  - (3) Electronic systems
  - (4) Elevators (all electric operated ones)
  - (5) Generator and bus ties
  - (6) Guns and launchers
  - (7) Hoists
  - (8) Pumps (all electric operated ones)
  - (9) Multi-purpose outlets
  - (10) Steering gear

6.19.4 Lighting distribution system. The text for the lighting distribution system shall contain the following:

- (a) Design arrangement features that provide for instantaneous emergency supply to lights in vital areas. Generally, circuit arrangement for such normal, alternate, and emergency supplies shall be indicated.
- (b) Function of relay operated and manually operated hand lanterns.
- (c) Information in regard to low level (red light) illumination.

6.19.5 Cableway arrangements. The text for cableway arrangements shall contain the following:

- (a) Brief description of main cableway runs throughout the ship.
- (b) Brief description of selection of runs to provide maximum separation between normal, alternate, and emergency supplies both horizontally and vertically.

6.19.6 Cable marking and identification. The text for cable marking and identification shall contain the following:

- (a) Brief description of cable marking and identification.
- (b) Examples showing how the cable description indicates location of source and destination of cable in addition to its voltage and service application.

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6.19.7 Electrical equipment. The text for electrical equipment shall contain the following:

- (a) List of electrical equipment available for damage control purposes.
- (b) Functions of equipment except for casualty power system for which reference should be made to applicable section describing purpose and scope of that system.
- (c) List of the following equipment:
  - (1) Flood lanterns
  - (2) Portable submersible pumps
  - (3) Welding facilities

6.20 Casualty power supply system. The text for the casualty power supply system shall contain the following:

- (a) Reference to casualty power supply control diagram; if one is required.
- (b) Reference to vital damage control electrical equipment and power supply chart, if one is required.
- (c) Description of system including specific arrangements.
- (d) Include the following in the text when a casualty power supply diagram is not required:
  - (1) List of casualty power supply panels, including location number.
  - (2) List of casualty power supply bulkhead and deck terminals, including location number.
  - (3) List of casualty power portable cable racks, location and number.
  - (4) List of portable cable (by cable rack number) and the lengths of cable stowed thereon. This listing shall be in sequence starting with the lower deck, reading forward to aft, and ending at the highest deck.
  - (5) List of multi-purpose outlets, including location number and power source.

6.21 Interior communication circuit. The text for the interior communication circuits shall contain the following:

- (a) Reference to vital damage control electrical equipment and power supply chart; if one is required.
- (b) Reference to communication directory, if one is required.
- (c) Essential information regarding the function, operation, and use of interior communication circuits that are used for damage control.
- (d) Location of the outlets for the circuits listed in tables VI and VII, when a communication directory is not required.

Table VI - Interior communication circuits.

Circuit	System
DG	Remote draft indicator
F	High temperature alarm
9F	High temperature alarm, ASROC
FD	Flooding alarm
FH	Sprinkling alarm
FR	CO <sub>2</sub> release alarm
FZ	Security alarm
J	Dial telephone
L	Rudder order
LB	Steering emergency signal
LC	Gyro compass
MB	Engine order or motor order
3MB	Engine control order
1MC	General announcing
3MC	Aviator's announcing
4MC	Damage control announcing
21MC	Captain's command announcing
26MC	Machinery operations control announcing
30MC	Special weapons control
N(LN-4N)	Rudder angle indicator
5N-6N	Emergency rudder angle indicator
QD	Gasoline compartment exhaust ventilation alarm system
QX	Oxygen nitrogen plant ventilation exhaust alarm
VS	Valve position indicator

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Table VII - Circuits of sound powered telephone systems.

Circuit	System
JA	Captain's battle
1JG	Aircraft control
3JG	Aircraft service
4JG	Aviation fuel control
1JV	Maneuvering and docking
2JV	Engineer (engines)
3JV	Engineer (boilers)
4JV	Engineer (fuel)
5JV	Engineer (electrical)
6JV	Ballast control
2JZ	Damage and stability control
3JZ	Main deck repair
4JZ	Forward repair
5JZ	Aft repair
6JZ	Amidships repair
7JZ	Engineer's repair
8JZ	Crash and salvage repair team
9JZ	Ammunition spaces sprinkling and ordnance repair, forward
10JZ	Ammunition spaces sprinkling and ordnance repair, aft
11JZ	Gallery deck and island structure repair
X6J1	Electronic service
X40J	Casualty communication
X50J	Foam
XJA	Auxiliary captain's battle
X1JG	Auxiliary aircraft control
X1JV	Auxiliary maneuvering and docking
X2JZ	Auxiliary damage and stability control

## 7. BOOK FORMAT REQUIREMENTS

7.1 General requirements for text and tables. The typewritten manuscript of the damage control book text and tables shall be prepared on standard forms specified in table VIII.

Table VIII - Text and table forms.

Title	NavShips No.			
	Sheets 8 by 10-1/2 inches		Sheets 10-1/2 by 16 inches	
	UNCLASS	CONF	UNCLASS	CONF
Blank form	9881/1	9881/10	9881/18	9881/26
Connecting spaces	9881/2	9881/11	9881/19	9881/27
Valve list	9881/3	9881/12	9881/20	9881/28
Ventilation fans	9881/4	9881/13	9881/21	9881/29
Controllers and power panels for ventilation fans	9881/5	9881/14	9881/22	9881/30
Ventilation closure fittings	9881/6	9881/15	9881/23	9881/31
Fixed fog nozzle fittings	9881/7	9881/16	---	---
Fire plugs	9881/8	9881/17	9881/24	9881/32
Record of revision dates	9881/9	9881/9	9881/25	9881/25

7.2 Availability of forms. The text and table forms are obtainable from the Navy Supply Center at Oakland, California and Norfolk, Virginia, via the Supervisor of Shipbuilding.

7.3 Page size. The size shall be as follows:

- (a) 10-1/2 inches wide by 16 inches long for all diagrams 16 inches wide.
- (b) 8 inches wide by 10-1/2 inches long for all other diagram sizes.

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7.4 Handling and distribution. Handling and distribution shall be in accordance with figure 2. All required copies shall be made from the original master.

7.5 Format for text and tables.

7.5.1 Type required. A typewriter with pica size type only shall be used for typing the text and tables.

7.5.2 Format. The format for the text and tables shall be as follows:

- (a) Title typed above the border line.
- (b) Text and list of fittings typed between the border line on all forms.
- (c) Space between lower margin and guide line left blank.
- (d) When footnotes, such as "Manifold", are required, the symbol referring to the footnote shall be typed outside the left hand bind margin immediately adjacent to the vertical line, the footnote shall be typed below the lower margin.
- (e) Tables shall have a double space between a description of each closure, valve, or fitting.
- (f) The "class" ship number, such as DLG 16, class, shall be typed in the blocks by the lead activity.
- (g) All pages with changes shall be retyped.
- (h) All pages, retyped due to changes, shall have the individual ship number typed in the block. The month and year will be typed below the ship number by the post-shakedown activity.
- (i) When pages are being retyped, due to the addition of one or two line items, typing within the 1-1/2 inch space is permissible to eliminate the addition of a new page with a suffix letter; such as II(e)6A which would contain only a few lines.
- (j) Where new items are added, the page or pages shall be typed so that the items are in numerical order. This may necessitate additional pages which shall have the same page number as the original plus a letter subscript.

7.6 Miscellaneous pages. The miscellaneous pages shall be as specified in 7.6.1 through 7.6.8.

7.6.1 Title page. The title page shall contain the following:

- (a) The words "Damage Control Book"
- (b) Ship number
- (c) Ship type
- (d) NAVSEC identification
- (e) Year date
- (f) Distribution statement no. 4 in block lower left hand corner with DOD office "NAVSHIPS".

7.6.2 Security classification. Each damage control book, as it applies to a ship or group of ships, is considered as a unit for "classification" purposes. Damage control books are either unclassified or confidential. For the damage control books that are classified "Confidential" the following shall apply:

- (a) Text and tables typed on "Confidential" forms.
- (b) The following note shall be typed only on the "cover page" of the text, and shall appear no where else on the diagrams and text:  
"GROUP 3, DOWNGRADED AT 12 YEAR INTERVALS. NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10".
- (c) On "Classified" material add the following "NOTE" on the "List of Damage Control Diagrams" page (see 7.6.8) "This Damage Control Text and all of the above lithographic copies of the damage control diagrams, regardless of whether they are removed from the book, are classified 'Confidential' and shall be safeguarded in accordance with the provisions of the United States Security Manual for Classified Matter. However, the 'Confidential' laminated plastic copies of the Damage Control Diagrams shall be downgraded to 'Unclassified' only after these diagrams are received onboard ship. These laminated copies shall be treated as being in a 'FOR OFFICIAL USE ONLY' category."
- (d) The record of page revision and dates and firemain segregation diagrams shall be unclassified.

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7.6.3 Table of contents. The table shall contain the title and the page numbers of all sections.

7.6.4 Record of page revision dates. The page shall be as follows:

- (a) When prepared for a class of ships.
- (1) First column headed "Page No." shall have each sheet, front and back page numbers, on an individual line; for example, I(d)1-2, II(d)3-4, etc.
  - (2) Second column headed by the word "class". Below this heading type "Original Undated".
  - (3) Third column heading shall be left blank for the first ship of the class since additional information will be added by the outfitting and post-shakedown activities. In this third column the letters "N", "R" and "V" shall be added, as noted on the form, below the blank heading opposite the retyped page numbers.
  - (4) Third column, for following ship of the class, shall be headed by the month and year. In this third column the letters "N", "R" and "V" shall be added, as noted on the form, below the heading opposite the retyped page numbers.
  - (5) Fourth column shall be left blank for the ships of the following yards since additional information will be added by the outfitting and post-shakedown activities. In this fourth column the letters "N", "R" and "V" shall be added, as noted on the form, below the blank heading opposite the retyped page numbers.
- (b) When prepared for an individual ship.
- (1) First column headed "Page No." shall have each sheet, front and back page numbers, on an individual line: for example, II(d)1-2, II(d)3-4, II(d)5-6, etc.
  - (2) Second column headed by the year only; the year to coincide with the year in the lower right hand corner of the diagrams.
  - (3) Third column heading shall be left blank since additional information will be added by the outfitting and post-shakedown activities. In this third column the letters "N", "R" and "V" shall be added, as noted on the form, below the blank heading opposite the retyped page numbers.

7.6.5 Procedure for revising and handling damage control diagrams and text. The page in the book shall read as follows: "Damage Control diagrams and text shall be revised and handled in accordance with Naval Ships Technical Manual, Section II, NAVSHIPS 0901-882-0002 and MIL-STD-784."

7.6.6 Preface. The text shall contain a brief introductory statement on Damage Control.

7.6.7 References. Reference all publications, pertaining to damage control, which are available to the ship.

7.6.8 List of damage control diagrams. The page shall contain the following:

- (a) List of diagram titles.
- (b) List of diagram numbers.
- (c) A column headed "Overhaul Date".
- (d) Information below the "Overhaul Date" column shall correspond to that in the "Record of Page Revision Dates".

7.7 Page numbering. Pages shall be numbered as follows and shall be typed in the block on the forms.

7.7.1 Guide for "part" and "section" page numbering.

- (a) "Part" and "section" page numbering shall be as follows:

A to - (see special requirements)	}	Table of contents.
1/2		Record of page revision dates.
3		Procedure for revising and handling damage control diagrams and text.
4		Preface.
5		References.
		List of damage control diagrams.

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**PART I - GENERAL INFORMATION**

- (a) Principal characteristics
- (b) Shoring
- (c) Steering gear
- (d) Towing
- (e) Ammunition handling
- (f) Medical
- (g) Personnel protection
- (h) Aircraft launching and handling

**PART II - DAMAGE CONTROL SYSTEMS**

- (a) Stability and loading
- (b) Subdivision and access
- (c) Drainage, ballasting and list control systems
- (d) Tank stripping system
- (e) Firemain, sprinkling, foam, washdown and chemical fire systems
- (f) Fuel oil filling, transfer and overflow systems
- (g) JP-5 filling, transfer and overflow systems
- (h) Aviation and automotive gasoline systems
- (i) Ventilation systems
- (j) Chilled water system
- (k) Compressed air systems
- (l) Oxygen and nitrogen systems

**PART III - MISCELLANEOUS SYSTEMS**

- (a) Fresh water system
- (b) Flushing system
- (c) Voice and pneumatic tubes, and message passing facilities
- (d) Lubricating oil system

**PART IV - ELECTRICAL SYSTEMS**

- (a) Power and lighting
- (b) Interior communication circuits

7.7.1.1 Sections not required. The section letters shall be maintained regardless of whether or not a particular system is required. For example, on ships that do not have a gasoline system a page shall be provided and numbered II(h)1. The page shall be headed by "Part II(h) Gasoline System (Not applicable to this ship)". The page shall be included in the table of contents.

7.7.2 Component parts of page number.

7.7.2.1 General requirements for page numbering. A page number consists of the following three components; for example, II(c)1:

- (a) First component: Roman number corresponding to the "part" number, for example, "II" as required by the guide above.
- (b) Second component: In parenthesis, a letter corresponding to the "section" of the "part"; for example "c".
- (c) Third component: Arabic numbers in sequence for all pages in the "section"; for example, "1".
  - (1) Final text is reproduced by NAVSEC back to back; odd numbered pages will be right hand; even numbered pages will be left hand, except as noted in 7.7.3(d) and (e).

7.7.3 Specific requirements for page numbering within sections. Page numbering within sections shall be as follows:

- (a) Each section, for example, "II(e) Firemain, sprinkling, foam, washdown, and chemical fire systems" shall be subdivided into individual sub-sections; one for the firemain system; one for the sprinkling system; one for the fixed fog nozzle system; one for the foam system, one for the washdown system, one for the chemical fire system.
- (b) The sub-sections shall be further divided into separate units; one for the text and one for the tables.

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- (c) Each unit shall always start an odd numbered page.
- (d) When new pages are added in a unit between odd and even numbered pages, for example II(b)13 and II(b)14, the new pages shall be assigned the same number as the odd numbered page in addition to suffix letter; for example, II(b)13, II(b)13A, II(b)13B, II(b)14.
- (e) When new pages are added in a unit after the end of an even numbered page, the new pages shall be assigned the same page number as the even numbered page in addition to a suffix letter; for example, II(b)14, II(b)14A, II(b)14B.
- (f) When the last page of any unit ends on an odd number and that page has been assigned a double number; for example, II(d)17&18, the new page shall be assigned the number II(d)18 and the previous page assigned II(d)17 in lieu of II(d)17 & 18. However, if the unit ends on an even numbered page, for example II(d)18, the new page shall continue in the same sequence, for example II(d)19.

7.7.4 Special page numbering. The "Table of Contents" shall be assigned capital letters as page numbers. The "Record of Page Revision Dates" shall also be assigned capital letters which are a continuation of the last letter of the "Table of Contents" page.

7.7.5 Requirements for two volumes. When the number of original typewritten pages (text and list of fittings) exceeds 800, it shall be prepared as two volumes. The following shall apply:

- (a) Volume 1
  - (1) Type "Volume 1" on cover page.
  - (2) Table of Contents shall be prepared for Volume 1 and Volume 2.
  - (3) All pages preceding "PART I" shall be prepared and assembled with Volume 1 only.
  - (4) At the end of Volume 1 include a page titled "NOTE" which shall read "For the following sections, see Volume 2". Indicate the sections that appear in Volume 2 and number the page II(d)4.
- (b) Volume 2
  - (1) Type "Volume 2" on cover page.
  - (2) At the beginning of Volume 2, include a page title "NOTE" which shall read "For the following sections, see Volume 1" and number the page II(e)A.

7.8 Binders. The contractor will not be required to provide binders.

## 8. QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for preparation and revision. The responsibility for preparation and revision shall be as follows:

- (a) The lead building yard is responsible for the preparation of the damage control book "text and diagrams" in conformance with this standard and to reproduce and distribute this material in accordance with figures 1 and 2. Further it is required that:
  - (1) The lead building yard mark-up 2 lithographic copies of the diagrams, and retype pages of the text that reflect changes in the ship as delivered. Distribute in accordance with figures 1 and 2.
- (b) The following yard is responsible to revise the diagrams and text received from the lead building yard to suit the individual ship and to reproduce and distribute the revised material in accordance with figures 1 and 2. Further it is required that:
  - (1) The following yard mark-up 2 lithographic copies of the diagrams and retype pages of the text that reflect changes in the ship as delivered. Distribute in accordance with figures 1 and 2.

8.2 Responsibility for accuracy. Each activity shall be responsible for the accuracy of the damage control diagrams and associated text submitted to NAVSEC. The material for the individual ship shall be examined by the contractor for completeness, technical accuracy, legibility, reproducibility and for conformance to all requirements specified herein. This includes the touching up of lines, lettering or symbols as required to eliminate any evidence of weakness.

8.3 Certification. The contractor shall furnish to the Supervisor of Shipbuilding a certified statement with the forwarding letter stating that the damage control book "text and diagrams" conform to the requirements of this standard.

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8.4 In-process inspection. The Government reserves the right of inspection which may be made at any point or during any phase of the development process to determine whether the information as shown in the damage control book is in agreement with the approved installation drawings for systems and label plates. Failure to meet any applicable requirements specified herein shall be cause for rejection.

#### 9. PREPARATION FOR DELIVERY

9.1 Packaging. Damage control diagram plastic may be rolled or packaged flat. Lithographed copies of diagram may be folded or rolled. Damage control book text shall be packaged flat. Material shall be packaged in accordance with the suppliers commercial practice.

9.2 Packing. Material shall be packed in containers of the type, size and kind commonly used for the purpose and in a manner which will insure acceptance by a common carrier and safe delivery at destination. Shipping containers shall comply with the carrier rules and regulations applicable to the mode of transportation.

9.3 Classified material. Classified material shall be packed in totally enclosed shipping containers. All boxes or cartons containing classified material shall be sealed in such a manner that the contents of the containers cannot be inspected without evidence of forcible opening. All containers, except registered mail packages, shall be strapped perpendicular and parallel to the length of the container. The intersection of the strapping shall be joined with sealed strapping seals so constructed and located that tampering would cause mutilation, readily detected by inspection.

9.3.1 Registered mail. Registered mail packages containing classified material shall be limited to size and weight and securely bound in accordance with the Postal Manual Regulation.

9.3.2 Shipping security regulations. Classified materials shall be shipped in accordance with the Departmental Security Regulations which are available in the Government Inspection Office.

#### 9.4 Marking.

9.4.1 Classified material. When classified material is being shipped, marking shall be as specified by the cognizant activity concerned. Except for any marking indicating the nature of the classified material, its confidential classification shall not appear on the outside of the container.

9.4.2 Unclassified material. Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice including the following:

- (a) Nomenclature.
- (b) Contractor's name.

#### 10. NOTES

10.1 Ordering data. Procurement documents should include the "Title, number and date of this standard" and "The contractor is responsible for the delivery of the 'Ship's Master Copy' plastics and text in good condition at its destination. If damaged, it shall be replaced by the contractor at no cost to the Government. In this connection, the plastic negatives, used in making the 'Ship's Master Copy' positives, shall be retained until information is received from the Consignee that the material has been received in a satisfactory condition."

10.2 CHANGES FROM PREVIOUS ISSUE. THE OUTSIDE MARGINS OF THIS DOCUMENT HAVE BEEN MARKED "\*" TO INDICATE WHERE CHANGES (DELETIONS, ADDITIONS, ETC.) FROM THE PREVIOUS ISSUE HAVE BEEN MADE. THIS HAS BEEN DONE AS A CONVENIENCE ONLY AND THE GOVERNMENT ASSUMES NO LIABILITY WHATSOEVER FOR ANY INACCURACIES IN THESE NOTATIONS. BIDDERS AND CONTRACTORS ARE CAUTIONED TO EVALUATE THE REQUIREMENTS OF THIS DOCUMENT BASED ON THE ENTIRE CONTENT AS WRITTEN IRRESPECTIVE OF THE MARGINAL NOTATIONS AND RELATIONSHIP TO THE LAST PREVIOUS ISSUE.

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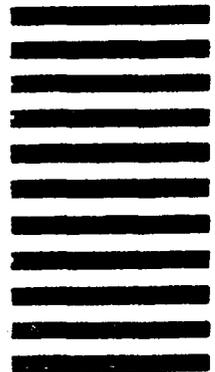
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