

**DDS 100-2
OPENINGS IN DECKS
AND BULKHEADS FOR
STUFFING TUBES AND PIPES**



**DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, DC 20362-5101**

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DESIGN DATA SHEET

DDS 100-2

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FOR STUFFING TUBES AND PIPES

26 OCTOBER 1987

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND

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Openings in Decks and Bulkheads for Stuffing Tubes and Pipes
Other Than in Protective Plating

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100-2-a References

- (a) MIL-STD-2189 (SH) Section 100-1. Reinforcement of Openings in Structure of Surface Ships Other than in Protective Plating.
- (b) NAVSEA Drawing No. 803-5001027, Electric Plant Installation Standard Methods, Section 3.
- (c) Federal Specification GGG-W-646. Wrench, Open End Ratchet (Tac Pattern) for Tube Fittings, Electric Cable Terminals and Stuffing Nuts.
- (d) Military Specification MIL-S-24235A(SH) Supplement 1A. Stuffing Tubes, Metal and Packing Assemblies for Electric Cables, General Specifications for MIL-S-24235/1 through MIL-S-24235/17.

100-2-b Introduction

The design criteria have been prepared as guidance for the installation of stuffing tubes and kickpipes in the steel and aluminum structures of surface ships. The minimum spacings for various sizes of stuffing tube and kickpipe penetrations are shown in tables 1 and 2. These spacings are based on stress concentration criteria and a survey of current shipyard practice. Generally, the shipyards use reference (b) as a guide for installing the stuffing tubes and pipes, but there are few using the single cable penetrator on modern Navy ships.

100-2-c Scope and Contents

1. In general, openings in the ships structure should be in areas of minimum stress. See reference (b) for multiple cable penetrations which cover many of the special conditions. Openings larger than five (5) inches clear dimension should be reinforced. Reference (a) shows an acceptable method of sizing these reinforcing rings.

2. In order to preserve structural strength, the requirement for minimum spacing between any two adjacent holes should not be less than two times the main diameter (center to center). The hole diameters to use are the actual drilled holes made in the structural elements. The requirement does not impose any restriction on how the holes are arranged as long as the restriction regarding minimum spacing is followed. When pipes used in conjunction with stuffing tubes are welded to the structural element, the compensation that the pipe provides is considered adequate. Tables 1 and 2 cover minimum spacing for stuffing tubes and swage tubes respectively. These tubes may be used for all plate thicknesses up to and including 3". They may also be used for aluminum decks and bulkheads. The tables do not apply to armor plating.

3. When locating a hole from the boundary of a structural member or from the intersection of structural members including butts and seams, the distance from the hole edge to the

structural boundary/intersection should not be less than the diameter of the hole.

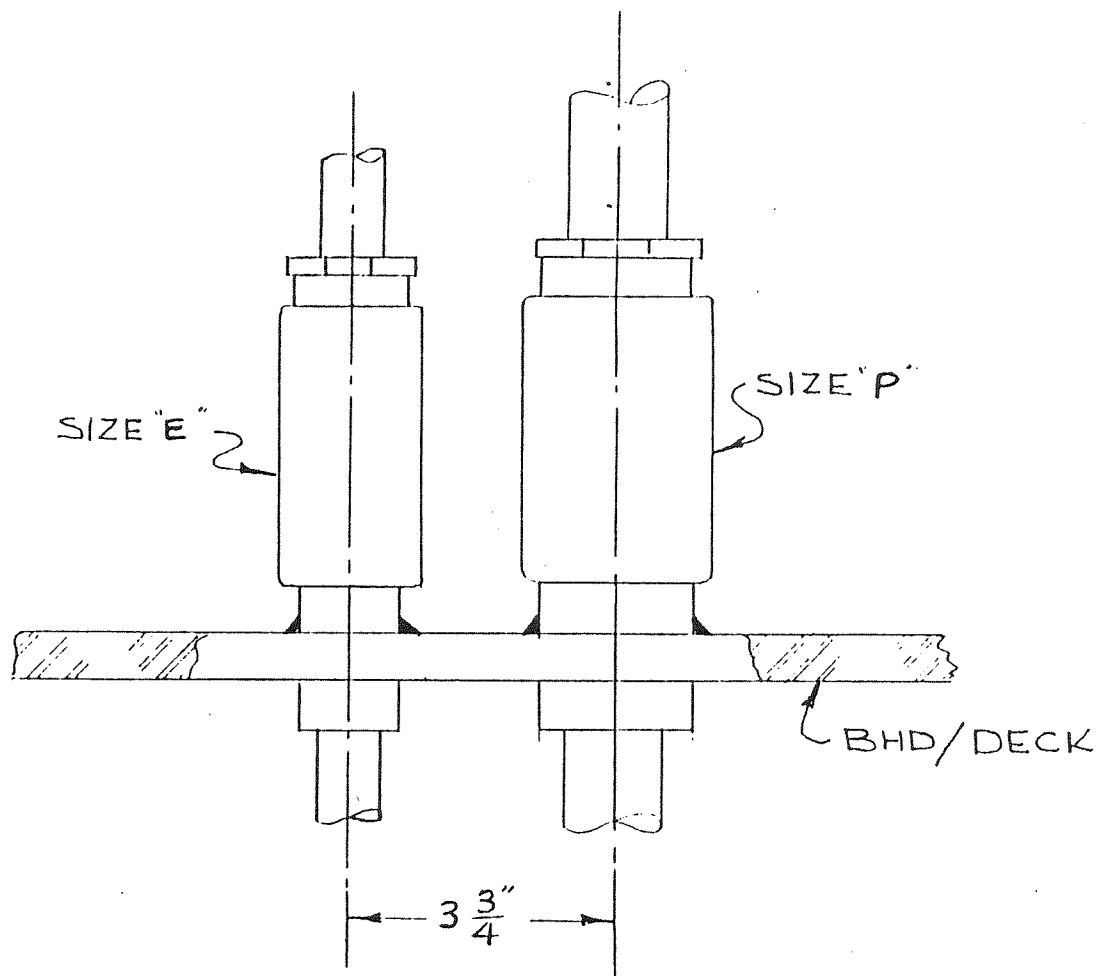
4. The tabular spacing of tables 1 and 2 shown for tube sizes "A" through "Z" are sufficient for the use of the standard ratchet wrenches (reference (c)). Those shown for sizes "AA" and "BB" allow the use of a 32 point crow foot wrench with square drive. Use of these tables does not require any increase in thickness of plating or the addition of doubler plates. The material restored by mounting the stuffing tube or kickpipe is adequate compensation for the material removed.

100-2-d Examples

1. Determine the center to center spacing between a size "E" and a size "P" stuffing tubes. Assume that the stuffing tubes are of the type which screw onto a kickpipe and they penetrate a deck. Under the column headed tube size find size "E" and size "P". The extreme lefthand column gives the nominal pipe sizes as 1" and 2" respectively. The second column gives the hole sizes required as $1 \frac{21}{64}$ " and $2 \frac{13}{32}$ " respectively. Following the line of the size "P" tube, under the column headed size "E" find $3 \frac{3}{4}$ " the required minimum center to center distance.

2. Determine the center to center spacing between a size "D" and a size "R" swage type stuffing tube. Assume that the swage tubes penetrate the structural plate. Under the column headed

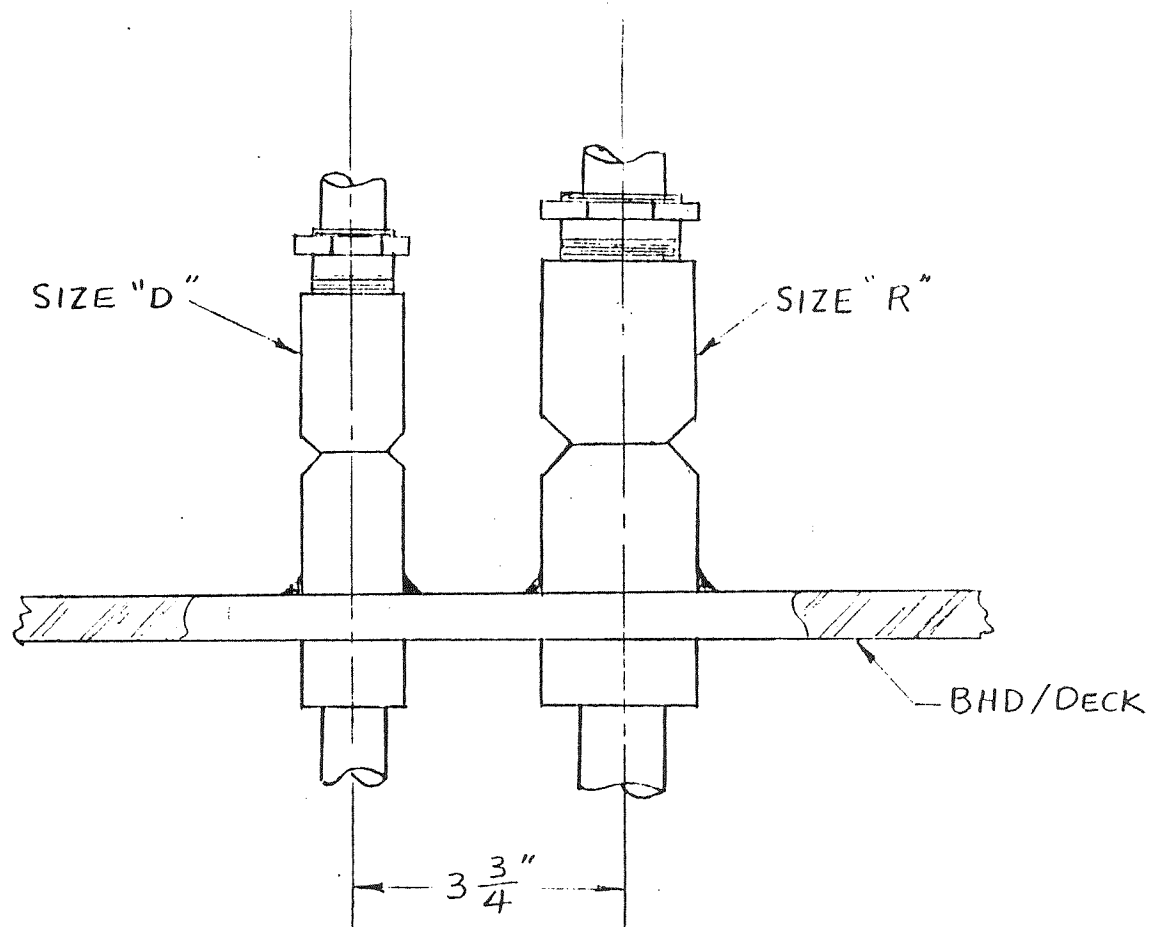
tube size find size "D" and size "R". The extreme lefthand column gives the outside diameter of the swage tubes a $1 \frac{5}{16}$ " and $2 \frac{3}{8}$ " respectively. The second column gives the hole sizes required as $1 \frac{11}{32}$ " and $2 \frac{13}{32}$ " respectively. Following the line of size "R" tube, under the column headed size "D" find $3 \frac{3}{4}$ " the required minimum center to center distance.



EXAMPLE 1

TYPICAL STUFFING TUBE AND PIPE HOLE SPACING

FIGURE 1



EXAMPLE 2

TYPICAL SWAGE TUBES HOLE SPACING

FIGURE 2

TABLE I MINIMUM SPACING OF HOLES FOR STUFFING TUBES AND KICKPIPES

NOMINAL DIA. OF KICKPIPE (IRON PIPE SIZE)	DRILL FOR PIPE ORDINARY STEEL	TUBE SIZE	A	B	C	D	E	F	G	J	K	L	M	N	P	R	S	T	V	W	X	Y	Z	AA	BB
3/8"	23/32	A	1 29/64																						
1/2"	7/8	B	1 17/32	1 3/4																					
3/4"	1 3/32	C	1 13/16	1 21/32	2 3/16																				
3/4"	1 3/32	D	1 13/16	1 31/32	2 3/16	2 7/16																			
1"	1 21/64	E	2 1/16	2 3/32	2 7/16	2 7/16	2 21/32																		
1"	1 21/64	F	2 1/16	2 7/32	2 7/16	2 7/16	2 21/32	2 21/32																	
1"	1 21/64	G	2 1/16	2 7/32	2 7/16	2 7/16	2 21/32	2 21/32	2 21/32																
1 1/4"	1 45/64	J	2 7/16	2 19/32	2 13/16	2 15/16	3 1/2	3 1/2	3 1/2	3 13/32															
1 1/4"	1 45/64	K	2 7/16	2 19/32	2 13/16	2 13/16	3 1/2	3 1/2	3 1/2	3 13/32	3 13/32														
1 1/4"	1 45/64	L	2 7/16	2 19/32	2 13/16	2 13/16	3 1/2	3 1/2	3 1/2	3 13/32	3 13/32	3 13/32													
1 1/2"	1 11/16	M	2 21/32	2 13/16	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 13/32	3 13/32	3 7/8													
1 1/2"	1 11/16	N	2 23/32	2 13/16	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 13/32	3 13/32	3 7/8	3 7/8												
2"	2 13/32	P	3 7/8	3 9/32	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8								
2"	2 13/32	R	3 7/8	3 9/32	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8							
2"	2 13/32	S	3 7/8	3 9/32	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8						
2 1/2"	2 29/32	T	3 11/16	3 25/32	4	4	4 1/4	4 1/4	4 1/4	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	5 1/8	5 1/8				
2 1/2"	2 29/32	V	3 11/16	3 25/32	4	4	4 1/4	4 1/4	4 1/4	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	5 1/8	5 1/8	5 1/8	5 1/8	5 1/8	5 1/8
2 1/2"	2 29/32	W	3 11/16	3 25/32	4	4	4 1/4	4 1/4	4 1/4	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	5 1/8	5 1/8	5 1/8	5 1/8	5 1/8	5 1/8
3"	3 17/32	X	4 1/4	4 13/32	4 5/8	4 5/8	4 7/8	4 7/8	4 7/8	4 7/8	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
3"	3 17/32	Y	4 1/4	4 13/32	4 5/8	4 5/8	4 7/8	4 7/8	4 7/8	4 7/8	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
3"	3 17/32	Z	4 1/4	4 13/32	4 5/8	4 5/8	4 7/8	4 7/8	4 7/8	4 7/8	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
3"	3 17/32	AA	4 1/4	4 13/32	4 5/8	4 5/8	4 7/8	4 7/8	4 7/8	4 7/8	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
3 1/2"	4 1/32	BB	4 3/4	4 29/32	5 1/8	5 1/8	5 3/8	5 3/8	5 3/8	5 3/8	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4

TABLE 2

MINIMUM SPACING OF HOLES FOR SWAGE TUBES

O.D. SWAGE TUBE (NOM.)	DRILL FOR SWAGE TUBE	TUBE SIZE	A	B	C	D	E	F	G	J	K	L	M	N	P	R	S	T	V	W	X	Y	Z	AA	BB
1 1/16	1 3/32	A	2 3/16																						
1 1/16	1 3/32	B	2 3/16	2 3/16																					
1 5/16	1 1/32	C	2 13/32	2 1/4	2 1/16																				
1 5/16	1 1/32	D	2 13/32	2 1/4	2 1/16	2 1/16																			
1 5/16	1 1/32	E	2 13/32	2 1/4	2 1/16	2 1/16	2 1/16																		
1 5/16	1 1/32	F	2 13/32	2 1/4	2 1/16	2 1/16	2 1/16	2 1/16																	
1 21/32	1 1/16	G	2 25/32	2 25/32	3 1/32	3 1/32	3 1/32	3 1/32	3 3/8																
1 29/32	1 5/16	J	3 1/32	3 1/32	3 1/32	3 1/32	3 1/32	3 1/32	3 5/8	3 5/8															
1 29/32	1 5/16	K	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 5/8	3 5/8	3 5/8														
2 3/8	2 13/32	L	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	3 3/4	4 3/32	4 1/2	4 1/2	4 13/16													
2 3/8	2 13/32	M	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	3 3/4	4 3/32	4 1/2	4 1/2	4 5/16	4 1/2												
2 3/8	2 13/32	N	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	3 3/4	4 3/32	4 1/2	4 1/2	4 5/16	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2								
2 3/8	2 13/32	P	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	3 3/4	4 3/32	4 1/2	4 1/2	4 5/16	4 1/2	4 1/2	4 1/2	4 1/2	4 13/16								
2 3/8	2 13/32	R	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	3 3/4	4 3/32	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 13/16	4 13/16							
2 3/8	2 29/32	S	4	4	4 1/4	4 1/4	4 1/4	4 1/4	4 9/32	4 21/32	4 21/32	5 5/16	5 5/16	5 5/16	5 5/16	5 5/16	5 5/16	5 5/16	5 3/16						
3 1/8	3 3/16	T	4 1/32	4 9/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32	4 17/32
3 1/4	3 5/16	V	4 1/2	4 13/32	4 11/32	4 11/32	4 11/32	4 11/32	4 11/32	5	5 1/4	5 1/4	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32	5 23/32
3 1/2	3 9/16	W	4 21/32	4 21/32	4 21/32	4 21/32	4 21/32	4 21/32	4 21/32	5 1/4	5 1/2	5 1/2	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32
3 1/2	3 9/16	X	4 21/32	4 21/32	4 21/32	4 21/32	4 21/32	4 21/32	4 21/32	5 1/4	5 1/2	5 1/2	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32	5 31/32
4	4 1/16	Y	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32
4	4 1/16	Z	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32	5 5/32
4	4 1/16	AA	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32	5 3/32
4 1/2	4 1/16	BB	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32	5 21/32