NOTE: MIL-STD-25B has been redesignated as a standard practice. The cover page has been changed for Administrative reasons. There are no other changes to this Document.

MIL-STD-25B
10 May 1984
SUPERSEDING
MIL-STD-25A
15 August 1969

DEPARTMENT OF DEFENSE
STANDARD PRACTICE

SHIP STRUCTURAL SYMBOLS FOR USE ON SHIP DRAWINGS

AMSC N/A AREA DRPR

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DEPARTMENT OF DEFENSE
Washington, DC 20301

Ship Structural Symbols for Use on Ship Drawings

MIL-STD-25B

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

This standard was developed to provide guidance for assuring uniformity in the preparation of ship structural drawings. The drawings to which it applies include those prepared by the Naval Sea Systems Command and by private contractors, for providing contract requirements or guidance, and for describing construction details.

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FIGURES

CONTENTS. - Continued

TABLES

1. SCOPE

1.1 This standard applies to ship structural drawings for steel and aluminum ships and supplements MIL-STD-12 and DOD-STD-100. Where a conflict exists between these documents, this standard shall have precedence.

1.2 Two distinct categories of ship drawings as defined in DOD-D-1000 are covered by this document as follows:

(a) Structural contract drawings and contract guidance drawings which are Naval Sea Systems Command drawings used to define or illustrate Navy requirements for a ship structural design as outlined in the ship specifications.
(b) Structural ship construction drawings which are the detailed drawings from which the individual parts of the ship are fabricated and erected.

For the former, it is generally sufficient to outline the extent of each change in weight of plating and indicate the general location and sizes of component parts of the structure. Ship construction drawings, on the other hand, shall give a precise and complete description of what is required. This includes exact boundaries of each plate, sizes and location of stiffening members, and joints and attachments.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATION

MILITARY
DOD-D-1000 - Drawings, Engineering and Associated Lists.

STANDARDS

MILITARY
MIL-STD-12 - Abbreviations for Use on Drawings, Specifications, Standards and in Technical Documents.
MIL-STD-22 - Welded Joint Design.
DOD-STD-100 - Engineering Drawing Practices.

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

2.2 Other publications. The following document forms a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN WELDING SOCIETY (AWS)
A2.4 - Symbols for Welding and Nondestructive Testing (NDT).

(Application for copies should be addressed to the American Welding Society, 550 NW LeJeune Road, P.O. Box 351040, Miami, FL 33135.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. DEFINITIONS (Not applicable)

4. GENERAL REQUIREMENTS (Not applicable)

5. DETAILED REQUIREMENTS

5.1 Standard abbreviations. Frequently used standard abbreviations used in structural drawings are shown in table I. Additional standard abbreviations are presented with the discussions addressing their subject matter, elsewhere in this document. MIL-STD-12 provides a complete list of accepted standard abbreviations.

TABLE I. Frequently used standard abbreviations.

above	ABV	innerbottom	IB
above baseline	ABL	intercostal	INTCL
baseline	BL	knuckle	KNU
below	BLW	level	LVL
bracket	BRKT	lightened	LTD
breasthook	BH	load waterline	LWL
bulkhead	BHD	longitudinal	LONG.1/
centerline	CL	nontight	NT
center vertical keel	CVK	platform	PLATF
cut form	CF	schedule	SCHED
deck	DK	stanchion	STAN
design waterline	DWL	standard	STD
ditto	DO	station	STA
double extra strong (pipe)	XX STR	stiffener	STIF
extra strong (pipe)	XSTR	stringer	STGR
flange	FLG	transverse	TRANSV
flat bar	FB	trunk	TRK
floor	FL	watertight	WT
frame	FR		
gauge	GA		

1/ Periods are used only when the abbreviation spells another word.

5.2 Delineation. Conventional delineation used on ship structural drawings is illustrated on figure 1.

5.3 Designating material. Material shall be indicated by symbols, as listed below, following the size designations of the members. However, where the structure is predominantly of one material, this may be indicated by a general note, with exceptions labeled in the normal manner.

Material	Symbols
Ordinary strength steel	OSS
Higher strength steel	HSS
High yield steel	HY80, HY100, HY130 (Numbers refer to the yield strength)
Medium steel	MS (obsolete, listed for reference only)
High tensile steel	HTS (obsolete, listed for reference only)
Special treatment steel	STS (obsolete, listed for reference only)
Corrosion resisting steel	CRES
Aluminum alloy	AL (e.g. 5086 H-111; 5456 H-116; etc)

5.4 Designating size.

5.4.1 Plate thickness. Plate thicknesses as shown in table II are designated on drawings. The plate symbol, PL, is omitted for simplicity when the size is labeled directly on the member. For example, a 15.3 pound ordinary strength steel plate would be labeled 15.3# OSS or where the material is covered by the general notes, 15.3#. If reference is made to a plate and the label is not directly written on the member, the PL symbol should be used. For example, "ALL WEBS SHALL BE 15.3# PL."

TABLE II. Plate thickness.

Material	Designation	Examples
Medium steel 1/	By weight in pounds per square foot of area	20.4# MS
Ordinary strength steel	By weight in pounds per square foot of area	20.4# OSS
Higher strength steel	By weight in pounds per square foot of area	15.3# HSS
High tensile steel 1/	By weight in pounds per square foot of area	15.3# HTS
High yield steel for noncritical applications	By weight in pounds per square foot of area	30.6# HY80
Corrosion resisting steel	By weight in pounds per square foot of area	7.65# CRES

See footnotes at end of table.

TABLE II. Plate thickness. - Continued

Material	Designation	Examples
Special treatment steel 1/	By weight in pounds per square foot of area, rounded to nearest integer	50# STS
Aluminum alloy	By thickness in inches and decimals of an inch	0.75 AL (alloy)
High yield steel for critical applications 2/	By thickness in inches and decimals of an inch	1.92 HY80
Sheet steel	By thickness in inches and decimals of an inch	0.0625 (16 GA)
Other materials less than 1/8 inch thickness	By thickness in inches and decimals of an inch	0.0625 (16 GA)

1/ Special treatment steel (STS), medium steel (MS) and high tensile steel (HTS) are obsolete and listed here for reference only.
2/ Plate thicknesses are specified in inches and decimals for critical applications which requires tighter tolerances on plate thickness or ultrasonic inspection for thickness and soundness.

5.4.2 Standard shapes.

5.4.2.1 The notation and symbols representing rolled or extruded shapes are as shown in table III.

TABLE III. Standard shape notation and symbols.

Shape	Notation			Symbol
	First number	Second number	Third number	
I-beams (standard, wide flange sections, light beams, junior beams, and joists)	Web nominal depth in inches and fractions	Flange width in inches and fractions	Linear density in pounds (and decimals) per foot	I
Channels (standard, junior, and ship channels)	Web nominal depth in inches and fractions	Flange width in inches and fractions	Linear density in pounds (and decimals) per foot	C
Angles (equal and unequal legs)	Longer leg width in inches and fractions	Shorter leg width in inches and fractions	Thickness in inches and fractions	L

TABLE III. Standard shape notation and symbols. - Continued

Shape	Notation			Symbol
	First number	Second number	Third number	
Tees	Web nominal depth in inches and fractions	Flange width in inches and fractions	Linear density in pounds (and decimals) per foot	T
Flat bars (up to and including 8-inch width; sections exceeding 8-inch are referred to as plates)	Width in inches and fractions	Thickness in inches and fractions	----	FB
Half rounds	Outside diameter in inches and fractions	----	----	HR
Tubing	Outside diameter in inches and decimals	Wall thickness in decimal inches	----	TUBE
Pipe	Nominal diameter in inches and SCHED, STD or strength	----	----	PIPE
Bulb angles	Longer leg width in inches and fractions	Shorter leg width in inches and fractions	Linear density in pounds (and decimals) per foot	BA
Zee bars	Depth in inches and fractions	Leg length in inches and fractions	Linear density in pounds (and decimals) per foot	Z

5.4.2.2 A few sizes of "miscellaneous columns and beams" have the same nominal depth, flange width, and weight per foot as certain "wide flange sections", the variation being in the thickness of web and flange. When using these sections, the symbol "I" should not be used and they should be designated either as a "miscellaneous column" or "miscellaneous beam", whichever applies.

5.4.2.3 Application of symbols for designating shapes are given in the following examples:

8 x 5-1/4 x 21#I
8 x 5-1/4 x 20#MISC BEAM
13 x 4 x 40#[
6 x 6 x 1/2L
5 x 3-1/2 x 1/2L
6 x 4 x 7#T
6 x 1/4FB
3 HR
6 x .25 TUBE
6 STD PIPE
6 XSTR PIPE
6 SCHED #-PIPE
9 x 3-1/2 x 21.6#BA
4 x 3 x 8.2#B

5.4.2.4 In all designations specified in table III and 5.4.2.3, inch marks are omitted but symbol "#" is used for clarity to indicate the weight in pounds per linear foot. Nominal sizes are used throughout.

5.4.2.5 Steel and aluminum structural tubing should not be referred to as pipe since the material specification for pipe does not specify structural physical properties. Tubing is designated by outside diameter and wall thickness. Structural steel tubing is sometimes more readily available in nominal pipe sizes in which case it should be designated by nominal diameter and schedule, standard or strength.

5.4.3 Special shapes cut from rolled sections.

5.4.3.1 Special shapes can be made from rolled I-beams, wide flange shapes, or channels by cutting off either one or two sides of a flange. This leaves the depth of the section unchanged. Shape dimensional notation is as shown in table III. The most common applications and symbols representing each are as follows:

Application	Symbol
I-beam, or wide flange shapes cut to a T (two sides of one flange removed)	I-T
I-beam, or wide flange shapes cut to a J (one side of one flange removed)	I-J
Channel cut to an angle	[-L

Examples:
12 x 4 x 19#I-T
10 x 8 x 33#I-J
13 x 4 x 31.8#[-L

5.4.3.2 Many tees are manufactured from I-beams by cutting through the middle of the web to make two tees. Such members are indicated as tees of half the nominal depth and half the weight of the parent beam.

Example:
6 x 4 x 7ØT (this is a T cut from a 12 x 4 x 14ØI)

5.4.3.3 Serrated angles and tees can be made from channels and I-beams, respectively, by making a serrated cut lengthwise through the web. Since no universal standard for the configuration has been established, details of the cuts shall be shown on drawings. The following symbols shall be used to indicate serrated members:

Application	Symbol
Tee-beam serrated from an I	I-SERR(*)T
Angle serrated from a channel	⊏-SERR(*)⌊

*Indicate here the finish depth of T or ⌊

Examples:
10 x 4 x 17Ø I-SERR 7"T
12 x 4 x 35Ø ⊏-SERR 8"⌊

5.4.4 Special tees and angles.

5.4.4.1 An I-beam or channel can be modified by trimming off a part of one flange to leave the remainder of the faying flange intact. As an example, for a deck longitudal or bulkhead stiffener requiring a 4-inch faying flange, the following nomenclature shall be used.

12 x 6-1/2 x 26ØI-T (4 FAY FLG)

5.4.4.2 Example using channels requiring faying flange:

13 x 4 x 35Ø⊏-⊏(2-1/2 FAY FLG)

5.4.4.3 To modify a member where the above convention does not apply the symbol CF (cut from) can be used.

Examples:
16 x 4⌊CF 18 x 4 x 42.7Ø⊏
4-1/4 x 1-1/4⌊CF 5 x 3 x 1/4⌊
6 x 2⌊CF 6 x 3-1/2 x 1/2⌊

5.4.5 Built-up tees.

5.4.5.1 Tee sections may be built up by welding plates and flat bars together. Built-up tees are indicated by designating the depth of web by width of flange, followed by the weight per square foot of the web and the weight per square foot of the flange. For high yield strength steel tees used in critical application or aluminum alloy, the flange and web thickness is expressed in decimals. A tee with an overall depth of 18 inches giving a 20.4# web and a 30.6# flange 7 inches wide is represented as follows:

18 x 7 x 20.4#/30.6#T (steel)
18 x 7 x 0.50/0.75 T (aluminum alloy)

5.4.5.2 In critical application tee sections may be built up by welded plates or flat bars. A tee with an overall depth of 18 inches having a 1/2 inch thick web and 3/4 inch thick flange with a 7 inch flange width is represented as follows:

18 x 7 x 0.50/0.75 T (critical application)

5.4.6 Flanged plates used as structural members.

5.4.6.1 Flanged plates used as structural members are indicated by designating the depth of member by width of flange by weight per square foot of plate.

Examples:
8 x 4 x 15.3# FLG PL
18 x 7-1/2 x 20.4# FLG PL

5.5 Shell strakes.

5.5.1 The term "shell strake" is applied to a continuous row of shell plating which may be connected to adjacent rows of plating by welding or mechanical fasteners.

5.5.1.1 On ship construction drawings, in the portion of the ship where these strakes run fore and aft, they are identified by a letter. The letter A identifies the first plate adjacent to the flat keel, continued by B, C, D, etc., to the upper part of the shell. The letter "I" is not used, since it may be confused with the numeral one.

5.5.1.2 Contract drawings and contract guidance drawings show only changes in plate thickness and therefore the lettering for individual strakes are not used.

5.6 Shell and deck longitudinals.

5.6.1 The name "longitudinal" is a generic term applying to all stiffening members running in a fore and aft direction. The Navy has adopted the policy of avoiding the use of the word "stringer" insofar as practical. Therefore, shell stiffeners previously identified as stringers should be redesignated as longitudinals.

5.6.2 On ship construction drawings shell longitudinals are identified by numbers. The number "1" designates the first longitudinal outboard of the vertical keel. This is followed by the numbers 2, 3, 4, etc., to the uppermost part of the shell. Preceding the number is a letter, the letter "L" being used to indicate a longitudinal (e.g., L1, L2,..., LN).

5.6.2.1 Deck longitudinals are numbered L1, L2, etc. beginning with the first longitudinal off centerline either port or starboard and increasing towards the outboard edge of the deck.

5.6.2.2 Longitudinals on contract drawings and contract guidance drawings are not numbered.

5.7 Welding and mechanical fasteners.

5.7.1 Welded and mechanically fastened seams and butts. Welded and mechanically fastened seams and butts are indicated on the drawing by an appropriate symbol in accordance with figure 1. (Additional detail such as type and size of weld or mechanical fastener can be shown if required on guidance drawings only.)

5.7.2 Mechanical fasteners type and size symbols.

Types of mechanical fasteners

Navy	(DOD)	Heads	Navy	(DOD)	Points
B	(BTNHD)	- Button head	CK	(CTSKPT)	- Countersunk point
C	(CSKH)	- Countersunk head	B	(BTNPT)	- Button point
T	(TAP)	- Tap	CP	(CP)	- Cone point

5.7.2.1 On drawings, following the dimension indicating the mechanical fastener diameter, the type of mechanical fastener shall be designated by a fraction; the numerator designates the head and the denominator the point, thus:

B/CK (BTNHD/CTSKPT) - Button head and counter sunk point
B/B (BTNHD/BTNPT) - Button head and button point

5.7.2.2 The symbol HSS shall be used to designate higher strength steel rivets and the symbol AL shall be used to designate aluminum alloy rivets. This symbol shall precede the dimension for rivet diameter, as HSS 3/B/CK (3/BTNHD/CTSKPT). Ordinary strength steel rivets shall not have any distinguishing symbol.

5.7.2.3 Special bolt-type fasteners. There are no standard symbols for certain special fasteners. Bolt styles and head types vary with manufacturer.

5.7.2.4 Zigzag fastening shall not have any distinguishing symbol. Chain fastening shall be represented by the symbol CH.

5.7.3 Welding joint type and size symbols.

5.7.3.1 Welding symbols for drawings shall be in accordance with AWS A2.4 and of MIL-STD-22.

5.7.4 Application.

5.7.4.1 Type and size welding and mechanical fastener symbols are generally applicable to working drawings only since for contract designs they are covered by specification requirements.

5.8 Application examples of symbols on ship structural drawings.

5.8.1 Contract drawings and contract guidance drawings.

5.8.1.1 Typical examples showing the use of symbols on contract drawings and contract guidance drawings are shown on figures 2 through 6.

5.8.1.2 Note that in each example, scantlings are shown only for certain structures. For example, on the bulkhead drawing longitudinal stiffeners are not labeled because they are labeled on the shell expansion, deck drawing and midship section. Table IV indicates on which drawings scantlings shall be shown, to reduce repetitive identification.

TABLE IV. Scantling identification on drawings.

Scantling \ Drawing	Bulkhead drawings	Deck drawings	Shell expansion	Midship section
Longitudinal stiffeners	X	X	X	X
Transverse webs	X	X	X	
Plating	X	X	X	X
Coamings	X	X	X	
Vertical stiffeners	X		X	
Vertical webs	X			
Stanchions		X		X

5.8.1.3 The midship section drawing, figure 6, is a unique drawing. This drawing is sometimes designated a contract drawing, and only those scantlings which are desired as contractual items are labeled. In the example shown, all structure contributing to the longitudinal strength of the hull is labeled. The transverse structure is considered contractor developed and therefore not labeled. This drawing will vary in content depending on the contractor scantlings invoked.

5.8.2 Ship construction drawings. Typical examples showing the use of symbols on ship construction drawings are shown on figures 7 and 8.

5.9 Metric conversion. Table V shows metric symbols and conversion factors.

TABLE V. Selected SI[1/] conversion factors.

Category	To convert from inch-pound units	To SI units	Multiply by
Length:	foot (ft)	meter (m)	0.3048
	inch (in)	meter (m)	$2.540\ 10^{-2}$
	inch (in)	mm	25.4
Area:	$foot^2$ (ft^2)	$meter^2$ (m^2)	$9.290\ 10^{-2}$
	$inch^2$ (in^2)	mm^2	$6.452\ 10^{2}$
Force:	kip	newton (N)	$4.448\ 10^{3}$
	pound-force (lbf)	newton (N)	4.448
Mass:	pound (lb)	kilogram (kg)	0.454
	ton (long, 2240 lb)	metric ton	1.016
Stress (force/area)	$kip/inch^2$ (ksi)	pascal (Pa)	$6.895\ 10^{6}$
	$pound\text{-}force/inch^2$ (lbf/in^2)	pascal (Pa)	$6.895\ 10^{3}$

SI makes extensive use of prefixes to form decimal multiples; it officially establishes 16 prefixes. Those 5 prefixes most frequently used are as follows:

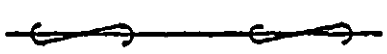
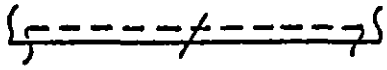
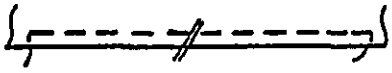
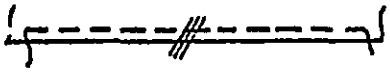
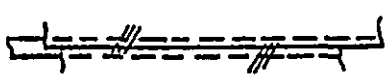
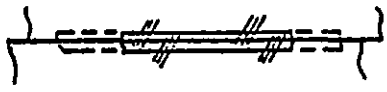
mega	M	1,000,000	$= 10^{6}$
kilo	k	1,000	$= 10^{3}$
centi	c	0.01	$= 10^{-2}$
milli	m	0.001	$= 10^{-3}$
micro	μ	0.000001	$= 10^{-6}$

1/ SI - International system of units.

Custodians:
Army - AR
Navy - SH
Air Force - 16

Review activity:
Army - ME

Preparing activity:
Navy - SH
(Project DRPR-0250)

SYMBOL	INTERPRETATION
	DIMENSION LINES, PLATE EDGES AND STIFFENERS, NEAR SIDE
	BULKHEADS, DECKS OR OTHER PLATING IN SECTION
	PLATE EDGES, FLOORS, GIRDERS, BEAMS, STIFFENERS, ETC., FAR SIDE OR BELOW
	DECKS AND BULKHEADS, FAR SIDE OR BELOW
	CENTERLINE
	OPENING OR SPECIFIC AREA OR BOUNDARY
	WELDED SEAM OR BUTT
	SINGLE FASTENED LAP
	DOUBLE FASTENED LAP
	TRIPLE FASTENED LAP
	FASTENED SINGLE BUTT OR SEAM STRAP
	FASTENED DOUBLE BUTT OR SEAM STRAP

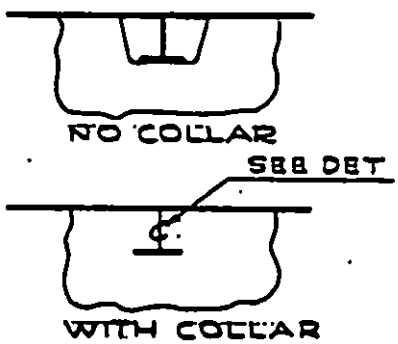
SH 13028

FIGURE 1. Conventional delineation.

SYMBOL	INTERPRETATION
8X4X13# I-T ⟂ 8X4X10# I-T	LIMITS OF BEAMS - CONTINUOUS OR INTERCOSTAL (CONTRACT DRAWINGS) OR LIMITS OF INTERCOSTAL BEAMS (SHIP CONSTRUCTION DRAWINGS)
8X4X13# I-T | $ 8X4X10# I-T, 24"	LIMITS OF CONTINUOUS BEAMS (SHIP CONSTRUCTION DRAWINGS)

CONTINUOUS SHAPE THROUGH PLATE

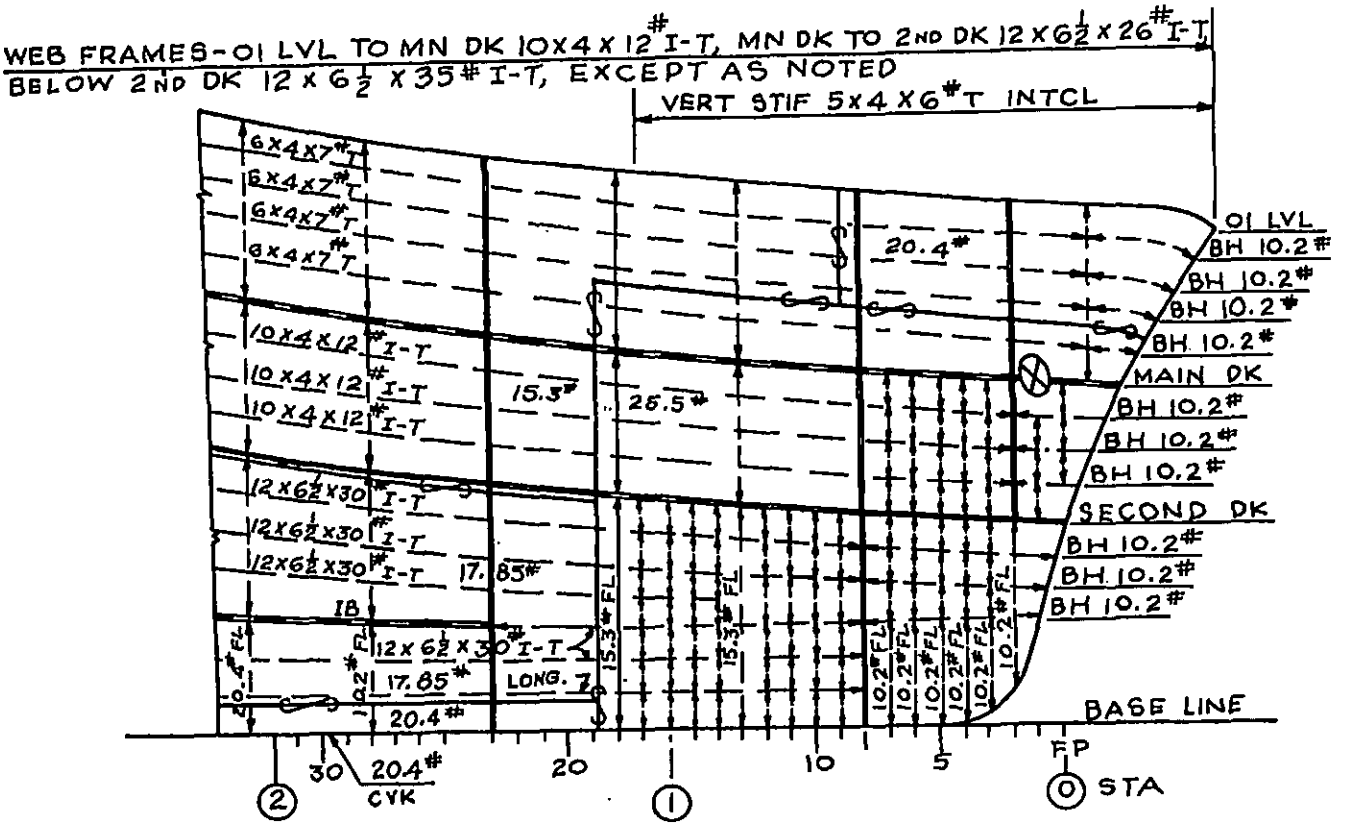
CONTRACT DRAWINGS:
COLLAR DETAILS SPECIFIED IN APPROPRIATE SPECIFICATION



SHIP CONSTRUCTION DRAWINGS:
COLLAR DETAILS SHOWN ON DETAIL VIEW AS REQUIRED.

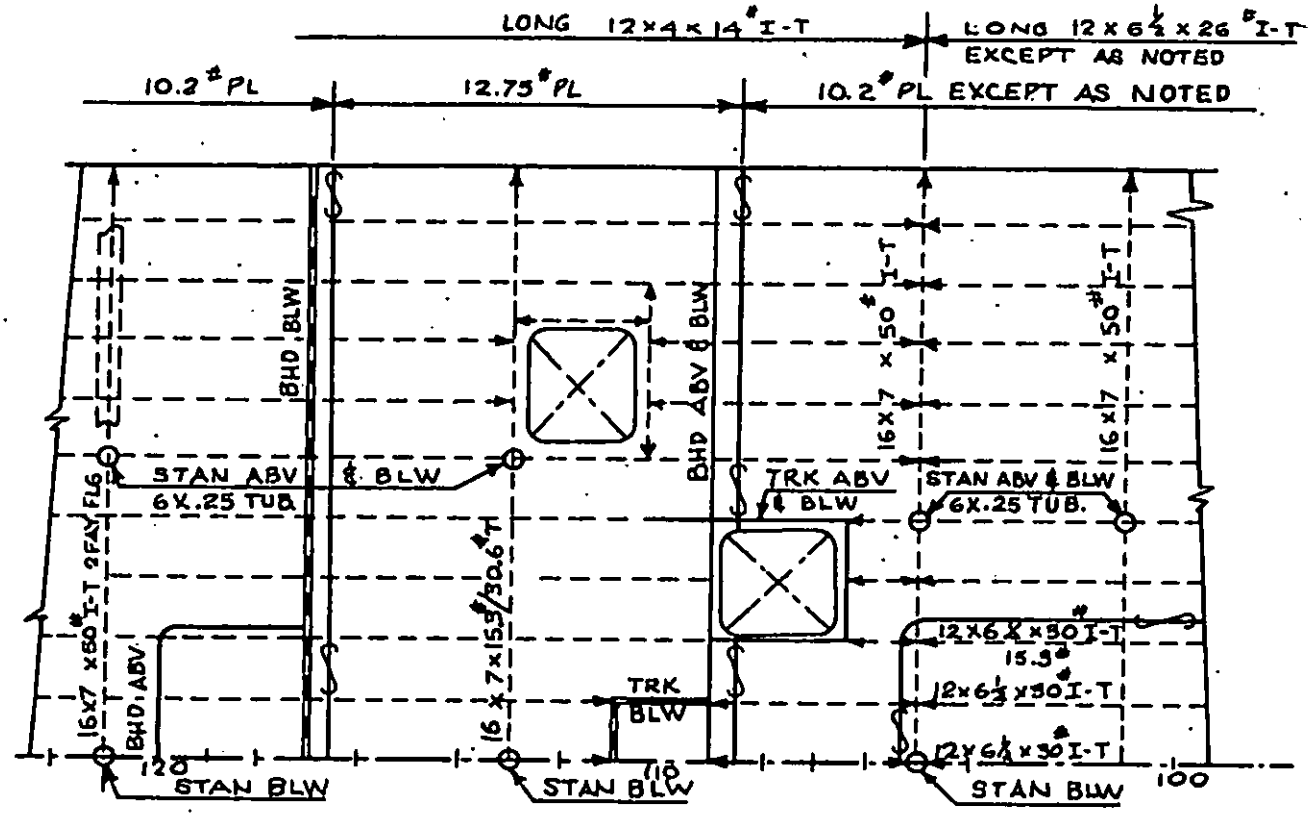
SH 13028-1

FIGURE 1. Conventional delineation. - Continued



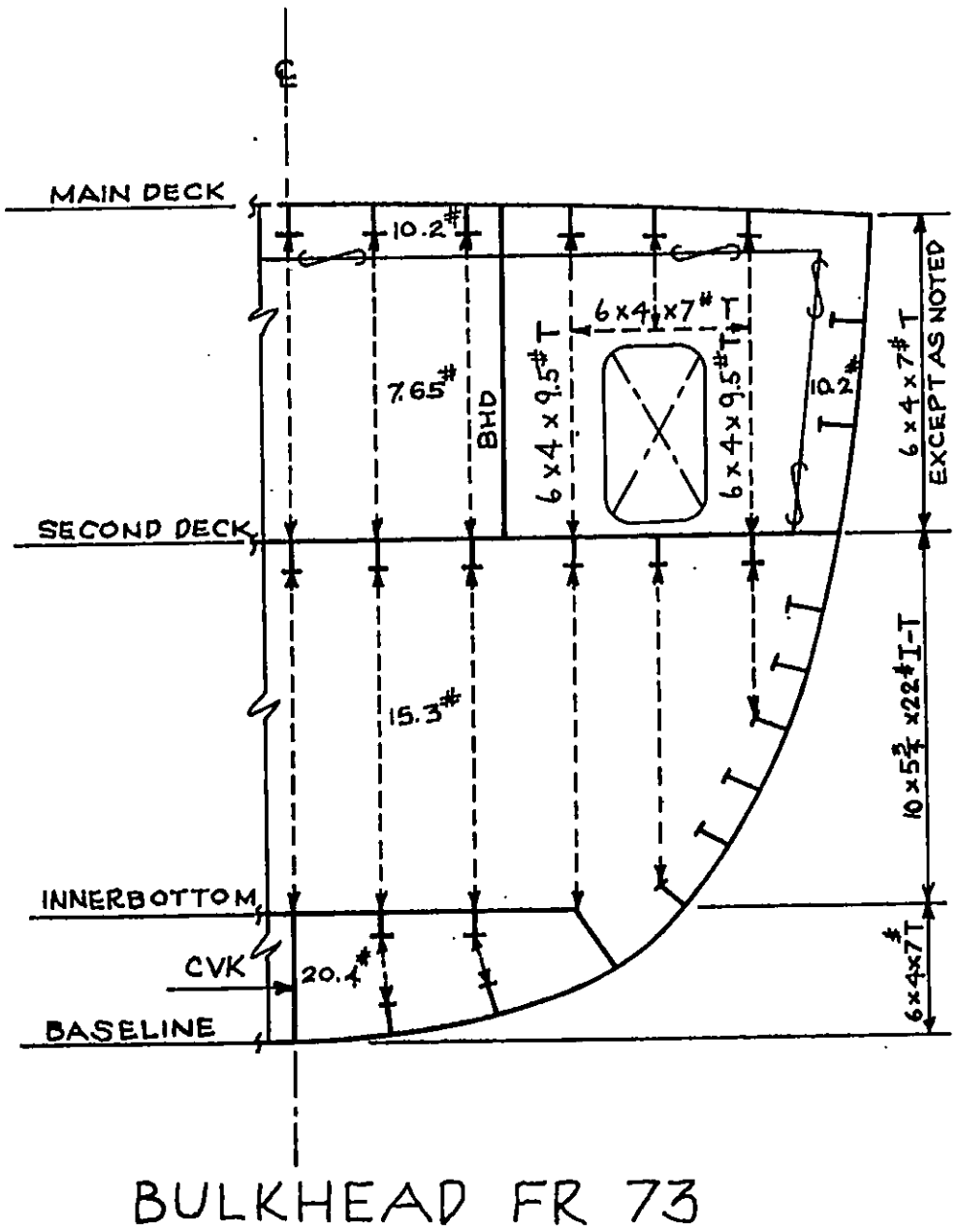
SH 13029

FIGURE 2. Contract drawing or contract guidance drawing - shell expansion.



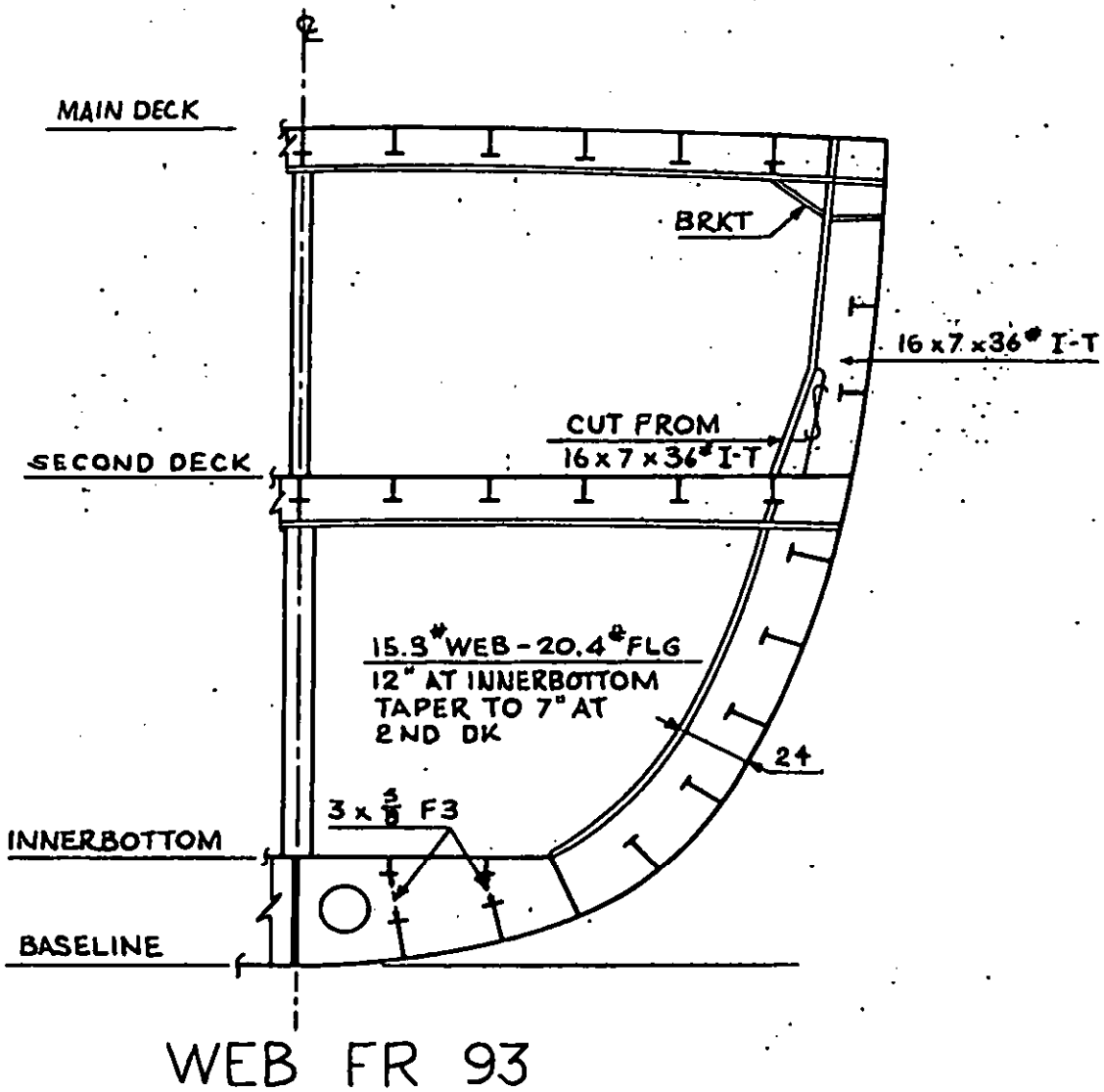
SH 13030

FIGURE 3. Contract drawing or contract guidance drawing - deck plan.



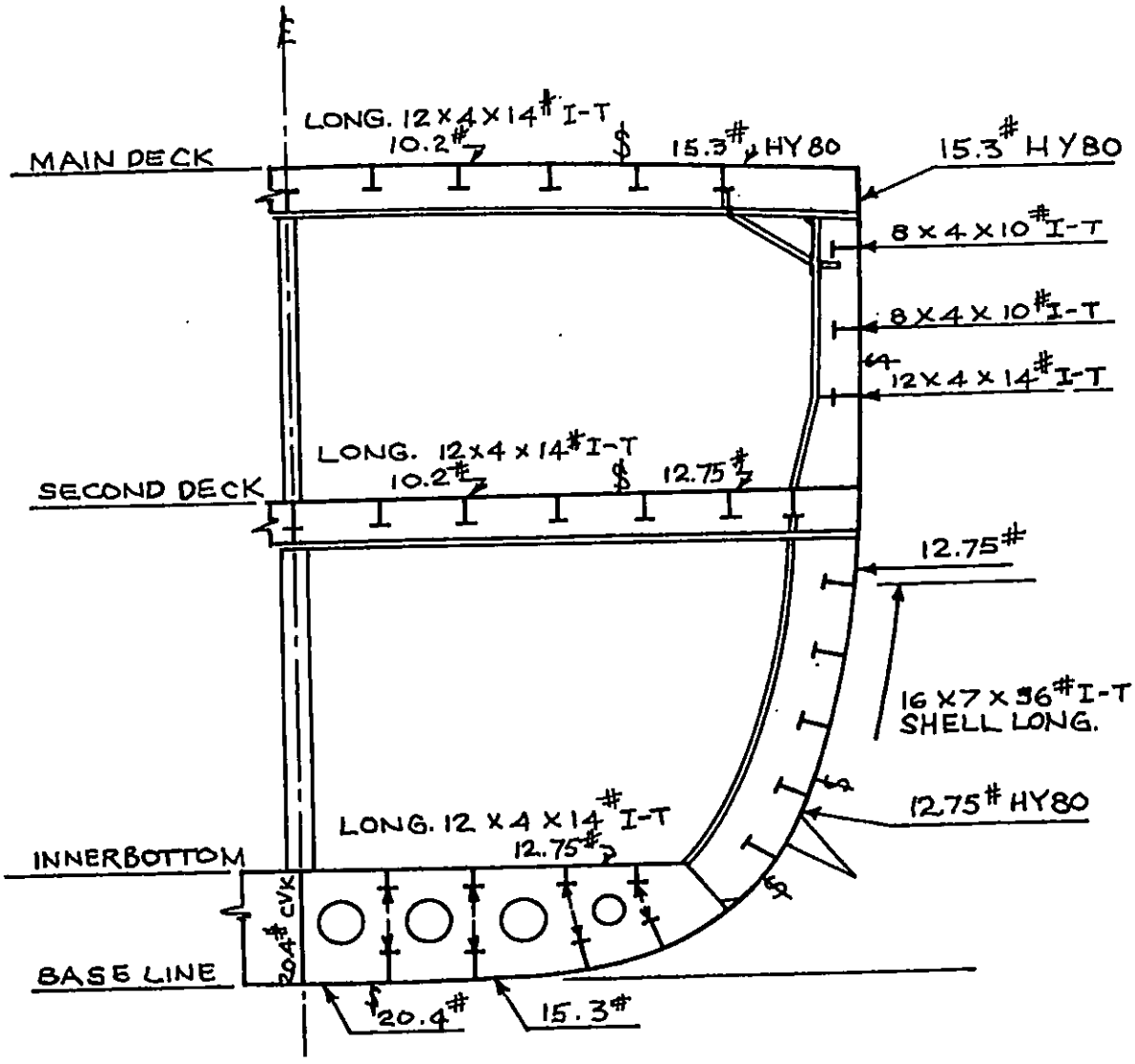
SH 13031

FIGURE 4. Contract drawing or contract guidance drawing - typical section, bulkhead.



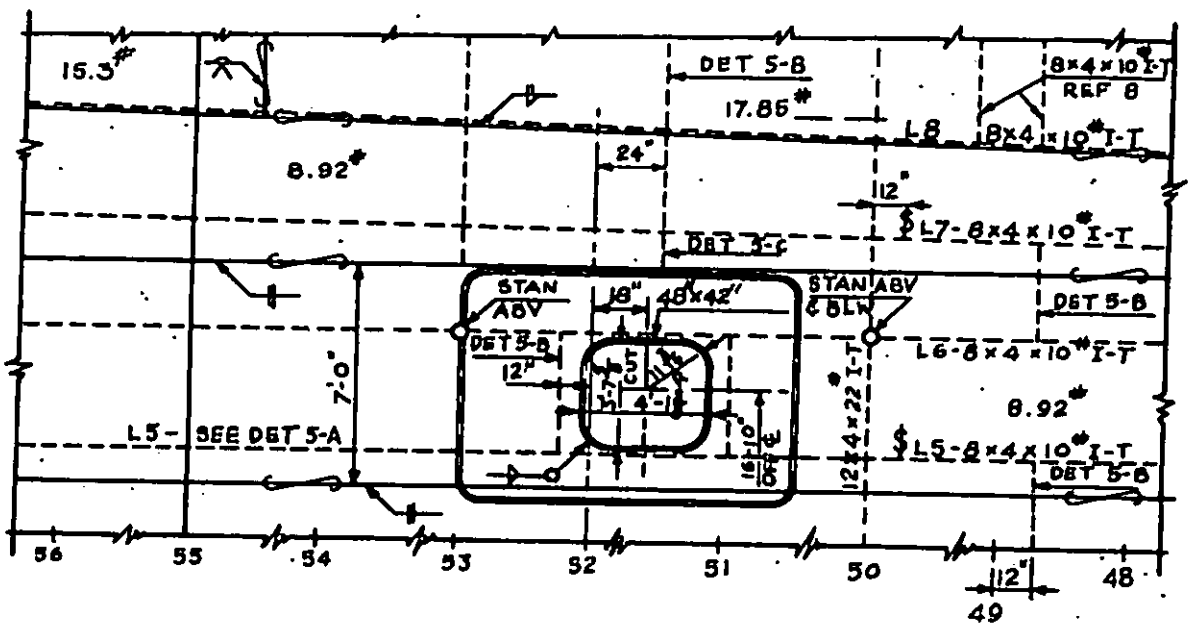
SH 13032

FIGURE 5. Contract drawing or contract guidance drawing - typical section, web frame.



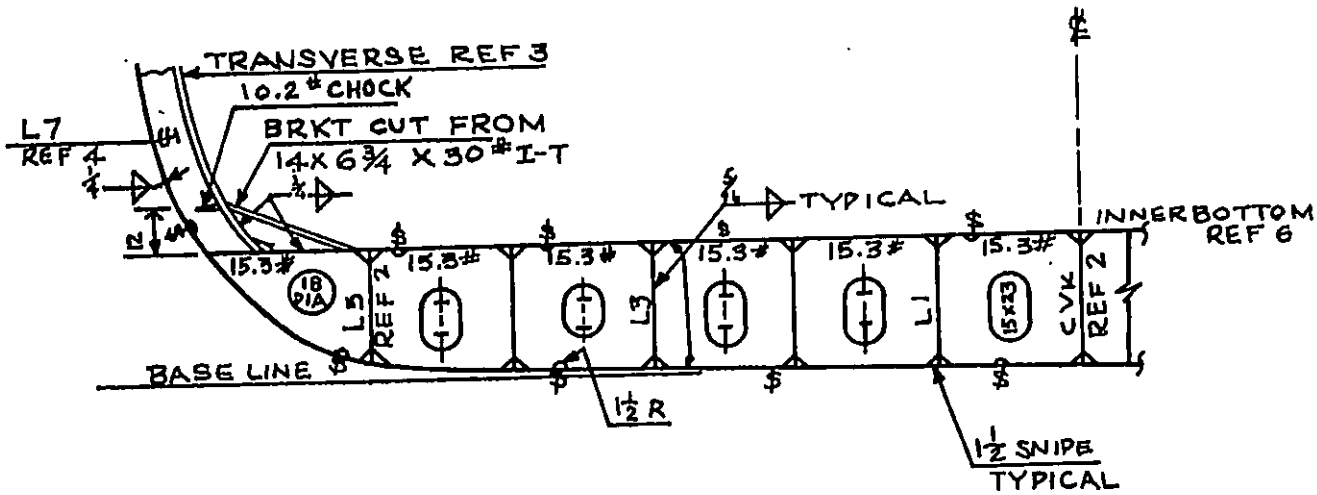
SH 13033

FIGURE 6. Contract drawing or contract guidance drawing - midship section.



SH 13034

FIGURE 7. Ship construction drawing - deck drawing.



SH 13035

FIGURE 8. Ship construction drawing - nontight floor.

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