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PAPER P-1132

ACCOMPLISHING SHIPYARD WORK
FOR THE UNITED STATES NAVY:
INSTITUTIONS, SYSTEMS AND OPERATIONS

VOLUME 2: APPENDIXES

John D. Morgan, Project Leader

Norman B. Davis

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William J. E. Shafer

August 1975

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Accomplishing Shipyard Work for the United States Navy: Institutions, Systems and Operations, Vol. 1, Appendixes.		5. TYPE OF REPORT & PERIOD COVERED (9) Final rept.
7. AUTHOR(s) John D. Morgan, Norman B. Davis, Marvin H. Kahn, William J. E. Shafer		6. PERFORMING ORG. REPORT NUMBER (14) P-1132-Vol-2
8. PERFORMING ORGANIZATION NAME AND ADDRESS Institute for Defense Analyses Cost Analysis Group 400 Army-Navy Drive - Arlington, Va. 22202		8. CONTRACT OR GRANT NUMBER(s) (15) DAHC 15-73-C-0200
11. CONTROLLING OFFICE NAME AND ADDRESS Charles Groover, Director Logistics Division Room 2D311 The Pentagon Washington, D.C.		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS PAGE-81
12. REPORT DATE (11) Aug 1975		13. NUMBER OF PAGES 255 (12) 272
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) (18) IDA/HQ (19) 75-17637		15. SECURITY CLASS. (of this report) UNCLASSIFIED
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Shipyards; Naval Shipwork; Naval Ship Alteration, Construction, Conversion, Overhaul and Repair; U.S. Shipbuilding and Repair Industry.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This study examines factors relating to accomplishment of Navy ship workloads in naval and private shipyards. It was designed to present, in a single document, a comprehensive discussion and evaluation of information from a wide range of areas that impact on the accomplishment of Navy workloads. The results of the study are presented in three volumes. Volume 1 (the basic report) examines facilities, organizations and manpower		

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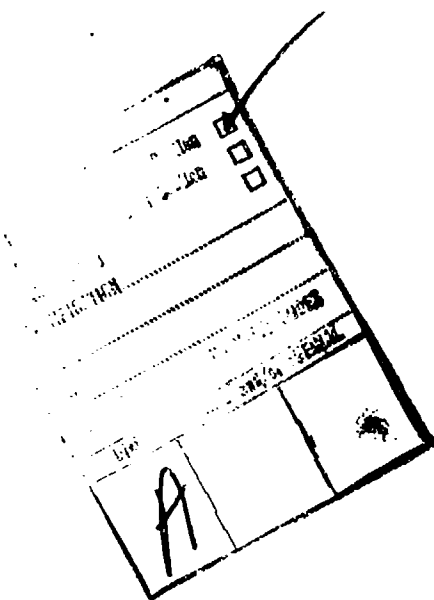
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skills required for ship construction versus depot maintenance in both naval and private shipyards; Navy procedures for placing shipyard work; shipyard performance indicators; and labor market for the shipbuilding and repair industry. The volume concludes with recommendations to improve the cost-effectiveness of performance of shipyard work and identifies several key areas for further study. Volume 2 is a compilation of appendixes containing additional material to support the basic report. Volume 3 is an annotated bibliography covering 150 documents related to subjects covered by this study.



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400 Army-Navy Drive, Arlington, Virginia 22202

Contract DAHC15 73 C 0200
Task 81

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APPENDIX A

NAVAL SHIPYARD MISSION, TASKS, AND FUNCTIONS

(Derived from the Standard Naval
Shipyard Organization Manual)

NAVAL SHIPYARD MISSION, TASKS, AND FUNCTIONS

MISSION

To provide logistic support for assigned ships and service craft; to perform authorized work in connection with construction, conversion, overhaul, repair, alteration, drydocking, and outfitting of ships and craft, as assigned; to perform manufacturing, research, development and test work, as assigned; and to provide services and material to other activities and units, as directed by competent authority.

TASKS AND FUNCTIONS

1. Providing logistic support to activities and units of the Operating Forces of the U.S. Navy and naval shore (field) activities, as assigned by competent authority.
2. Performing authorized shipwork in connection with the construction, overhaul, repair, alteration, activation, inactivation and outfitting of naval ships and service craft.
3. Performing authorized repairables work in connection with repair, restoration, refit, refurbishment and overhaul of systems, equipments, components and modules, as scheduled.
4. Designing naval ships, when so designated.
5. Operating as planning yard for ship alterations and preparing allowance lists for ships under construction and conversion in accordance with instructions issued by the Naval Sea Systems Command.

6. Performing research, development, test and evaluation work, as assigned.
7. Serving as stock point for designated material, as assigned.
8. Providing accounting, civil payroll, savings bond, public works, industrial relations, medical, dental, berthing, messing, fire prevention and fire protection, security and other services to naval shore (field) activities and other government agencies, as assigned.
9. Performing manufacturing, as assigned.
10. Accomplishing shore-electronics work, as requested by the Naval Electronic Systems Command.
11. Preparing and maintaining development, logistics support, disaster control and other plans, as assigned.
12. Performing work for other U.S. Government departments, private parties and foreign governments, as directed by competent authority.

EXPLANATORY NOTE: All tasks and functions set forth in this standard statement are not necessarily applicable to all naval shipyards. Shipyards will modify local copies of this manual to reflect only those tasks and functions that they are performing. Special tasks and functions assigned to specific yards will also be included.

APPENDIX B

TABLES OF HISTORICAL ACCRUED COSTS OF NAVAL SHIPYARD WORK

These tables display the historical accrued costs of naval shipyard work for the eight existing naval shipyards for fiscal years 1960-1974. Shipyard work is categorized as either shipwork or non-shipwork. The dollar costs and percentage of total cost for major types of work comprising each category are displayed.

(Derived from Naval Shipyard Financial
and Operating Statements)

Work Category	1960		1961		1962		1963		1964		1965		1966		1967
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$
New Construction and Conversion	63.7	75.7	73.6	80.9	79.2	83.3	82.7	83.5	65.4	75.9	40.6	54.2	35.0	45.0	27.6
Overhauls and Repairs	9.4	11.2	7.6	8.4	4.1	4.3	3.0	3.0	7.1	8.2	12.8	17.1	15.7	20.2	20.5
Alterations	2.2	2.6	0.8	0.9	1.0	1.0	1.2	1.2	1.6	1.9	4.3	5.7	7.8	10.0	21.6
Other Shipwork	1.9	2.3	y	z	0.2	0.2	0.3	0.3	y	z	6.7	9.0	8.0	10.3	7.7
Total Shipwork	77.3	91.9	82.1	90.2	84.5	87.8	86.9	87.8	74.1	86.0	64.3	86.0	66.5	85.6	77.5
Manufacturing ¹	1.7	2.0	1.8	2.0	3.2	3.3	3.0	3.0	2.5	2.9	3.1	4.1	2.6	3.3	3.5
Repairs to Material in Store	0.2	0.2	0.2	0.2	0.8	0.8	0.5	0.5	0.4	0.5	0.1	0.1	y	z	0.1
Other Productive Work ²	0.8	1.0	0.6	0.7	0.8	0.8	0.7	0.7	1.5	1.7	2.4	3.2	3.2	4.1	4.2
Special Deposits	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.1	0.1	0.2
Plant Property	0.1	0.1	y	z	y	z	0.1	0.1	y	z	y	z	0.4	0.5	0.3
Productive Work For Other Activities	1.4	1.7	2.2	2.4	3.3	3.4	4.5	4.5	3.9	4.5	1.5	2.0	1.3	1.7	1.4
Military Support	2.2	2.6	2.2	2.4	2.2	2.3	2.2	2.2	2.2	2.6	2.1	2.8	2.3	3.0	2.1
Research and Development	0.1	0.1	1.7	1.9	1.0	1.0	0.7	0.7	1.2	1.4	1.1	1.5	1.0	1.3	0.7
Total Non-Shipwork	6.8	8.1	8.9	9.8	11.7	12.2	12.1	12.2	12.1	14.0	10.5	14.0	11.2	14.4	12.1
Grand Total	84.1	100.0	91.0	100.0	96.2	100.0	99.0	100.0	86.2	100.0	74.9	100.0	77.7	100.0	90.0

¹This line includes manufacturing for NIF Shop Stores and Direct Material Issue, Navy Stock Fund and Defense Stock Fund manufacturing for stores, and in process (lines 45-48 on the Financial and Operating Statement).

²This line includes non-shipwork in the categories of Refit and Restoration; Construction and Conversion; Overhaul, Renovation; Alteration and Modification; and Other Products and Services (lines 50-53 and 56 on the Financial and Operating Statement).

Note: y = less than \$0.1 million

z = less than 0.1 percent

Sum of individual items may not add to subtotals due to rounding.

Source: Naval Shipyard Financial and Operating Statements.

Table B-1. DISTRIBUTION OF ACCRUED COSTS
OF NAVAL SHIPYARD WORK by
CATEGORY--PORTSMOUTH
(Costs in millions of current
dollars)

1966	1967		1968		1969		1970		1971		1972		1973		1974	
%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
45.0	27.6	30.6	38.1	39.0	42.0	41.7	35.7	34.0	20.4	20.5	10.3	10.2	6.6	6.9	8.2	8.0
20.2	20.5	22.7	21.7	22.2	21.0	20.9	23.8	22.7	32.9	33.0	45.8	45.4	51.1	53.5	56.4	55.1
10.0	21.6	23.9	14.7	15.0	8.9	8.8	12.0	11.4	10.0	10.0	11.6	11.5	6.8	7.1	8.3	8.1
10.3	7.7	8.5	7.6	7.8	9.4	9.3	12.2	11.6	8.4	8.4	1.9	1.9	0.8	0.8	1.7	1.7
85.6	77.5	85.9	82.2	84.1	81.3	80.8	83.7	79.7	71.8	72.0	69.6	69.0	65.5	68.5	74.7	72.9
3.3	3.5	3.9	3.6	3.7	2.7	2.7	1.2	1.1	5.8	5.8	5.9	5.8	0.5	0.5	0.5	0.5
2	0.1	0.1	0.3	0.3	0.2	0.2	0.1	0.1	y	z	0.1	0.1	0.1	0.1	0.1	0.1
4.1	4.2	4.7	6.2	6.3	12.1	12.0	15.8	15.0	18.2	18.3	21.1	20.9	26.1	27.3	23.9	23.3
0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1
0.5	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
1.7	1.4	1.6	1.2	1.2	1.2	1.2	1.4	1.3	1.2	1.2	0.8	0.8	0.8	0.8	0.8	0.8
3.0	2.1	2.3	2.5	2.6	1.5	1.5	1.6	1.5	1.5	1.5	1.9	1.9	1.4	1.5	1.3	1.3
1.3	0.7	0.8	0.9	0.9	1.1	1.1	0.7	0.7	0.5	0.5	0.8	0.8	0.9	0.9	0.9	0.9
14.4	12.7	14.1	15.5	15.9	19.4	19.2	21.3	20.3	27.9	28.0	31.3	31.0	30.1	31.5	27.7	27.1
100.0	90.2	100.0	97.7	100.0	100.6	100.0	105.0	100.0	99.7	100.0	100.9	100.0	95.6	100.0	102.4	100.0

ense Stock Fund, all other

Overhaul, Repair and
Financial and Operating

Work Category	1960		1961		1962		1963		1964		1965		1966	
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
New Construction and Conversion	39.9	47.9	53.1	57.4	54.6	53.5	49.8	49.6	55.8	59.1	30.2	35.0	20.4	17.1
Overhauls and Repairs	18.3	22.0	12.4	13.4	20.3	19.9	17.0	16.9	10.2	10.8	19.0	22.0	35.3	29.5
Alterations	5.7	6.8	6.3	6.8	6.6	6.5	9.4	9.4	3.6	3.8	5.6	6.5	21.0	17.6
Other Shipwork	1.0	1.2	0.7	0.8	0.3	0.3	2.9	2.9	0.3	0.3	6.3	7.3	15.7	13.1
Total Shipwork	64.9	77.9	72.5	78.4	81.8	80.1	79.3	79.0	69.9	74.0	61.2	71.0	92.5	77.3
Manufacturing ¹	1.6	1.9	3.6	3.9	3.4	3.3	2.7	2.7	4.1	4.3	3.8	4.4	4.0	3.3
Repairs to Material in Store	3.7	4.4	0.6	0.6	0.5	0.5	0.6	0.6	0.5	0.5	0.2	0.2	0.3	0.3
Other Productive Work ²	1.0	1.2	3.4	3.7	4.7	4.6	4.9	4.9	5.9	6.3	8.1	9.4	9.9	8.3
Special Deposits	2.9	3.5	0.8	0.9	0.7	0.7	0.6	0.6	0.4	0.4	0.6	0.7	0.6	0.5
Plant Property	0.1	0.1	y	z	y	z	y	z	y	z	y	z	0.2	0.2
Productive Work for Other Activities	y	z	3.7	4.0	2.4	2.4	1.7	1.7	2.1	2.2	3.1	3.6	3.3	2.8
Military Support	3.2	3.8	5.7	6.2	6.7	6.6	7.1	7.1	7.3	7.7	5.5	6.4	5.3	4.4
Research and Development	5.8	7.0	2.2	2.4	1.8	1.8	3.5	3.5	4.1	4.3	3.6	4.2	3.4	2.8
Total Non-Shipwork	18.4	22.1	20.1	21.6	20.3	19.9	21.1	21.0	24.5	26.0	25.0	29.0	27.1	22.7
Grand Total	83.3	100.0	92.5	100.0	102.1	100.0	100.4	100.0	94.4	100.0	86.2	100.0	119.6	100.0

¹This line includes manufacturing for NIF Shop Stores and Direct Material Issue, Navy Stock Fund and Defense Stock Fund manufacturing for stores, and in process (lines 45-48 on the Financial and Operating Statement).

²This line includes non-shipwork in the categories of Refit and Restoration; Construction and Conversion; Overhaul, Renovation; Alteration and Modification; and Other Products and Services (lines 50-53 and 56 on the Financial and Operating Statement).

Note: y = less than \$0.1 million

z = less than 0.1 percent

Sum of individual items may not add to subtotals due to rounding.

Source: Naval Shipyard Financial and Operating Statements.

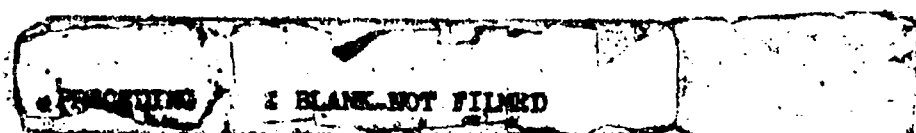


Table B-2. DISTRIBUTION OF ACCRUED COSTS
OF NAVAL SHIPYARD WORK by
CATEGORY--PHILADELPHIA
(Costs in millions of current
dollars)

1966	1967		1968		1969		1970		1971		1972		1973		1974	
%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
17.1	49.5	34.0	77.2	42.5	101.0	52.6	136.0	70.2	98.3	60.9	39.5	29.6	52.6	40.9	40.6	28.3
29.5	29.9	20.5	29.3	16.1	36.7	19.1	17.4	9.0	25.9	16.0	48.3	36.2	36.7	28.5	43.0	29.9
17.6	9.0	6.2	13.7	7.5	13.8	7.2	1.3	0.7	1.5	0.9	3.3	2.5	0.2	0.2	18.9	13.2
13.1	32.7	22.4	34.9	19.2	18.3	9.5	15.6	8.1	11.6	7.2	11.0	8.2	10.5	8.2	13.1	9.1
77.3	121.1	83.1	155.1	85.5	169.8	88.4	170.3	88.0	137.3	85.1	102.1	76.4	100.0	77.8	115.6	80.4
3.3	3.6	2.5	3.2	1.8	2.3	1.2	1.8	0.9	2.3	1.4	2.2	1.6	3.0	2.3	3.4	2.4
0.3	0.4	0.3	0.5	0.3	0.4	0.2	0.7	0.4	0.8	0.5	1.2	0.9	1.4	1.1	1.0	0.7
8.3	6.6	4.5	9.0	5.0	7.4	3.9	8.0	4.1	9.0	5.6	15.7	11.8	11.6	9.0	10.2	7.1
0.5	0.1	0.1	0.2	0.1	0.1	z	0.1	z	0.2	0.1	0.1	0.1	y	z	0.2	0.1
0.2	0.5	0.3	1.2	0.7	0.7	0.4	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1
2.8	3.5	2.4	3.3	1.8	3.5	1.8	3.6	1.9	3.0	1.9	3.1	2.3	2.7	2.1	2.8	1.9
4.4	6.4	4.4	7.2	4.0	7.1	3.7	8.1	4.2	8.5	5.3	8.8	6.6	9.3	7.2	10.0	7.0
2.8	3.3	2.3	1.7	0.9	0.5	0.3	0.5	0.3	0.1	z	0.3	0.2	0.5	0.4	0.2	0.1
22.7	24.5	16.9	26.3	14.5	22.1	11.6	23.3	12.0	24.1	14.9	31.6	23.6	28.6	22.2	28.1	19.6
100.0	145.7	100.0	181.5	100.0	192.0	100.0	193.6	100.0	161.4	100.0	133.6	100.0	128.6	100.0	143.7	100.0

Stock Fund, all other

Overhaul, Repair and
Maintenance and Operating

Work Category	1960		1961		1962		1963		1964		1965		1966	
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
New Construction and Conversion	6.9	7.4	2.0	2.1	4.5	4.2	16.1	14.6	26.2	24.6	14.7	14.4	9.9	9.4
Overhauls and Repairs	46.2	49.6	50.6	52.1	53.6	50.3	39.7	36.1	37.5	35.2	46.0	45.2	51.3	48.5
Alterations	16.8	18.0	17.1	17.6	25.9	24.3	27.2	24.7	13.3	12.5	11.5	11.3	17.1	16.2
Other Shipwork	1.8	1.9	7.2	7.4	1.9	1.8	3.6	3.3	5.2	4.9	8.1	8.0	7.5	7.1
Total Shipwork	71.7	76.9	76.9	79.2	85.9	80.7	86.6	78.8	82.2	77.3	80.4	79.0	85.9	81.2
Manufacturing ¹	3.0	3.2	2.9	3.0	3.4	3.2	3.1	2.8	3.0	2.8	2.4	2.4	2.6	2.5
Repairs to Material in Store	3.5	3.8	3.0	3.1	3.1	2.9	4.6	4.2	3.4	3.2	1.7	1.7	1.6	1.5
Other Productive Work ²	5.1	5.5	6.5	6.7	5.0	4.7	5.6	5.1	8.0	7.5	9.5	9.3	6.7	6.3
Special Deposits	0.3	0.3	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Plant Property	0.2	0.2	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.5	0.6	0.6	1.1	1.0
Productive Work for Other Activities	4.1	4.4	3.2	3.3	4.8	4.5	4.7	4.3	4.9	4.6	1.8	1.8	2.1	2.0
Military Support	4.0	4.3	3.1	4.0	3.9	3.7	4.8	4.4	4.2	3.9	3.4	3.3	3.4	3.2
Research and Development	1.3	1.4	0.4	0.4	y	z	y	z	y	z	1.5	1.5	1.9	1.8
Total Non-Shipwork	21.5	23.1	20.2	20.8	20.6	19.3	23.3	21.2	24.2	22.7	21.4	21.0	19.9	18.8
Grand Total	93.2	100.0	97.1	100.0	106.5	100.0	109.9	100.0	106.4	100.0	101.8	100.0	105.8	100.0

¹This line includes manufacturing for NIF Shop Stores and Direct Material Issue, Navy Stock Fund and Defense Stock Fund manufacturing for stores, and in process (lines 45-48 on the Financial and Operating Statement).

²This line includes non-shipwork in the categories of Refit and Restoration; Construction and Conversion; Overhaul, Repair, Renovation; Alteration and Modification; and Other Products and Services (lines 50-53 on the Financial and Operating Statement).

Note: y = less than \$0.1 million

z = less than 0.1 percent

Sum of individual items may not add to subtotals due to rounding.

Source: Naval Shipyard Financial and Operating Statements.

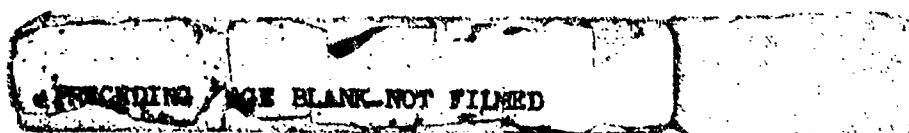


Table B-3. DISTRIBUTION OF ACCRUED COSTS
OF NAVAL SHIPYARD WORK by
CATEGORY--NORFOLK

(Costs in millions of current
dollars)

6	1967		1968		1969		1970		1971		1972		1973		1974	
%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
9.4	9.3	7.3	3.1	2.3	7.4	5.1	13.9	9.7	10.7	7.1	8.8	5.4	8.2	5.3	5.9	3.4
48.5	58.5	45.7	74.4	54.4	74.9	51.8	65.3	45.4	84.4	56.3	87.4	53.9	84.9	54.8	98.6	56.5
16.2	31.1	24.3	29.0	21.2	34.2	23.7	28.8	20.0	25.2	16.8	34.5	21.3	35.3	22.8	38.7	22.2
7.1	8.5	6.6	9.1	6.7	8.7	6.0	12.1	8.4	11.2	7.5	11.8	7.3	8.9	5.7	12.0	6.9
81.2	107.4	84.0	115.6	84.6	125.1	86.6	120.1	83.6	131.4	87.7	142.5	87.9	137.2	88.5	155.2	88.9
2.5	2.7	2.1	2.9	2.1	2.9	2.0	2.6	1.8	2.2	1.5	2.1	1.3	2.2	1.4	1.9	1.1
1.5	2.1	1.6	2.7	2.0	2.3	1.6	2.4	1.7	1.8	1.2	2.5	1.5	2.5	1.6	3.1	1.8
6.3	6.4	5.0	7.4	5.4	5.6	3.9	9.5	6.6	6.0	4.0	7.2	4.4	6.4	4.1	5.2	3.0
0.2	0.2	0.2	0.2	0.1	0.3	0.2	0.3	0.2	0.6	0.4	0.4	0.2	0.2	0.1	0.7	0.4
1.0	1.0	0.8	0.4	0.3	0.4	0.3	0.9	0.6	0.4	0.3	0.2	0.1	0.2	0.1	0.4	0.2
2.0	2.6	2.0	2.4	1.8	2.5	1.7	2.6	1.8	2.5	1.7	1.4	0.9	1.2	0.8	1.2	0.7
3.2	3.1	2.4	3.4	2.5	3.9	2.7	4.1	2.9	4.2	2.8	4.7	2.9	4.5	2.9	6.5	3.7
1.8	2.3	1.8	1.6	1.2	1.5	1.0	1.1	0.8	0.7	0.5	0.8	0.5	0.3	0.2	0.3	0.2
18.8	20.5	16.0	21.1	15.4	19.4	13.4	23.5	16.4	18.4	12.3	19.5	12.1	17.7	11.5	19.4	11.1
100.0	127.9	100.0	136.7	100.0	144.5	100.0	143.7	100.0	149.8	100.0	162.1	100.0	155.0	100.0	174.6	100.0

Fund, all other

Repair and
Inc

Work Category	1960		1961		1962		1963		1964		1965		1966		
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	
New Construction and Conversion	21.5	31.6	24.9	38.4	13.0	18.1	11.0	15.9	20.0	28.9	12.4	18.9	19.6	23.4	4.1
Overhauls and Repairs	14.5	21.3	19.2	29.6	28.4	39.4	22.8	32.9	21.5	31.0	29.1	44.4	32.6	38.9	37.1
Alterations	4.9	7.2	6.7	10.3	16.6	23.1	20.1	29.0	14.5	20.9	10.8	16.5	17.1	20.4	32.1
Other Shipwork	14.5	21.3	0.2	0.3	0.1	0.1	0.6	0.9	0.2	0.3	2.6	4.0	3.9	4.6	5.1
Total Shipwork	55.4	81.4	51.0	78.6	58.2	80.8	54.4	78.7	56.2	81.1	55.0	83.8	73.2	87.2	80.1
Manufacturing ¹	0.7	1.0	0.6	0.9	0.8	1.1	0.8	1.2	1.1	1.6	0.9	1.4	1.2	1.4	1.1
Repairs to Material in Store	1.3	1.9	0.4	0.6	1.2	1.7	1.8	2.6	2.2	3.2	0.2	0.3	0.1	0.1	0.1
Other Productive Work ²	0.1	0.1	1.3	2.0	2.3	3.2	0.3	0.4	0.1	0.1	3.6	5.5	4.3	5.1	5.1
Special Deposits	0.1	0.1	0.1	0.2	0.2	0.3	2.0	2.9	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Plant Property	0.4	0.6	0.4	0.6	0.3	0.4	0.3	0.4	0.5	0.7	0.3	0.5	0.3	0.4	0.4
Productive Work for Other Activities	4.1	6.0	4.4	6.8	1.0	1.4	0.2	0.3	0.1	0.1	0.4	0.6	0.3	0.4	0.1
Military Support	5.8	8.5	6.5	10.0	7.9	11.0	9.4	13.6	7.7	11.1	4.3	6.6	4.4	5.2	4.1
Research and Development	0.3	0.4	0.2	0.3	0.1	0.1	1.8	2.6	1.2	1.7	0.6	0.9	y	z	0.1
Total Non-Shipwork	12.7	18.6	13.9	21.4	13.8	19.2	14.7	21.3	13.1	18.9	10.6	16.2	10.7	12.8	12.1
Grand Total	68.1	100.0	64.9	100.0	72.0	100.0	69.2	100.0	69.3	100.0	65.6	100.0	83.9	100.0	92.1

¹This line includes manufacturing for NIF Shop Stores and Direct Material Issue, Navy Stock Fund and Defense Stock Fund manufacturing for stores, and in process (lines 45-48 on the Financial and Operating Statement).

²This line includes non-shipwork in the categories of Refit and Restoration; Construction and Conversion; Overhaul, Renovation; Alteration and Modification; and Other Products and Services (lines 50-53 and 56 on the Financial and Operating Statement).

Note: y = less than \$0.1 million

z = less than 0.1 percent

Sum of individual items may not add to subtotals due to rounding.

Source: Naval Shipyard Financial and Operating Statements.

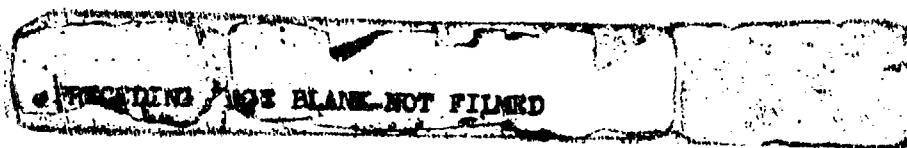


Table B-4. DISTRIBUTION OF ACCRUED COSTS OF
NAVAL SHIPYARD WORK by CATEGORY--
CHARLESTON

(Costs in millions of current dollars)

66	1967		1968		1969		1970		1971		1972		1973		1974	
%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
23.4	4.6	5.0	1.1	1.1	1.0	1.0	3.6	3.6	8.7	7.9	2.9	2.8	5.1	4.9	9.0	7.7
38.9	37.7	40.6	48.3	48.3	54.1	53.0	47.6	47.4	61.2	55.3	58.5	55.7	55.2	53.0	60.5	51.5
20.4	32.4	34.9	30.5	30.5	26.0	25.5	26.9	26.8	16.1	14.5	15.0	14.3	19.4	18.6	23.5	20.0
4.6	5.9	6.4	4.9	4.9	4.6	4.5	5.8	5.8	7.6	6.9	6.3	6.0	3.7	3.5	7.0	6.0
87.2	80.6	86.8	84.9	84.8	85.7	83.9	83.9	83.5	93.6	84.6	82.7	78.8	83.4	80.0	100.0	85.2
1.4	1.6	1.7	1.5	1.5	1.1	1.1	1.1	1.1	1.0	0.9	1.1	1.0	0.7	0.7	0.7	0.6
0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.5	0.5	0.6	0.6	0.5	0.4
5.1	5.0	5.4	7.6	7.6	8.6	8.4	8.2	8.2	9.2	8.3	13.9	13.2	13.3	12.8	8.4	1.2
0.1	0.1	0.1	y	z	0.1	0.1	0.1	0.1	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1
0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.8	0.8	0.7	0.6	0.8	0.8	0.4	0.4	0.3	0.3
0.4	0.3	0.3	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	1.0	1.0	0.9	0.8
5.2	4.6	5.0	4.2	4.2	4.7	4.6	5.4	5.4	4.8	4.3	5.1	4.9	5.0	4.8	6.3	5.4
z	0.1	0.1	0.3	0.3	0.2	0.2	y	z	y	z	y	z	y	z	y	z
12.8	12.3	13.2	15.2	15.2	16.4	16.1	16.6	16.5	17.1	15.4	22.3	21.2	20.9	20.0	17.4	14.8
100.0	92.9	100.0	100.1	100.0	102.1	100.0	100.5	100.0	110.7	100.0	105.0	100.0	101.1	100.0	117.4	100.0

Stock Fund, all other

erhaul, Repair and
ial and Operating

Work Category	1960		1961		1962		1963		1964		1965		1966	
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
New Construction and Conversion	5.6	9.3	7.8	12.1	3.6	5.2	13.6	20.2	14.4	21.1	7.6	11.7	4.7	6.0
Overhauls and Repairs	29.9	49.7	31.1	48.2	29.6	42.6	24.2	36.0	27.0	39.6	35.2	54.3	42.4	54.2
Alterations	11.2	18.6	13.4	20.8	20.9	30.1	15.6	23.2	13.9	20.4	10.0	15.4	17.3	22.1
Other Shipwork	1.2	2.0	1.7	2.6	2.4	3.5	1.5	2.2	2.5	3.7	4.9	7.6	5.7	7.3
Total Shipwork	47.8	79.6	53.9	83.6	56.5	81.3	55.0	81.8	57.9	84.9	57.8	89.2	70.1	89.6
Manufacturing ¹	0.3	0.5	0.1	0.2	0.4	0.6	0.2	0.3	0.2	0.3	0.4	0.6	0.5	0.6
Repairs to Material in Store	0.8	1.3	1.0	1.6	1.1	1.6	1.1	1.6	1.0	1.5	0.1	0.2	0.5	0.6
Other Productive Work ²	2.0	3.3	2.1	3.3	4.2	6.0	3.6	5.4	2.5	3.7	3.8	5.9	4.3	5.5
Special Deposits	y	z	y	z	y	z	y	z	y	z	y	z	y	z
Plant Property	0.1	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1
Productive Work for Other Activities	2.0	3.3	1.1	1.7	1.0	1.4	0.9	1.3	0.9	1.3	1.5	2.3	1.0	1.3
Military Support	6.0	10.0	5.9	9.1	5.8	8.3	5.8	8.6	4.9	7.2	0.8	1.2	0.9	1.2
Research and Development	0.6	1.0	0.1	0.2	0.3	0.4	0.3	0.4	0.6	0.9	0.3	0.5	0.7	0.9
Total Non-Shipwork	12.3	20.0	10.5	16.4	13.0	18.0	12.2	18.2	10.4	15.1	7.0	10.8	8.1	10.4
Grand Total	60.2	100.0	64.5	100.0	69.5	100.0	67.2	100.0	68.2	100.0	64.8	100.0	78.2	100.0

¹This line includes manufacturing for NIF Shop Stores and Direct Material Issue, Navy Stock Fund and Defense Stock Fund manufacturing for stores, and in process (lines 45-48 on the Financial and Operating Statement).

²This line includes non-shipwork in the categories of Refit and Restoration; Construction and Conversion; Overhaul, Repair, Renovation; Alteration and Modification; and Other Products and Services (lines 50-53 and 56 on the Financial and Operating Statement).

Note: y = less than \$0.1 million

z = less than 0.1 percent

Sum of individual items may not add to subtotals due to rounding.

Source: Naval Shipyard Financial and Operating Statements.

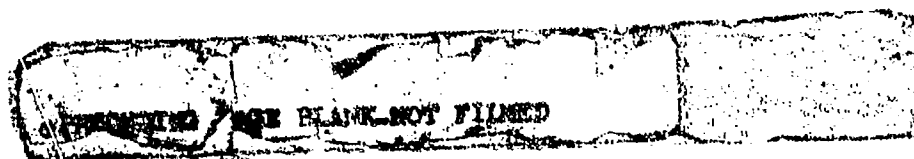


Table B-5. DISTRIBUTION OF ACCRUED COSTS
OF NAVAL SHIPYARD WORK by
CATEGORY--LONG BEACH
(Costs in millions of current dollars)

1967	1968		1969		1970		1971		1972		1973		1974	
%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
17.2	10.4	8.7	8.8	7.7	28.8	24.1	27.8	23.1	17.0	13.3	21.5	17.1	3.9	2.8
38.4	55.5	46.3	57.9	59.5	57.8	48.4	61.0	50.7	67.4	52.5	51.4	40.9	68.2	49.2
24.6	26.2	21.9	16.2	14.2	10.7	9.0	9.0	7.5	22.7	17.7	25.1	20.0	41.8	30.1
7.5	16.2	13.5	7.1	6.2	7.5	6.3	8.9	7.4	5.1	4.0	12.7	10.1	7.7	5.6
87.7	108.3	90.4	100.0	87.6	104.9	87.9	106.7	88.7	112.3	87.5	110.3	87.9	121.6	87.7
0.5	0.6	0.5	0.3	0.3	0.7	0.6	0.3	0.2	0.3	0.2	0.4	0.3	0.2	0.1
1.0	1.0	0.8	1.2	1.1	1.4	1.2	1.0	0.8	1.0	0.8	0.9	0.7	0.9	0.6
5.7	6.8	5.7	9.2	8.1	9.9	8.3	9.7	8.1	11.7	9.1	10.8	8.6	13.0	9.4
z	y	z	0.6	0.5	y	z	y	z	y	z	y	z	y	z
0.3	0.5	0.4	0.6	0.5	0.4	0.3	0.6	0.5	0.3	0.2	0.2	0.2	0.2	0.1
1.0	1.0	0.8	0.9	0.8	0.8	0.7	0.9	0.7	1.5	1.2	1.8	1.4	1.5	1.1
1.4	1.0	0.8	1.3	1.1	1.1	0.9	1.0	0.8	1.0	0.8	1.1	0.9	1.0	0.7
2.4	0.5	0.4	0.5	0.4	0.1	0.1	0.1	0.1	0.1	0.1	y	z	y	z
12.3	11.5	9.6	14.1	12.4	14.5	12.1	13.6	11.3	16.0	12.5	15.2	12.1	17.1	12.3
100.0	119.8	100.0	114.1	100.0	119.4	100.0	120.3	100.0	128.3	100.0	125.8	100.0	138.7	100.0

all other

r and
ting

Work Category	1960		1961		1962		1963		1964		1965		1966	
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
New Construction and Conversion	60.5	69.4	63.6	62.4	96.0	76.7	103.4	81.8	86.5	77.3	80.4	66.5	53.9	40.7
Overhauls and Repairs	7.8	8.9	7.1	7.0	7.9	6.3	6.4	5.1	6.3	5.6	10.3	8.5	20.1	15.2
Alterations	2.2	2.5	16.8	16.5	5.1	4.1	1.7	1.3	1.2	1.1	7.6	6.3	30.0	22.6
Other Shipwork	0.5	0.6	0.1	0.1	1.6	1.3	y	z	0.1	0.1	5.8	4.8	8.5	6.4
Total Shipwork	71.1	81.5	87.6	86.0	110.6	88.2	111.5	88.2	94.2	84.2	104.1	86.2	112.5	84.9
Manufacturing ¹	3.1	3.6	1.6	1.6	2.3	1.8	1.2	0.9	2.1	1.9	1.5	1.2	3.0	2.3
Repairs to Material in Store	2.1	2.4	2.1	2.1	2.6	2.1	1.2	0.9	1.8	1.6	0.4	0.3	0.8	0.6
Other Productive Work ²	2.7	3.1	3.2	3.1	3.1	2.5	3.3	2.6	3.8	3.4	7.1	5.9	7.9	6.0
Special Deposits	0.2	0.2	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Plant Property	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.4	0.3	0.4	0.3
Productive Work for Other Activities	2.5	2.9	2.1	2.1	2.4	1.9	4.1	3.2	4.4	3.9	1.8	1.5	2.2	1.7
Military Support	4.7	5.4	3.8	3.7	3.5	2.3	4.0	3.2	4.2	3.8	4.3	3.6	4.4	3.3
Research and Development	0.5	0.6	1.0	1.0	0.4	0.3	0.6	0.5	0.8	0.7	1.0	0.8	1.3	1.0
Total Non-Shipwork	16.1	18.5	14.3	14.0	14.8	11.8	14.9	11.8	17.7	15.8	16.7	13.8	20.0	15.1
Grand Total	87.2	100.0	102.0	100.0	125.2	100.0	126.4	100.0	111.9	100.0	120.9	100.0	132.5	100.0

¹This line includes manufacturing for NIF Shop Stores and Direct Material Issue, Navy Stock Fund and Defense Stock Fund, manufacturing for stores, and in process (lines 45-48 on the Financial and Operating Statement).

²This line includes non-shipwork in the categories of Refit and Restoration; Construction and Conversion; Overhaul, Repair, Renovation; Alteration and Modification; and Other Products and Services (lines 50-53 and 56 on the Financial and Operating Statement).

Note: y = less than \$0.1 million

z = less than 0.1 percent

Sum of individual items may not add to subtotals due to rounding.

Source: Naval Shipyard Financial and Operating Statements.

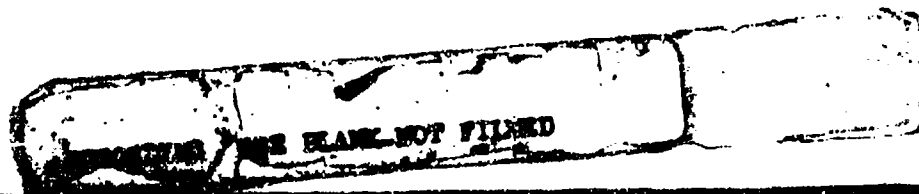


Table B-6. DISTRIBUTION OF ACCRUED COSTS OF
NAVAL SHIPYARD WORK by CATEGORY--
MARE ISLAND
(Costs in millions of current dollars)

1967		1968		1969		1970		1971		1972		1973		1974	
\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
89.8	35.5	117.6	42.4	167.4	55.2	71.0	41.1	39.0	22.3	15.5	9.4	3.4	2.3	y	z
76.3	30.2	59.0	21.3	49.3	16.3	27.2	15.7	45.7	26.1	56.2	34.1	72.9	48.9	112.3	62.7
35.5	14.0	36.4	13.1	12.2	4.0	10.6	6.1	17.3	9.9	19.9	12.1	14.9	10.0	20.4	11.4
17.4	6.9	25.1	9.1	21.5	7.1	12.9	7.5	36.4	20.8	36.2	21.9	22.3	15.0	16.3	9.1
219.0	86.6	238.2	85.9	250.4	82.6	121.7	70.5	138.4	79.0	127.8	77.5	113.6	76.2	149.0	83.1
4.0	1.6	3.4	1.2	4.4	1.5	3.0	1.7	1.1	0.6	1.9	1.2	1.3	0.9	1.0	0.6
2.1	0.8	4.2	1.5	3.7	1.2	1.7	1.0	1.2	0.7	1.1	0.7	0.6	0.4	1.1	0.6
13.8	5.5	16.7	6.0	23.4	7.7	19.2	11.1	18.2	10.4	14.2	8.6	16.5	11.1	13.6	7.6
0.2	0.1	0.3	0.1	0.3	0.1	0.2	0.1	0.3	0.2	0.2	0.1	0.1	0.1	y	z
0.8	0.3	0.6	0.2	0.6	0.2	0.4	0.2	0.5	0.3	0.2	0.1	0.2	0.1	0.3	0.2
5.6	2.2	3.8	1.4	4.5	1.5	4.2	2.4	1.9	1.1	y	z	y	z	y	z
5.4	2.1	7.8	2.8	9.6	3.2	10.3	6.0	10.5	6.0	7.8	4.7	7.4	5.0	7.3	4.1
1.7	0.7	2.3	0.8	6.1	2.0	12.4	7.2	3.6	2.1	11.7	7.1	9.1	6.1	6.5	3.6
33.8	13.4	39.1	14.1	52.7	17.4	51.1	29.5	36.9	21.0	37.2	22.5	35.4	23.8	30.2	16.9
252.8	100.0	277.2	100.0	303.1	100.0	172.7	100.0	175.2	100.0	165.0	100.0	149.0	100.0	179.2	100.0

all other

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Work Category	1960		1961		1962		1963		1964		1965		1966	
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
New Construction and Conversion	55.5	67.1	62.4	67.6	53.2	54.9	71.6	70.1	81.8	77.9	47.5	46.5	62.7	53.5
Overhauls and Repairs	8.0	9.7	11.0	11.9	13.9	14.3	11.7	11.5	7.1	6.8	21.7	21.2	18.1	15.4
Alterations	2.5	3.0	3.6	3.9	14.1	14.6	6.8	6.7	3.3	3.1	15.5	15.2	12.1	10.1
Other Shipwork	1.4	1.7	2.0	2.2	4.7	4.9	1.5	1.5	1.3	1.2	5.4	5.3	8.2	7.0
Total Shipwork	67.5	81.6	79.1	85.7	86.0	88.7	91.6	89.7	93.4	89.0	90.4	88.5	101.1	86.1
Manufacturing ¹	3.8	4.6	3.2	3.5	2.3	2.4	2.2	2.2	1.7	1.6	1.4	1.4	2.0	1.7
Repairs to Material in Store	0.6	0.7	0.6	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5
Other Productive Work ²	3.6	4.4	2.9	3.1	1.8	1.9	1.5	1.5	2.2	2.1	2.2	2.2	3.7	3.1
Special Deposits	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	y	z	0.3	0.2
Plant Property	0.3	0.4	0.2	0.2	0.2	0.2	0.5	0.5	0.3	0.3	0.4	0.4	0.3	0.2
Productive Work for Other Activities	1.7	2.1	1.6	1.7	1.7	1.8	1.3	1.3	2.3	2.2	3.5	3.4	4.0	3.3
Military Support	4.2	5.1	4.1	4.4	4.1	4.2	4.1	4.0	4.3	4.1	2.9	2.8	3.2	2.7
Research and Development	0.8	1.0	0.4	0.4	0.1	0.1	0.1	0.1	y	z	0.9	0.9	1.9	1.6
Total Non-Shipwork	15.3	18.4	13.2	14.3	11.0	11.3	10.5	10.3	11.6	11.0	11.8	11.5	16.2	13.4
Grand Total	82.7	100.0	92.3	100.0	96.9	100.0	102.1	100.0	105.0	100.0	102.2	100.0	117.3	100.0

¹This line includes manufacturing for NIF Shop Stores and Direct Material Issue, Navy Stock Fund and Defense Stock manufacturing for stores, and in process (lines 45-48 on the Financial and Operating Statement).

²This line includes non-shipwork in the categories of Refit and Restoration; Construction and Conversion; Overhaul, Renovation; Alteration and Modification; and Other Products and Services (lines 50-53 and 56 on the Financial and Operating Statement).

Note: y = less than \$0.1 million

z = less than 0.1 percent

Sum of individual items may not add to subtotals due to rounding.

Source: Naval Shipyard Financial and Operating Statements.

Table B-7. DISTRIBUTION OF ACCRUED COSTS OF
NAVAL SHIPYARD WORK by CATEGORY--
PUGET SOUND

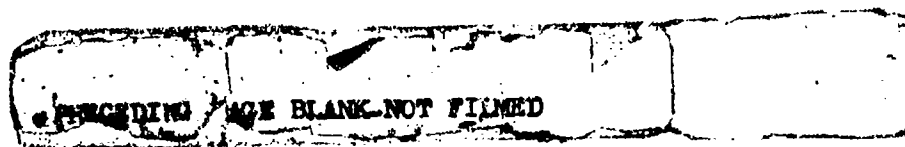
(Costs in millions of current dollars)

6	1967		1968		1969		1970		1971		1972		1973		1974	
	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	
53.5	68.9	51.2	77.8	53.2	74.4	48.1	63.3	39.5	30.4	20.6	83.6	57.8	46.3	34.7	50.9	28.8
15.4	22.4	16.7	22.2	15.2	37.5	24.2	36.5	22.8	59.5	40.4	32.2	22.3	49.2	36.9	66.3	37.5
10.3	15.9	11.8	26.6	18.2	19.2	12.4	30.5	19.1	24.3	16.5	3.7	2.6	13.1	9.8	31.6	17.9
7.0	9.7	7.2	6.0	4.1	10.8	7.0	17.1	10.7	17.0	11.5	10.4	7.2	4.2	3.1	7.5	4.2
86.2	116.8	86.8	132.6	90.6	141.9	91.7	147.4	92.1	131.3	89.0	129.8	89.8	112.8	84.6	156.3	88.4
1.7	2.8	2.1	2.2	1.5	2.1	1.4	1.9	1.2	1.4	0.9	1.4	1.0	1.6	1.2	2.3	1.3
0.5	0.6	0.4	0.5	0.3	0.4	0.3	0.5	0.3	0.6	0.4	1.4	1.0	1.4	1.0	1.3	0.7
3.2	3.1	2.3	2.9	2.0	3.3	2.1	3.2	2.0	6.1	4.1	5.1	3.5	10.7	8.0	8.6	4.9
0.3	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	z
0.3	1.1	0.8	1.0	0.7	1.2	0.8	1.4	0.9	1.4	0.9	0.5	0.3	0.4	0.3	1.0	0.6
3.4	4.5	3.3	1.1	0.8	y	z	y	z	y	z	y	z	y	z	y	z
2.7	3.4	2.5	4.4	3.0	4.5	2.9	4.4	2.7	5.1	3.5	5.4	3.7	5.4	4.0	5.8	3.3
1.6	2.1	1.6	1.5	1.0	1.0	0.6	1.0	0.6	1.5	1.0	0.7	0.5	1.0	0.7	0.9	0.5
13.8	17.7	13.2	13.7	9.4	12.8	8.3	12.7	7.9	16.2	11.0	14.8	10.2	20.6	15.4	20.5	11.6
100.0	134.5	100.0	146.3	100.0	154.7	100.0	160.1	100.0	147.4	100.0	144.6	100.0	133.4	100.0	177.0	100.0

ack Fund, all other

ul, Repair and
and Operating

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Work Category	1960		1961		1962		1963		1964		1965		1966		1
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$
New Construction and Conversion	2.0	4.4	2.1	4.3	11.0	20.7	9.5	17.6	5.7	10.5	12.4	20.5	0.7	1.0	2.2
Overhauls and Repairs	26.4	57.5	27.4	56.7	25.5	48.0	27.8	51.5	30.2	55.4	27.9	46.2	46.1	63.3	42.6
Alterations	7.6	16.6	8.2	17.0	5.9	11.1	6.2	11.5	6.6	12.1	5.8	9.6	13.6	18.7	15.6
Other Shipwork	1.3	2.8	0.9	1.9	1.0	1.9	1.3	2.4	2.5	4.6	3.1	5.1	3.4	4.7	2.9
Total Shipwork	37.3	81.3	38.7	80.1	43.4	81.8	44.9	83.1	45.0	82.6	49.2	81.5	63.9	87.8	63.3
Manufacturing ¹	0.3	0.7	0.3	0.6	0.4	0.8	0.5	0.9	1.1	2.0	2.0	3.3	0.7	1.0	0.7
Repairs to Material in Store	0.5	1.1	0.5	1.0	0.9	1.7	0.9	1.7	0.7	1.3	y	z	y	z	y
Other Productive Work ²	3.7	8.1	4.1	8.5	4.2	7.9	4.0	7.4	4.5	8.3	2.3	3.8	2.0	2.7	3.7
Special Deposits	y	z	y	z	y	z	y	z	y	z	0.1	0.2	y	z	y
Plant Property	y	z	y	z	0.1	0.2	0.3	0.6	y	z	1.4	2.3	0.2	0.3	0.2
Productive Work For Other Activities	2.0	4.4	2.7	5.6	2.1	4.0	1.6	3.0	1.1	2.0	0.5	0.8	0.5	0.7	0.7
Military Support	1.9	4.1	1.9	3.9	1.9	3.6	1.8	3.3	1.8	3.3	5.0	8.2	5.1	7.0	6.9
Research and Development	0.1	0.2	y	z	y	z	y	z	y	z	y	z	y	z	y
Total Non-Shipwork	8.6	18.7	9.6	19.9	9.6	18.2	9.1	16.9	9.5	17.4	11.2	18.5	8.9	12.2	12.3
Grand Total	45.9	100.0	48.3	100.0	53.1	100.0	54.0	100.0	54.5	100.0	60.4	100.0	72.8	100.0	75.6

¹This line includes manufacturing for NIF Shop Stores and Direct Material Issue, Navy Stock Fund and Defense Stock Fund, manufacturing for stores, and in process (lines 45-48 on the Financial and Operating Statement).

²This line includes non-shipwork in the categories of Refit and Restoration; Construction and Conversion; Overhaul, Repair, Renovation; Alteration and Modification; and Other Products and Services (lines 50-53 and 56 on the Financial and Operating Statement).

Note: y = less than \$0.1 million

z = less than 0.1 percent

Sum of individual items may not add to subtotals due to rounding.

Source: Naval Shipyard Financial and Operating Statements.

Table B-8. DISTRIBUTION OF ACCRUED COSTS OF
NAVAL SHIPYARD WORK by CATEGORY--
PEARL HARBOR

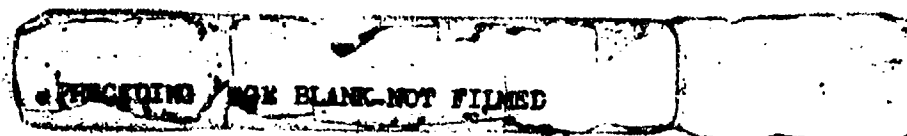
(Costs in millions of current dollars)

1966		1967		1968		1969		1970		1971		1972		1973		1974	
\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%
0.7	1.0	2.2	2.9	3.6	4.2	6.1	6.7	4.1	4.3	7.9	8.4	4.8	4.9	1.8	1.8	1.1	1.0
46.1	63.3	42.6	56.3	47.9	56.3	56.6	62.1	62.7	65.5	62.1	65.9	67.2	68.1	66.8	67.6	71.9	64.4
13.6	18.7	15.6	20.6	20.2	23.7	14.4	15.8	15.0	15.7	12.3	13.1	14.0	14.2	13.1	13.3	23.2	20.8
3.4	4.7	2.9	3.8	3.7	4.3	4.0	4.4	2.5	2.6	2.5	2.7	1.6	1.6	3.4	3.4	3.1	2.8
53.9	87.8	63.3	83.7	75.3	88.5	81.2	89.0	84.2	88.0	84.9	90.0	87.6	88.8	85.2	86.2	99.3	89.0
0.7	1.0	0.7	0.9	0.8	0.9	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.6	1.0	1.0	0.9	0.8
y	z	y	z	y	z	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.4	0.4	0.5	0.4
2.0	2.7	3.7	4.9	1.8	2.1	1.9	2.1	3.6	3.8	3.4	3.6	4.7	4.8	5.7	5.8	3.8	3.4
y	z	y	z	y	z	y	z	y	z	y	z	y	z	y	z	y	z
0.2	0.3	0.2	0.3	0.6	0.7	0.4	0.4	0.9	0.9	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.3
0.5	0.7	0.7	0.9	0.6	0.7	0.7	0.8	0.7	0.7	0.5	0.5	y	z	y	z	y	z
5.1	7.0	6.9	9.1	5.6	6.6	5.9	6.5	5.2	5.4	4.2	4.4	4.8	4.9	6.0	6.1	6.8	6.1
y	z	y	z	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	y	z	y	z
8.9	12.2	12.3	16.3	9.8	11.5	10.0	11.0	11.4	12.0	9.4	10.0	11.1	11.2	13.6	13.8	12.3	11.0
2.8	100.0	75.6	100.0	85.1	100.0	91.2	100.0	95.7	100.0	94.2	100.0	98.7	100.0	98.8	100.0	111.7	100.0

Defense Stock Fund, all other

on; Overhaul, Repair and
Financial and Operating

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2

APPENDIX C

TITLES AND RESPONSIBILITIES OF THE MAJOR OFFICES AND DEPARTMENTS OF A NAVAL SHIPYARD

(Derived from the Standard Naval
Shipyards Organization Manual)

TITLES AND RESPONSIBILITIES OF THE MAJOR OFFICES
AND DEPARTMENTS OF A NAVAL SHIPYARD

DIRECTOR OF DATA PROCESSING

Responsible for:

1. Directing and supervising the operation of the shipyard automatic data-processing equipment, the automated processing of management information, and other business-type data.
2. Serving as principal adviser and consultant to the Shipyard Commander and to shipyard department and office heads on automatic data-processing operations.
3. Supervising the installation of new ADP equipment and data-processing applications in the shipyard; reviewing installed computers and computer applications to determine whether they are operating as planned.
4. Providing ADP systems design and analysis and computer programming services for the shipyard and for higher authority, as required.
5. Performing staff studies in the area of computer-based systems and reports.
6. Promoting the use throughout the shipyard of source-data automation and of electric accounting machines (EAM) when their use can be demonstrated to be more efficient or economical than manual or computer means.
7. Performing other studies and services as directed.
8. Compiling, coordinating, and maintaining control of the shipyard ADP Budget, including all commercial and Government contracts for Automated Data Systems (ADS) support including engineering and numerical control tool programs.

TITLES AND RESPONSIBILITIES OF THE MAJOR OFFICES
AND DEPARTMENTS OF A NAVAL SHIPYARD

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4. Providing ADP systems design and analysis and computer programming services for the shipyard and for higher authority, as required.
5. Performing staff studies in the area of computer-based systems and reports.
6. Promoting the use throughout the shipyard of source-data automation and of electric accounting machines (EAM) when their use can be demonstrated to be more efficient or economical than manual or computer means.
7. Performing other studies and services as directed.
8. Compiling, coordinating, and maintaining control of the shipyard ADP Budget, including all commercial and Government contracts for Automated Data Systems (ADS) support including engineering and numerical control tool programs.

QUALITY ASSURANCE OFFICER

Responsible for:

1. Planning, executing and monitoring a quality assurance program for the shipyard in accordance with applicable quality assurance criteria and with due consideration to the safety of ships, equipment, and personnel.
2. Planning and managing a quality-cost measurement program for the shipyard (prevention, appraisal and failure costs).
3. Providing guidance, integration, and evaluation of the efforts of the shipyard toward the prevention of product quality degradation.
4. Investigation and evaluation of quality problems to determine the fundamental cause, the cost, the scope, and the significance of the problems.
5. Directing a shipyard program to ensure calibration of measuring and testing equipment, maintaining standards of measurement and performing calibration.
6. Developing a quality assurance training program for the shipyard.
7. Performing quality assurance functions such as inspection, physical and chemical testing, qualification testing, non-destructive testing, and witnessing formal operational tests, as assigned; performing audits of the procedures, conduct, and records of inspections and tests of weight-handling equipment.

8. Making failure mode analyses and process capability studies.
9. Establishing technical requirements for metal fabrication and thermal joining processes.
10. Managing the shipyard quality assurance audit program and performing internal audits to determine shipyard compliance with quality requirements.
11. Execution of such research, development, test and evaluation programs as are assigned.
12. Coordinating with, and responding to the requirements of, the Combat Systems Officer for performance of in-process tests and inspections.

NOTE: In shipyards in which a Nuclear Engineering Department has been established, certain of the foregoing functions related to nuclear reactor plant work are the responsibility of the Nuclear Engineering Manager.

DIRECTOR OF MANAGEMENT ENGINEERING

Responsible for:

1. INDUSTRIAL MANAGEMENT FUNCTION

- a. Recommending to the Shipyard Commander mid-range plans for the improvement of shipyard management and operations.
- b. Planning, coordinating, and performing general and industrial management programs, studies, reviews, and investigations; coordinating the shipyard Production Planning and Control Program; providing related consultant services as requested by department heads or as directed by the Shipyard Commander.
- c. Performing organizational planning in the light of the shipyard's assigned mission; reviewing organizational structure, administrative and functional relationships, and the allocation of authority and responsibility to improve shipyard organization and administration.
- d. Recommending distribution of personnel among departments, within shipyard ceilings.
- e. Performing long-range interdepartmental shipyard manpower planning studies for the purpose of determining future requirements for manpower, including adjustments in training, facilities, and manpower distribution necessary to support future work requirements; performing such studies in cooperation with the departments involved.
- f. Controlling the assignment of shipyard space, including study of space utilization.

- g. Developing operational goals and management objectives for the measurement of shipyard performance and the appraisal of organization functions, for incorporation in the shipyard's performance appraisal system.
- h. Conducting in-depth studies and analyses of performance deficiencies and recommending management actions for performance improvements.
- i. Providing management guidance and assistance to implement organizational, operational and procedural changes, and processes and projects to improve shipyard performance.
- j. Serving as the focal point for overall administration of the Shipyard Manpower Analysis Program.
- k. Performing paperwork management functions, including directives, forms, records, reports, and office-equipment management. (Note: Any or all paperwork management functions may be assigned to the Administrative Services Division of the Administrative Department as a local option.)
- l. Coordinating facilities and shipyard modernization planning among shipyard departments to ensure consistency with overall shipyard policy, to ensure interdepartmental coordination, and to assure adequate attention to long-range shipyard facilities requirements.
- m. Post-auditing of management procedures having only minor interfaces with other departments, when signed by the department head concerned; reviewing all management

procedures having significant interfaces prior to being signed by the Shipyard Commander.

2. APPRAISAL FUNCTION

- a. Developing, implementing, and monitoring a program for appraising the effectiveness and efficiency of shipyard functions, operations, and financial management.
- b. Preparing statistical reports, studies, and charts, and analyzing shipyard management and operations for performance appraisal against established goals and objectives; operating and maintaining the Shipyard Management Center, if established.
- c. Using analytical techniques to identify deficiency trends and management problem areas, and recommending development of programs and projects for their solution for review by the Shipyard Commander.
- d. Coordinating shipyard action in connection with all formally constituted surveys, inspections, and audits conducted by non-shipyard personnel, and appraising reports and advising the Shipyard Commander thereon.

3. INDUSTRIAL PLANNING FUNCTION

- a. Performing Industrial Mobilization Planning and responding to requirements of the Disaster Preparedness Officer (Code 800) for disaster preparedness and domestic emergency planning.

4. MANAGEMENT INFORMATION SYSTEM FUNCTION

- a. Serving as the shipyard focal point for management information system management matters, including performance of special studies and projects in the fields of management information systems and related automated data processing system requirements.
- b. Evaluating actions and decisions of higher authority for potential impact on shipyard management information systems requirements.
- c. Reviewing proposed local ADP reports and proposed additions or modifications to the shipyard MIS for necessity and to determine the optimum means of satisfying the requirements involved; e.g., by manual, EAM, or computer reports.

NOTE: In those shipyards assigned responsibility for naval nuclear propulsion plant work, certain of the above functions associated with reactor plant work are the responsibility of other departments and offices.

DIRECTOR OF INDUSTRIAL RELATIONS

Responsible for:

1. Providing advice and assistance to the Shipyard Commander and other shipyard officials in administration of an industrial-relations program, in keeping with sound management practices, that will meet military, production, and social requirements.
2. Formulating, adjusting, and promulgating labor-relations, socio-personnel and personnel-management policies and programs that meet the needs of the shipyard, and ensuring compliance with instructions of Navy, DoD, and the Civil Service Commission.
3. Providing for recognition of, and consultation with, employee organizations and unions in the development and implementation of programs and policies affecting working conditions.
4. Observing the effectiveness of industrial-relations policies and programs and initiating changes, where indicated, to improve the effectiveness of shipyard operations.
5. Maintaining liaison with outside organizations and community groups in industrial-relations matters, and representing the Shipyard Commander in these matters, as required.

COMBAT SYSTEMS OFFICER

Responsible for:

1. Proper, timely, and expeditious accomplishment of the field-engineering shipyard functions involving weapons, electronic systems, and (where applicable) shipboard aeronautical systems.
2. Performance of the following functions, under the direction of the Planning Officer, with respect to weapons and electronic systems and (where applicable) shipboard aeronautical systems:
 - a. Directing and coordinating arrival inspections.
 - b. Evaluating and analyzing deficiencies in operating systems in the planning phase of an availability.
 - c. Making recommendations concerning design specifications and changes necessary to correct deficiencies.
 - d. Preparing test specifications and systems check-out procedures.
 - e. Technical review of weapon--systems design work accomplished by the shipyard to ensure that it is satisfactory.
 - f. Coordinating planning phase of an availability.
 - g. Coordinating the efforts of contract field engineering and technical service representatives engaged in combat systems planning and design work.
 - h. Providing technical guidance and assistance to other shipyard departments and offices and to ships in the introduction of new equipments and systems, including training.

3. Performance of the following functions, under the direction of the Production Officer, with respect to weapons and electronic systems and (where applicable) shipboard aeronautical systems:
 - a. Directing and coordinating in-process tests and inspections in conjunction with the Quality Assurance Officer.
 - b. Directing and coordinating final system check-outs and tests.
 - c. Analysis and evaluation of deficiencies and discrepancies in the operation of installed systems and equipment during the production phase of an availability.
 - d. Coordinating scheduling, supply, and production aspects of combat systems and component equipment in the production phase of an availability.
 - e. Coordinating the efforts of contract field engineering and technical service representatives engaged in combat systems installation, equipment training, and other work in the production phase of an availability.
 - f. Providing technical guidance and assistance in the training of shipyard and ship's force personnel for combat systems installation, check-out, and maintenance, and in determination of shipyard facilities requirements for combat systems work.
4. Technical control of all weapons located in the shipyard, including those in store.
5. Approval of all ordnance drawings generated by the shipyard.
6. Providing liaison with Systems Commands on matters relating to weapons and electronics.

7. Providing technical services for such additional tasks and functions as may be assigned by the Shipyard Commander.

PLANNING OFFICER

Responsible for:

1. Overall administration of the shipyard's relations with its shipwork customers, and providing coordinated responses for the shipyard to its shipwork customers.
2. Acceptance of shipwork for the shipyard, based on the shipyard's capacity and capability to perform it.
3. Recommending to the Shipyard Commander the establishment of ship management officers to manage appropriate upcoming availabilities; approving, and ensuring compliance with, common systems and procedures for overall administration, reporting, and coordination control of the effort of ship management officers.
4. Ensuring that no work is issued that has not been authorized by the customer and that no work is issued that will require more time to complete than is available.
5. Overall administration of the preparation, approval, issue, and transfer of work authorizations, cost estimates, and design drawings, and of the initiation of material procurement, except for work under the cognizance of the Public Works Officer and except for work on shop expense job orders issued by the Production Department and excepting other general-expense material requests issued by the departments concerned.
6. Arranging, at or shortly before the time a ship arrives for overhaul, a conference among representatives

of the Planning Department, other shipyard departments, and the ship concerned to review the work requested by the ship and the cognizant type command and that authorized by cognizant Systems Commands, and to decide upon the work to be done.

7. Maintaining prescribed records of ships for which the shipyard has been designated Planning Yard or Overhaul Yard.

PRODUCTION OFFICER

Responsible for:

1. Executing all work approved for accomplishment by the Production Department, within the time allowed and in accordance with applicable instructions and sound engineering practice; accomplishing this work within the total funds made available to the department for each ship or project.
2. Maintaining the security, cleanliness and care of shops, buildings, drydocks, floating property, buildingways and other areas, equipment and facilities assigned to the Production Department; and of new-construction ships and ships not in commission that are undergoing repairs, alterations, or conversions, unless otherwise assigned by the Shipyard Commander.
3. Applying adequate safety appliances on plant equipment and safe practices in the performance of all work by the Production Department, including all measures necessary to prevent casualties to ships and ships' systems and equipment in Production Department custody.
4. Ensuring that all authorized shipwork, repairables work, and other productive non-shipwork performed by the departmental shops is accomplished on time, within assigned manhour allowances, in accordance with applicable instructions, and to specified quality standards.

5. Routine repair and maintenance of all ships and service craft assigned to the shipyard, except for tugs, derricks, floating cranes, and pile drivers, and except for other ships and service craft assigned for maintenance to other departments; operation, security, and routine repair and maintenance of floating drydocks.
6. Assuring that adequate planning and schedules are provided for the development, improvement, modernization and acquisition of industrial plant equipment, facilities, and machine tools to perform known or anticipated future work assignments.

PUBLIC WORKS OFFICER

Responsible for:

1. Planning, design, and maintenance management of public works and public utilities and all weight-handling equipment described in NAVFAC/NAVSHIPINST 1120.32A.
2. Operation of public works and public utilities, with the exception of those specifically assigned to other departments.
3. Serving as the focal point for coordination of matters relating to pollution control.
4. Ensuring that facilities are maintained in conformance with applicable safety standards and safe working practices.
5. Keeping informed on the status of operations, maintenance inspections, condition inspections, load testing and corrective actions taken with respect to shipyard weight-handling equipment. When so designated by the Shipyard Commander, performing the duties of the certifying officer for shipyard weight-handling equipment. (The duties of certifying officer for shipyard weight-handling equipment shall not be delegated by the Public Works Officer.)
6. Submitting to the Shipyard Commander an annual condition report of shipyard weight-handling equipment.
7. Functioning as Officer-in-Charge of Construction and/or Resident Officer-in-Charge of Construction as assigned by the cognizant Naval Facilities Engineering Command regional division.

SUPPLY OFFICER

Responsible for:

1. The organization, administration and supervision of the Supply Department.
2. Formulating local stocking levels and maintaining stock levels and stock records for Special Navy and Navy Industrial Fund Material within the shipyard.
3. Developing management techniques for forecasting of material requirements and establishing policies and procedures to ensure effective and efficient operation.
4. Administering the ordering, receipt, inspection, and control of material required by the shipyard.
5. Maintaining a current technical library on Navy material.
6. Identifying inadequately described material on incoming requisitions.
7. Such additional duties as the Shipyard Commander may assign.

COMPTROLLER

Responsible for:

1. Implementing and administering the law, policies, regulations and directives pertaining to the financial systems and operations of the shipyard, including budgeting, accounting, disbursing (where authorized), financial, statistical, and progress reporting, internal accounting review, and the procedures relating to such responsibilities.
2. Acting as adviser and consultant to the Shipyard Commander on financial policy matters, program planning and related areas of financial administration.
3. Administering accounting and disbursing (where authorized) operations for other naval activities, as designated by proper authority.
4. Directing preparation of the shipyard's operating budget.
5. Administering budgetary control programs and developing methods and techniques for use in furnishing budgetary information; analyzing and evaluating budget estimates and coordinating presentation thereof to the Shipyard Commander; and recommending action concerning budget revisions.
6. Supervising determination of costs of operations and securing reimbursements for work performed.
7. Establishing overhead rates subject to approval of the Shipyard Commander.
8. Devising internal review procedures for the Comptroller Department and supervising administration thereof.

ADMINISTRATIVE OFFICER

Responsible for:

1. Developing, securing approval of, and ensuring the effective operation of an exacting fire prevention and fire protection program for the shipyard, and within the confines of the shipyard, naval ships under construction, ships or craft not-in-commission or not-in-service assigned to the shipyard.
2. Ensuring that the Commanding Officers of ships berthed or assigned availabilities at the shipyard are informed of shipyard fire prevention and fire protection policies and services available in connection therewith.
3. Police protection of the shipyard.
4. Shipyard security measures.
5. Custody and security of all shipyard ships and craft, except for those otherwise specifically assigned.
6. Effecting ship movements, operating shipyard craft not assigned to other departments for operation, and collaborating with the Production Officer in the scheduling of ship movements and assignment of berthing space; nominating an officer to act as Berthing Officer for each ship or craft not-in-commission or not-in-service scheduled for movement.
7. Providing central administrative services to the shipyard, including records disposition, communications, central files, registered publications, correspondence procedures, and other central administrative services.

8. Maintaining and submitting monthly to the Shipyard Commander a journal containing records of the reporting for duty and detachment of officers; the arrival and departure of all ships and the purpose of the visit; the designation or change of status of ships and service craft of the Navy that are located at the shipyard; the hour of docking or undocking of all ships; and other principal events of the shipyard.
9. Coordinating shipyard and Naval District affairs in ship commissionings and ship transfer ceremonies and other ceremonies and receptions, as required by the Shipyard Commander.
10. Serving as Commanding Officer of enlisted personnel attached to the shipyard, including duty as the convening authority for nonjudicial punishment, summary courts-martial and special courts-martial.
11. Operating military messing facilities, as required and assigned.
12. Supervising, or maintaining liaison with, Commissary Store and Navy Exchange Officers.
13. Serving as Senior Officer Present Afloat (Administrative).
14. Providing administrative direction and support services to chaplains, when assigned.
15. Maintaining liaison and executing shipyard security programs in coordination with the Commanding Officer, Marine Barracks.
16. Serving as Disaster Preparedness Officer for the shipyard, executing the Shipyard Commander's responsibilities for damage control, communications, personnel-casualty control and treatment, and mission continuity in the event of an

emergency, including drills and exercises in preparation thereof; utilizing the assistance of the Management Engineering Office in developing and maintaining the shipyard's Disaster Preparedness Plan.

DISPENSARY SENIOR MEDICAL OFFICER

Responsible for:

1. Directing the industrial health activities of the shipyard.
2. Providing physical examinations (except dental) for the civilian force in the shipyard, in accordance with Civil Service Commission and other regulations, and first-aid and medical care for employees who are injured or become ill while on duty, as provided for by law or departmental direction.
3. As a matter of policy, keeping the Shipyard Commander fully and currently informed on all matters in the Naval Regional Medical Center concerned with ionizing radiation areas; consulting and obtaining the concurrence of the Shipyard Commander before procedures relating to radiation are changed.
4. Keeping the Shipyard Commander fully informed of any entry in records or forms concerning potential or actual radiation injury of shipyard personnel, including actions related to medical qualifications and disqualifications for radiation work; this includes any claims against the Government.
5. Conducting such surveys and inspections as are necessary for adequate preventive medicine, industrial hygiene (except oral hygiene), and sanitation measures within the shipyard, including the physical examination of food handlers.

6. Developing and establishing medical preventive measures for safeguarding the health of persons engaged in work requiring exposure to ionizing radiation, biologicals, and chemicals, and providing first-aid and emergency medical care of atomic, biological, and chemical warfare casualties.
7. Providing medical care and physical examinations (except dental) for personnel of the Navy and Marine Corps on duty in the shipyard, and on ships and craft at the shipyard not having medical officers, and for their dependents, in accordance with Navy Regulations and such other directives as may be issued by proper authority.
8. Reporting daily to department heads shipyard personnel who should be excused from duty on account of sickness.

DENTAL OFFICER

Responsible for:

1. Providing dental treatment and dental examinations for personnel of the Navy and Marine Corps on duty in the shipyard and on ships and craft at the shipyard not having dental facilities.
2. Designating, for liaison with ships not having adequate dental facilities, a representative of the Dental Department to assist personnel of ships in obtaining dental service while at the shipyard.
3. Rendering professional service to personnel of other naval activities and to other persons, subject to the limitations prescribed in Navy Regulations.
4. Making a daily report to the Shipyard Commander of all persons in the Naval Service attached to the shipyard who should be excused from duty on account of dental conditions, and furnishing to the head of each department a copy of that part of the report pertaining to naval personnel on duty therein.
5. Rendering necessary professional assistance when wounds or injuries received by civilian personnel result in need for emergency dental treatment, in accordance with current law and regulations.

6. Supervising the oral hygiene of the shipyard naval personnel and instituting such measures as he may deem necessary to prevent or control oral diseases; making a special dental report to the Chief of the Bureau of Medicine and Surgery whenever conditions warrant.
7. Procurement, storage, and issue of supplies and equipment for use in the Dental Department; maintaining records and inventories indicating the source and date of receipt and the disposition of each item invoiced and delivered for use in the Dental Department, in accordance with existing regulations and directives.

APPENDIX D

KEY OFFICERS OF THE PRODUCTION DEPARTMENT OF A NAVAL SHIPYARD AND THEIR ASSIGNED RESPONSIBILITIES

(Derived from the Standard Naval
Shipyard Organization Manual)

KEY OFFICERS OF THE PRODUCTION DEPARTMENT OF A NAVAL SHIPYARD
AND THEIR ASSIGNED RESPONSIBILITIES

REPAIR OFFICER

Responsible for:

1. All non-nuclear ship and shop work for ships and craft assigned to the shipyard for repair, overhaul, or conversion, and for special projects, as assigned.
2. Department-wide manpower planning and development of long range manpower requirements to be used for staffing and training purposes.
3. Shipyard scheduling, including development and coordination of interdepartmental master schedules.
4. Ensuring that the foregoing functions are performed in accordance with applicable safety directives and safe working practices; for nominating a Ship Safety Officer for each ship not-in-commission or not-in-service located in the shipyard, regardless of whether shipyard work is required.
5. Assigning berthing space and scheduling ship movements in collaboration with the Administrative Officer.
6. Directing the execution of all drydocking operations.
7. Assigning ships' berthing and scheduling ships' movements.

ASSISTANT REPAIR OFFICER

Responsible for:

1. Directing and coordinating shipwork and ship support programs, as assigned.
2. Directing and supervising Ship Superintendents, as assigned.

3. Liaison and coordination with Nuclear Ship Superintendents' responsibilities.
4. Providing a timely flow of data concerning schedule adherence and work status to the Repair Officer.

DOCKING OFFICER

1. Directing docking and undocking of naval vessels in accordance with USN Regulations and Naval Ships' Technical Manual.

PRODUCTION ENGINEERING OFFICER

Responsible for:

1. Conducting studies related to the development, improvement, consolidation and modernization of industrial facilities including arrangements, space utilization, equipment, utilities, and tools; proposing acquisitions and improvements and implementing approved proposals; and participating in shipyard facilities-improvement programs.
2. Determining requirements, developing specifications, initiating funding and procurement, and directing the installation and acceptance testing of plant equipment, machine tools, and shore-electronic test equipment. Conducting physical inventories and maintaining plant-account records.
3. Providing tool engineering and designing special tools, jigs, fixtures, and machinery and equipment.
4. Developing and improving production processes, methods, and practices.
5. Developing and maintaining engineered labor standards.
6. Conducting shop layout studies, work-flow studies and work sampling, in connection with methods improvement.

SHIP SUPERINTENDENT

Responsibilities:

Each Ship Superintendent is responsible to an Assistant Repair Officer for the safe, satisfactory, timely and economical accomplishment of all Production Department work on an assigned ship or project.

These responsibilities include:

1. Meeting the ship on arrival, seeing that necessary services are provided, calling on the Commanding Officer and heads of departments, and establishing liaison with the ship.
2. Inspecting and coordinating the work of his ship to the end that completion of individual jobs and the entire availability shall meet approved schedules; coordinating shipyard and ship's force work.
3. Advising and assisting senior trade supervisors assigned to his ship; recommending corrective action when, in his opinion, the numbers or distribution of men assigned his ship are disproportionate to the task, or when the utilization or industry of the men is deficient.
4. Ensuring that safe practices are followed in the performance of all work on his ship to the end that casualties to personnel, ships, systems and equipment do not occur; being personally present for critical events in his ship's availability.

5. Expediting the flow of material to ensure quality and progress is compatible with completion dates.
6. Immediately notifying higher authority whenever any schedule is jeopardized by factors beyond his control, and when work instructions or plans appear to be in error, or when they may be improved.
7. Ensuring that only authorized work is undertaken.
8. Ensuring prompt connecting, disconnecting, and reconnection of services when the ship arrives or is shifted on the waterfront; supervising those preparations for departure for which the Production Department is responsible; and assisting in the timely completion of the ship's preparations for sea.
9. Performing the duties of Ship Safety Officer for his ship when so designated.

As a matter of good practice, a Ship Superintendent will deal directly with the senior supervisors of the several trades or shops assigned to the ship(s) for which he is responsible, coordinating and assisting them in their relations with other trades, with other shipyard activities and with the ship's force. He shall take direct action with personnel below the level of the senior supervisor assigned to his ship(s) only when such action is immediately necessary to prevent or correct errors, for reasons of safety, or in emergencies; and he shall, in such instances, inform the senior supervisor as soon as practical of the action he has taken.

SHOP GROUP SUPERINTENDENT

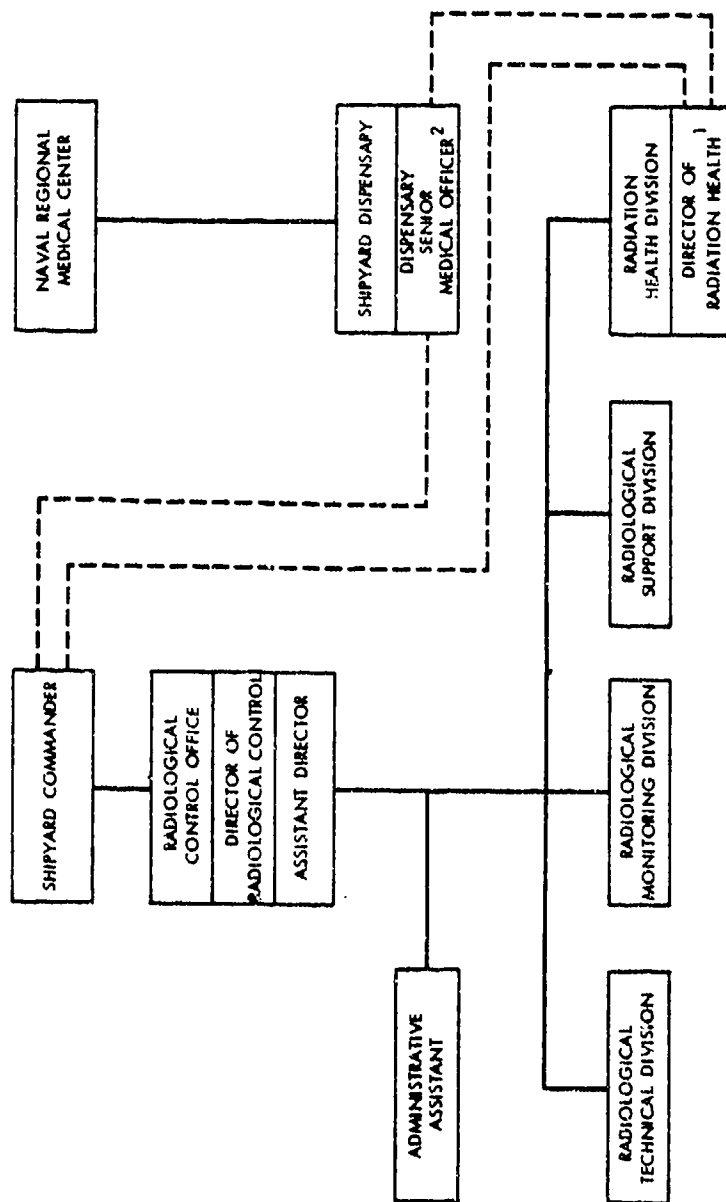
Responsible for:

1. Organization and administration of shop group and of the shops within the group.
2. Development, training and maintenance of a skilled and competent work force within the group.
3. Accomplishment of all work assignments in accordance with established plans and specifications, ensuring that all production work is accomplished on time, at reasonable cost, and in accordance with specified technical and safety requirements and good workmanship standards.
4. Administration of a sound labor-relations program within the group, the maintenance of good working relations between supervisors and employees, and the administration and application of personnel policies and procedures of the department and shipyard.
5. Management and control of overhead operating costs for shops of the group; development, coordination and submission of operating budgets.

APPENDIX E

ORGANIZATION CHARTS OF THE OFFICES AND DIVISIONS
REQUIRED IN A NAVAL SHIPYARD TO PERFORM
NUCLEAR WORK AND THE RESPONSIBILITIES OF THOSE
OFFICES AND DIVISIONS

(Derived from the Standard Naval
Shipyard Organization Manual)



¹The Director of Radiation Health has additional duty to the Dispensary Senior Medical Officer and has direct access to the Shipyard Commander.

²The Dispensary Senior Medical Officer has additional duty to the Shipyard Commander.

Source: Standard Naval Shipyard Organization Manual.

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Figure E-1. ORGANIZATION OF THE RADIOLOGICAL CONTROL OFFICE

DIRECTOR OF RADIOLOGICAL CONTROL

Responsible for:

Executing an effective radiological control program in connection with shipyard work on nuclear reactor plants, including training and supervision of radiological control monitoring personnel assigned or detailed to the Radiological Control Office

RADIOLOGICAL TECHNICAL DIVISION

Responsibilities:

1. Preparing necessary shipyard radiological control procedures to implement standard radiological control requirements issued by NAVSEA.
2. Assuring that specifications, design, operating instructions, and work procedures for nuclear reactor plant work contain adequate radiological control considerations involving such aspects as containment of contamination, temporary shielding, and waste disposal.
3. Providing Radiological Control Director coverage of naval nuclear propulsion plant work involving radioactive materials.

RADIOLOGICAL MONITORING DIVISION

Responsibilities:

1. Control of personnel exposure to ionizing radiation, protection against radioactive contamination and protection of the general public against exposure to ionizing radiation associated with naval nuclear propulsion plants.

2. Assuring the proper control of radioactive material associated with naval nuclear propulsion plants.
3. Conducting continuing surveillance of work involving radioactive materials and radiological controls associated with naval nuclear propulsion plant work.

RADIOLOGICAL SUPPORT DIVISION

Responsibilities:

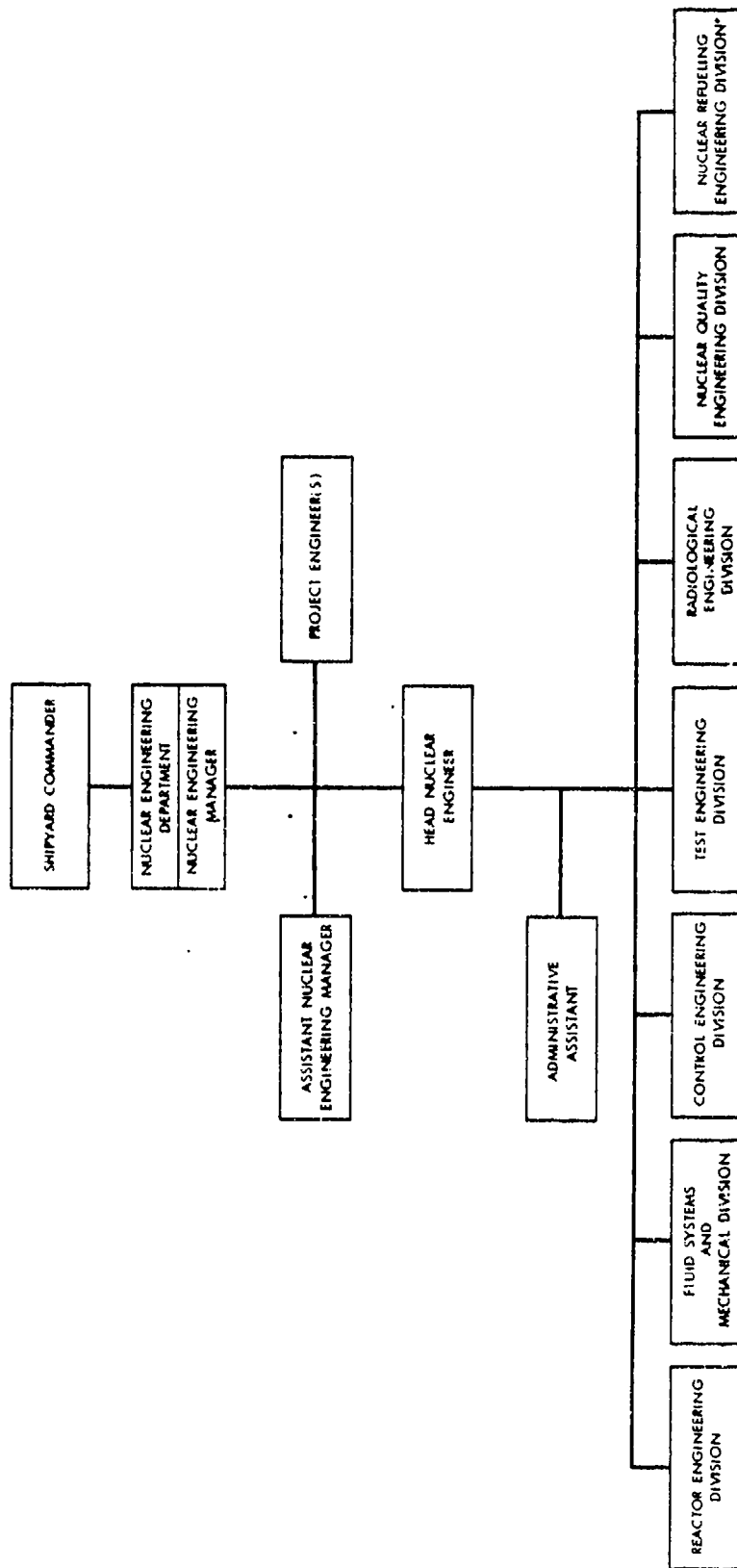
1. Assuring that all shipyard personnel have the appropriate radiological control training and/or qualifications.
2. Assuring that radioactive or contaminated materials within the shipyard, including radioactive liquid and solid wastes, are properly accounted for.
3. Assuring that radiological control equipment is properly maintained and necessary calibrations are performed.

DIRECTOR RADIATION HEALTH

Responsibilities:

1. Assuring the radiation health aspects of the shipyard's overall radiological control program, and reporting this to the Director of Radiological Control. In this capacity, he has additional duty to the Dispensary Senior Medical Officer for naval nuclear propulsion work conducted in the shipyard. He has access to and deals with other departments and office heads and nuclear managers. He supervises the operation of the Radiation Health Division.

2. The Radiation Health Division is responsible for planning, organizing and accomplishing a radiation health program commensurate with the needs of the Command. Responsibilities of the Radiation Health Division include:
 - a. Conducting the personnel dosimetry program and advising other departments as to the radiation exposure status of individuals concerned.
 - b. Assisting the Dispensary Industrial Medicine Division in the accomplishment of periodic medical examinations of personnel who may have been exposed to ionizing radiation. Such examinations shall be those determined necessary by the Dispensary Senior Medical Officer, including bio-assay and other indicated procedures.
 - c. Conducting required radiological environmental surveys of the shipyard area.
 - d. Conducting internal monitoring of personnel for radioactivity.
 - e. Training and supervision of radiation health protection personnel assigned or detailed to the Radiation Health Division, in matters relating to the division's responsibilities for radiation health.
 - f. Other duties as may be assigned.



*To be established only when specifically approved by NAVSEA.

Source: Standard Naval Shipyard Organization Manual.

1-10 7-4

Figure E-2. ORGANIZATION OF THE NUCLEAR ENGINEERING DEPARTMENT

NUCLEAR ENGINEERING MANAGER

Responsibilities:

The Nuclear Engineering Manager is responsible to the Shipyard Commander for all nuclear reactor plant technical matters; all technical problems involving reactor plant matters are referred to him for resolution. These responsibilities include:

1. Nuclear reactor safety: Any action that might influence reactor safety is referred to the Nuclear Engineering Department for concurrence; whenever it is not clear whether reactor safety is involved, the matter is referred to the Nuclear Engineering Department before proceeding with such action.
2. Technical aspects of construction, overhaul, maintenance, modification and refueling of nuclear reactor plants and nuclear support facilities on tenders.
3. Testing of nuclear reactor plants, and integrated propulsion-plant testing on nuclear-powered ships.
4. Providing advice to the responsible shipyard officials in order to assure quality control and radiological controls associated with such work, including advice on such matters as special fabrication procedures, instructions, proper manning levels, erection and overhaul schedules and sequences, estimates, facilities, industrial safety and security.
5. Quality-control engineering of nuclear reactor plant work.
6. Radiological engineering of nuclear reactor plant work.

7. Providing technical requirements for procurement and receipt inspection of reactor plant materials.
8. Exercising technical control, initiating or concurring in the requirements for--and providing or approving the specifications, design, and operating instructions for--special tools, equipment, facilities and training necessitated by nuclear reactor plant work.
9. Technical guidance and assistance in the development and implementation of a training program to meet the needs of the shipyard for nuclear reactor plants.

NOTE: Nothing in the foregoing Nuclear Engineering Manager responsibilities shall be construed as detracting from the responsibilities of other shipyard officials for the proper and timely performance of nuclear reactor plant work.

PROJECT ENGINEER(S)

Responsibilities:

Project Engineers are responsible to the Nuclear Engineering Manager for:

1. Assuring the proper preparation of schedules for assigned projects for items such as plan and procedure schedules, material requirements, and INSURV preparation.
2. Reviewing work progress and performance for assigned projects.

3. Coordination of assigned project work among the individual Nuclear Engineering Manager divisions and between the Nuclear Engineering Department and other shipyard departments and divisions.

HEAD NUCLEAR ENGINEER

Responsibilities:

The Head Nuclear Engineer is responsible to the Nuclear Engineering Manager for:

1. Technical direction and project-type coordination of all shipyard nuclear power programs at the management level.
2. Engineering work and all technical control connected with shipyard preparation for, and work on, nuclear reactor plants.
3. Technical direction and administration of the engineering personnel of the Nuclear Engineering Department.
4. Other responsibilities as assigned by the Nuclear Engineering Manager.

HEAD, REACTOR ENGINEERING DIVISION

Responsibilities:

In connection with the construction, overhaul, testing, maintenance, modification, and refueling of naval reactor plants, responsible for:

1. Reactor physics.
2. Conducting and evaluating radiation shield surveys.

3. Reactor-servicing operations, including such operations as core installation, refueling, and control-rod mechanism servicing.
4. Radiochemistry, water chemistry, and purification.
5. Metallurgy.
6. Special shipyard tools and facilities required for reactor plant nuclear materials and reactor plant manufacturing or repair processes.
7. Reactor plant "special nuclear material" control inspections.
8. Engineering surveillance and coordination of all shipyard work in the above areas, including specification of quality requirements.
9. Other responsibilities as may be assigned.

HEAD, FLUID SYSTEMS AND
MECHANICAL ENGINEERING DIVISION

Responsibilities:

In connection with the construction, overhaul, testing, maintenance modification and refueling of naval reactor plants, responsible for:

1. Nuclear reactor plant fluid systems and components.
2. Shielding-construction plans, and preparation of installation methods.
3. Nuclear reactor plant arrangements.

4. Steam-generating system and components, including safety devices, level indication, blows, vents; applicable portions of secondary-plant fluid system.
5. Material and manufacturing requirements of nuclear reactor fluid and shielding systems.
6. Engineering surveillance and coordination of all shipyard work in the above areas, including specification of quality requirements.
7. Other responsibilities as may be assigned.

HEAD, CONTROL ENGINEERING DIVISION

Responsibilities:

In connection with the construction, overhaul, testing, maintenance, modification, and refueling of naval reactor plants, responsible for:

1. Nuclear reactor plant instrumentation, control systems, and their associated components.
2. Steam-generator water-level control.
3. Applicable portions of ship's electrical systems.
4. Material and manufacturing requirements of nuclear reactor plant instrumentation and control system.
5. Engineering surveillance and coordination of all shipyard work in the above areas, including specification of quality requirements.
6. Other responsibilities as may be assigned.

HEAD, TEST ENGINEERING DIVISION

Responsibilities:

In connection with the construction, overhaul, testing, maintenance, modification and refueling of naval reactor plants, responsible for:

1. Reactor plant test-program preparations, including test index, test sequence, test specifications, operating procedures, test procedures and technical requirements for test equipment and services.
2. Nuclear reactor plant test-operating engineering, including coordination of all activities concerned, technical supervision of operations, and all integrated nuclear propulsion-plant tests that affect the reactor plant.
3. Analysis and evaluation of test results.
4. Initiating proposed changes to nuclear reactor plant system or operational procedures, as a result of tests.
5. Other responsibilities as may be assigned.

HEAD, RADIOLOGICAL ENGINEERING DIVISION

Responsibilities:

In connection with the construction, overhaul, testing, maintenance, modification, and refueling of naval reactor plants, responsible for:

1. Conducting periodic audits of radiological controls associated with nuclear reactor plant work.

2. Radiological engineering to reduce personnel radiation exposure, contain radioactive contamination, decontaminate material, and process radioactive waste for work associated with nuclear reactor plants.
3. Preparing shipyard radiological-control procedures (such as for liquid-waste processing) that require specific engineering effort available in this division.
4. Other responsibilities as may be assigned.

HEAD, NUCLEAR QUALITY ENGINEERING DIVISION

Responsibilities:

In connection with the construction, overhaul, testing, maintenance and refueling of naval reactor plants, responsible for:

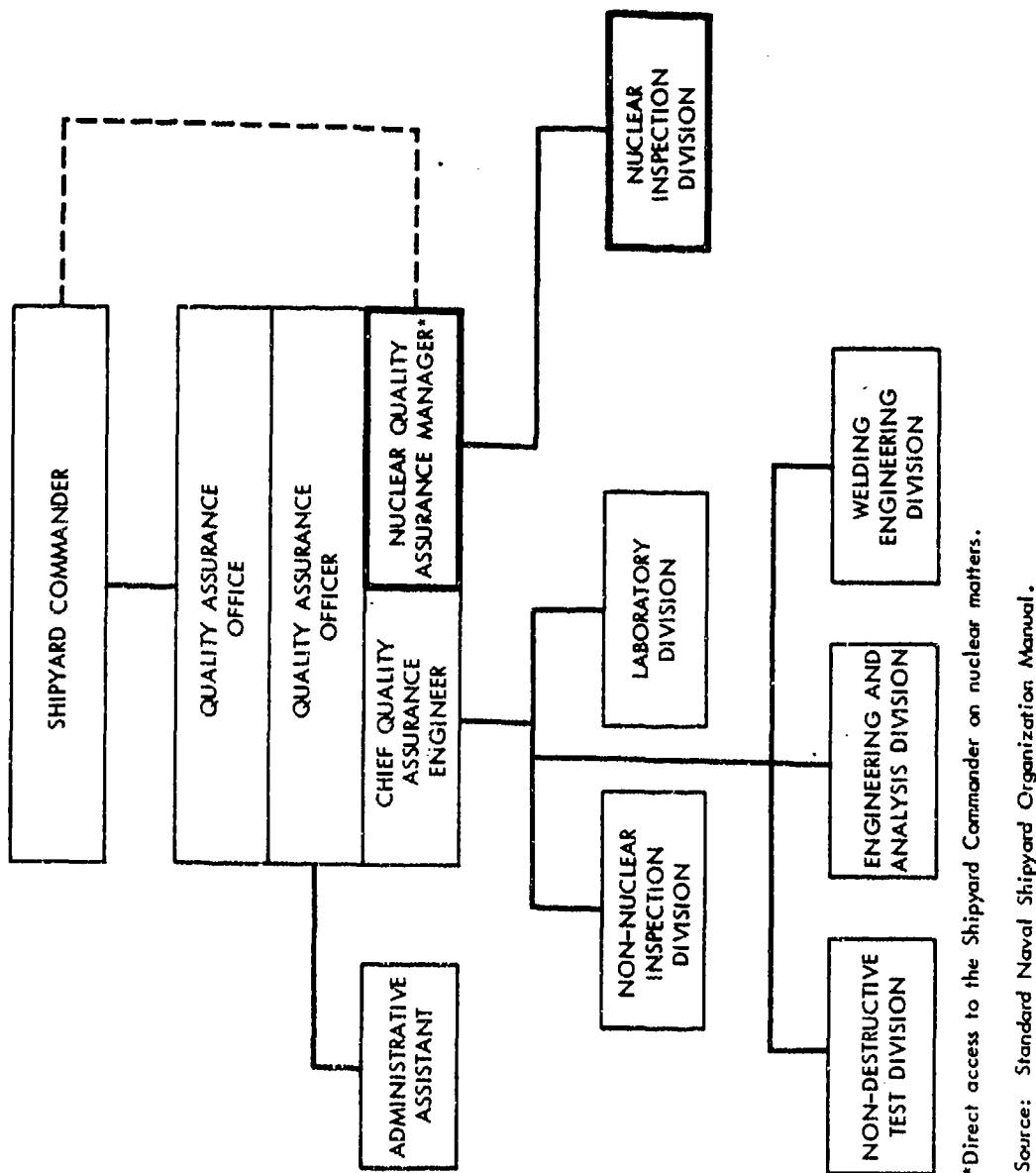
1. Establishing inspection and quality-control procedures to be used for nuclear reactor plant work.
2. Analysis of inspection data; recommending remedial actions to correct and prevent recurrence of errors in workmanship and procedures.
3. Providing information feedback to NAVSEA for improving specifications.
4. Conducting irregular periodic audits of the Nuclear Inspection Division and other shipyard operations related to nuclear reactor plant quality-control matters.
5. Other responsibilities as may be assigned.

HEAD, NUCLEAR REFUELING ENGINEERING DIVISION

Responsibilities:

In connection with the initial fueling and refueling of naval reactor plants, responsible (when established) for the following technical functions otherwise assigned to the Head, Reactor Engineering Division.

1. Reactor core installations, including initial fuelings of new construction ships.
2. Reactor refuelings.
3. Special facilities and equipment required for fueling and refueling operations.
4. Other duties as may be assigned.



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Figure E-3. ORGANIZATION OF THE QUALITY ASSURANCE OFFICE

NUCLEAR QUALITY ASSURANCE MANAGER

Responsibilities:

The Nuclear Quality Assurance Manager exercises line authority as a deputy to the Quality Assurance Officer for the nuclear quality inspection of new construction, overhaul, testing, refueling and core loading of naval reactor plants. He is responsible for:

1. Confirming that nuclear work is performed to specifications and procedures, and recording required data to document that the work is performed correctly, including maintenance of documentation files.
2. Keeping the appropriate department heads and the Shipyard Commander informed of work not being performed to specified requirements or not in accordance with safe practices.
3. Assuring that adequate planning and scheduling are provided for the nuclear work performed under the responsibility of the Quality Assurance Officer. This includes assuring that adequate manpower resources and equipment are provided within the Quality Assurance Office to prepare for and perform reactor plant work.
4. Keeping informed of the nuclear work performed under the cognizance of the Chief Quality Assurance Engineer and assuring that the Quality Assurance Officer and the Shipyard Commander are advised of such work not performed to required standards.
5. Assuring that lists of Quality Assurance Office personnel qualified for nuclear work are maintained, and concurring in such lists.

6. Consistent with the above, seeing that all functions of the Quality Assurance Office concerned with nuclear work are accomplished on time and at reasonable costs.

NOTE: In carrying out these responsibilities, the Nuclear Quality Assurance Manager has direct access to the Shipyard Commander.

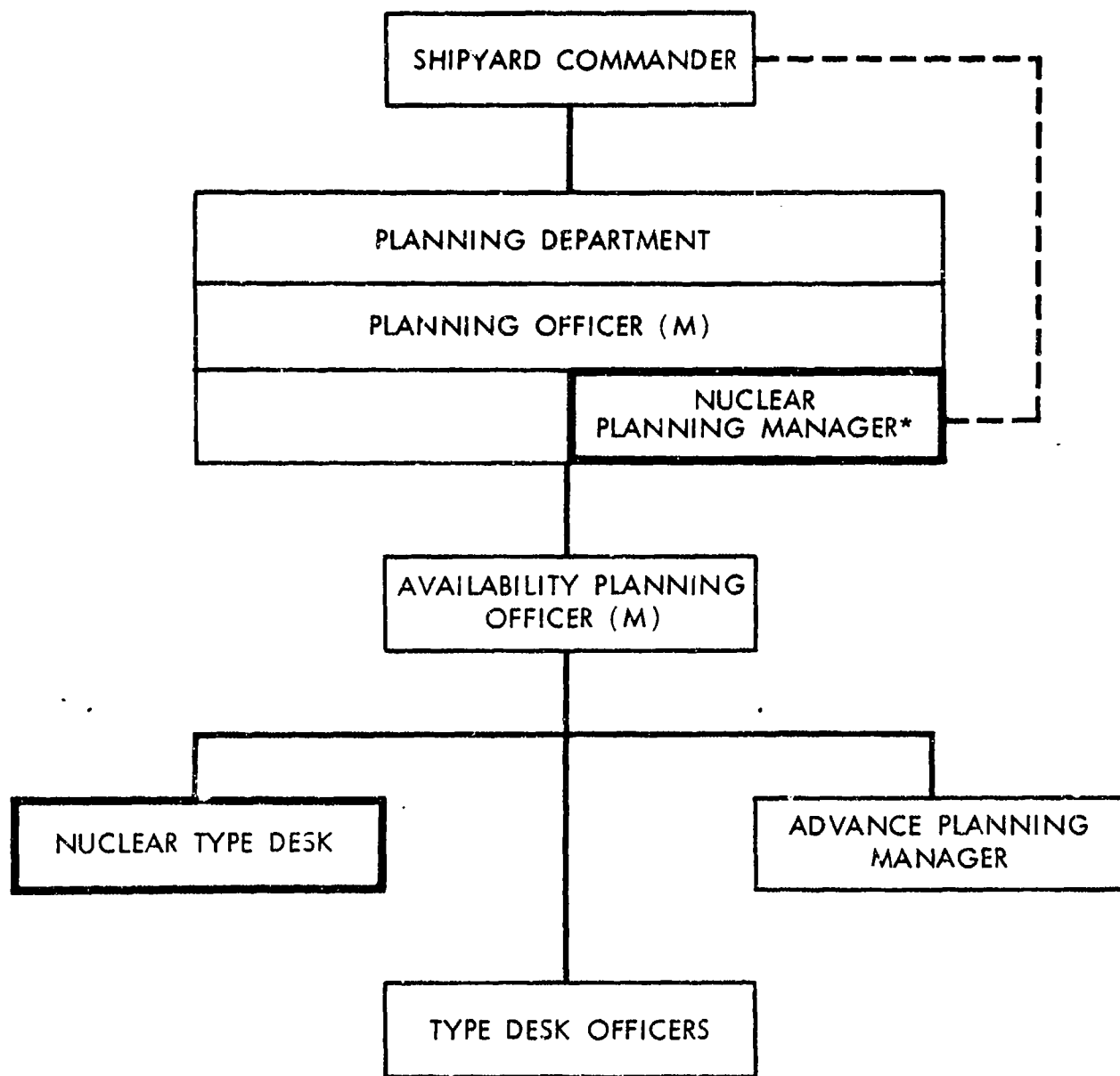
NUCLEAR INSPECTION DIVISION

Responsibilities:

The Head of the Nuclear Inspection Division, in connection with the construction, overhaul, testing, refueling and core loading of nuclear reactor plants, is responsible to the Nuclear Quality Assurance Manager for:

1. Conducting pre-use, in-process, product, and test inspections.
2. Initiation of rejection of workmanship and of components, materials and procedures used on the job that do not meet specifications.
3. Equipment, facilities, records and reports required in connection with the foregoing responsibilities.
4. Verification of the acceptability of load tests of weight-handling equipment used for lifts in accordance with NAVSEA Lifting Standard. Such verification shall include review of appropriate records of maintenance history and non-destructive tests performed in connection with load tests. Surveillance of tests shall be performed as necessary to accomplish the verification.

5. Where rigging sketches are required for lifts in accordance with NAVSEA Lifting Standard, perform inspections to confirm the proper rigging configuration. This confirmation is not to be substituted for, but is in addition to verification required of the rigging supervisor or other qualified production personnel identified by the shipyard.
6. Ensuring that in the performance of the preceding functions due consideration is given to the safety of ships, equipment and personnel.



*Direct access to the Shipyard Commander on nuclear matters.

Source: Standard Naval Shipyard Organization Manual.

5-20-75-11

Figure E-4. ORGANIZATION OF THE PLANNING DEPARTMENT

NUCLEAR PLANNING MANAGER

Responsible for:

1. The Nuclear Planning Manager (Code 200N) is organizationally located in the Planning Department. It is his responsibility to see that planning for nuclear work is initiated early and is properly completed on time, that job planning is performed and cost estimates prepared in sufficient detail to form the basis for effective cost control and that all planning is performed in accordance with specified technical requirements. The Nuclear Planning Manager, as a deputy to the Planning Officer, exercises line authority for the nuclear aspects of ship work lists and other type-desk functions, manday and cost estimates, job order preparation and issue, initiation of material procurements and other work performed by the Planning Department in connection with new construction, overhaul, testing, refueling, and core loading of nuclear-powered ships. As the Nuclear Planning Manager, he shall be responsible to maintain effective liaison and be responsive to the needs of other segments of the shipyard for nuclear work.
2. In carrying out his responsibilities, it is expected that he will direct nuclear planning work through the line supervisors within the Planning and Estimating Division and the various assistants and managers under the Planning Officer. While he does not have line authority over the Nuclear Engineering Department and Design Division, he shall work closely with and keep

the Nuclear Engineering Officer and Chief Design Engineer fully informed of any deficiencies he considers exist in Nuclear Engineering Department and Design Division planning and preparations for nuclear work. He shall assure that the Planning Office and Shipyard Commander are informed of planning work and work of other departments supporting planning functions that are not adequate.

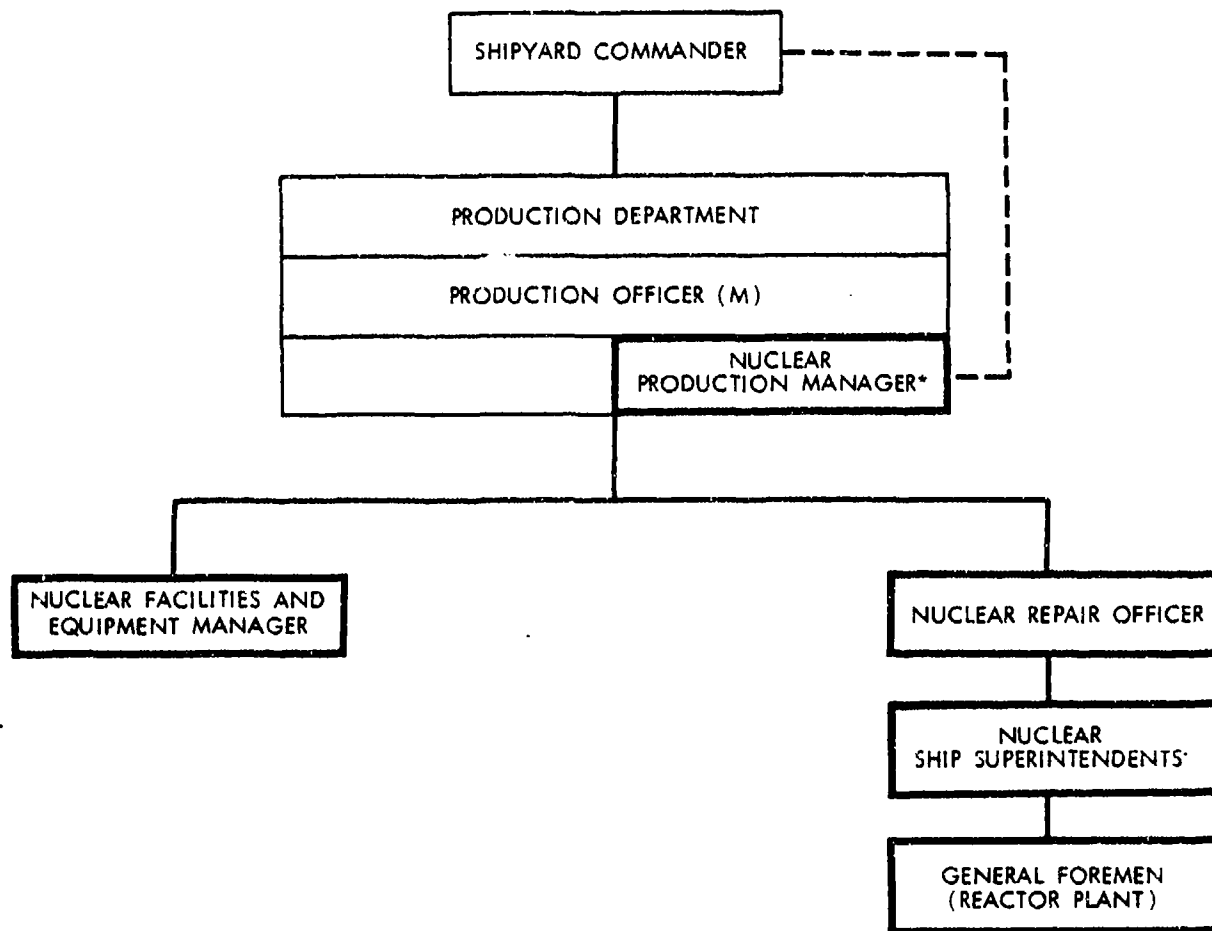
3. The Nuclear Planning Manager is responsible for directing and supervising the efforts of the Nuclear Type Desk.
4. Apprising each ship management officer of nuclear matters affecting the ship's overhaul status and completion, and coordinating with the ship management officer on nuclear/non-nuclear interface matters.

NOTE: In carrying out his responsibilities, the Nuclear Planning Manager has direct access to the Shipyard Commander.

NUCLEAR TYPE DESK

Responsible for:

1. Acting as primary point of contact for all external activities regarding nuclear work, e.g., Type Commander and NAVSEA, including coordination of work requests.
2. Controlling, coordinating and managing the planning process, and coordinating the ordering of material; providing technical direction to Work Specification Division personnel assigned to reactor plant work; issuing job orders, and concurring in work lists.
3. Administering funds allocated for assigned nuclear work, including the review and concurrence in manhour estimates and cost estimates and recommendations for fixed price of assigned work.



*Direct access to the Shipyard Commander on nuclear matters.

Source: Standard Naval Shipyard Organization Manual.

5-20-75-12

Figure E-5. ORGANIZATION OF THE PRODUCTION DEPARTMENT

NUCLEAR PRODUCTION MANAGER

Responsible for:

1. Ensuring that all nuclear production work is accomplished on time, at reasonable cost, and in accordance with specified technical requirements and good workmanship standards.
2. Exercising line authority as a deputy to the Production Officer for the nuclear aspects of new construction, overhaul, testing, refueling and core loading of concern to the Production Department.
3. Assuring that adequate planning and schedules are provided for nuclear work.
4. Assuring that adequate manpower resources and equipment are provided to prepare for and perform reactor plant work.
5. Directing nuclear production work through the Group and Shop Superintendents and through line supervisors in the various production shops who are assigned to nuclear work.
6. Assuring that lists of production personnel qualified for nuclear work are maintained and concurring in such lists.
7. Advising Shop Groups and the Administrative Assistant on functions such as training, merit promotion, leave, and other such administrative matters concerning shop personnel assigned to nuclear work.
8. Advising the Production Officer and the Shipyard Commander if, at any time, supporting effort from other departments is not adequate, and of the action he is taking to resolve the matter.

NOTE: In the discharge of his responsibilities, he has direct access to the Shipyard Commander. The Nuclear Production Manager may have a small staff directly under him to enable him to carry out his responsibilities.

NUCLEAR FACILITIES AND EQUIPMENT MANAGER

This is a single position that is double billeted and organizationally located in the Production Department and Public Works Department.

Responsible for:

1. Assuring the initiation, development, and engineering of all facilities and plant equipment for nuclear production work to meet applicable specifications and standards.
2. Ensuring that facilities and equipment projects proposed to NAVSEA are fully justified and costs properly determined and that approved facilities and equipment are provided on time, at reasonable cost, and in accordance with applicable plans and procedures.
3. Exercising line authority as a deputy to the Public Works Officer and as an assistant to the Nuclear Production Manager for the facilities and plant equipment that support the production aspects of new construction, overhaul, testing, refueling, and core loading of naval reactor plants.
4. Assuring that work performed on nuclear facilities and plant equipment is accomplished by personnel qualified to perform the work assigned.
5. Assuring that adequate planning, scheduling, and manpower resources are provided for construction, manufacture, preparation, maintenance, repair, and installation of facilities and plant equipment required for nuclear work. He shall assure that the Nuclear Production Manager, Production Officer, Public Works

Officer and Shipyard Commander are informed if, at any time, supporting effort of other departments is not adequate.

NUCLEAR REPAIR OFFICER

Responsible for:

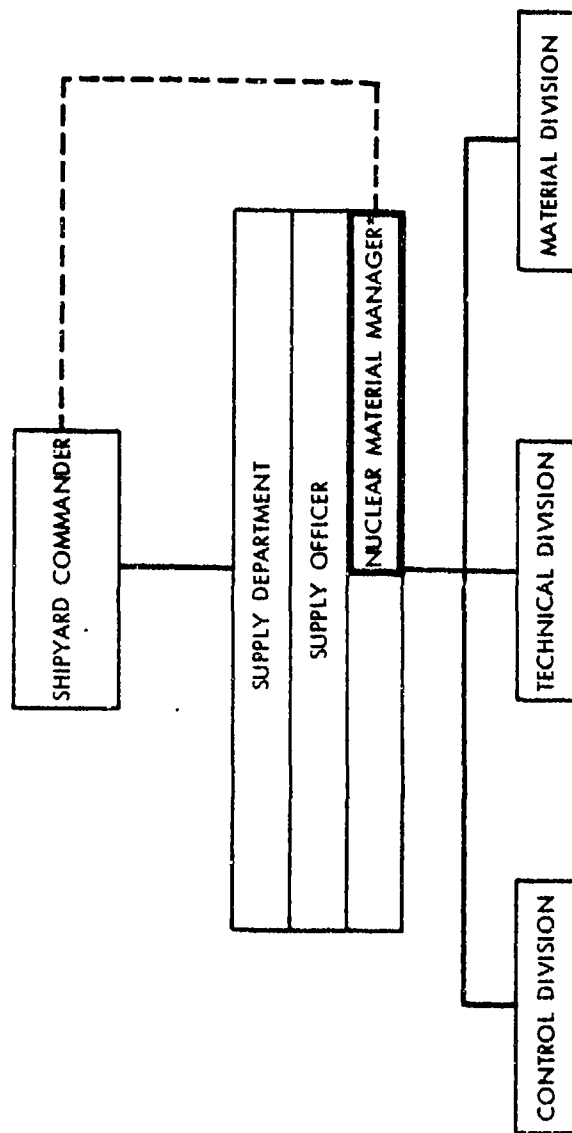
1. Directing and coordinating reactor plant work on nuclear-powered ships assigned to the shipyard for construction, repair, overhaul, conversion, or refueling; and for directing and coordinating such nuclear non-ship work as may be assigned.
2. Directing and supervising Nuclear Ship Superintendents assigned, as required.
3. Directing nuclear production work through line supervisors in the various shops who are qualified and assigned to nuclear work.
4. The Nuclear Repair Officer also reports to the cognizant Ship Safety Officer for matters involving the protection of ships against hazards of fire, inadvertent flooding and other such ships accidents; this does not include matters of reactor safety.

NUCLEAR SHIP SUPERINTENDENT

Each Nuclear Ship Superintendent is responsible to the Nuclear Repair Officer for the satisfactory, safe, timely, and economical accomplishment of Production Department work on nuclear reactor plants of his assigned ship or for assigned nuclear non-shipwork.

GENERAL FOREMEN (REACTOR PLANT)

Each General Foreman (Reactor Plant) is responsible to a Nuclear Ship Superintendent for ensuring accomplishment of scheduled work and progress in the reactor plant areas of his assigned ship or for assigned nuclear non-shipwork.



*Direct access to the Shipyard Commander on nuclear matters.

Source: Standard Naval Shipyard Organization Manual.

S-20-75-15

Figure E-6. ORGANIZATION OF THE SUPPLY DEPARTMENT

NUCLEAR MATERIAL MANAGER

Responsible for:

1. All Supply Department functions in support of the service-wide supply support responsibilities for nuclear material, prescribed by NAVSEA, and the industrial supply support required for the construction, overhaul, conversion and alteration of naval nuclear propulsion plants.
2. As a deputy to the Supply Officer, exercises line authority within the Supply Department to assure that all supply functions (planning, procurement, receipt, inspection, storage, control, and issue or disposal) in support of naval nuclear propulsion programs are accomplished effectively.
3. Maintain effective liaison with, and responsiveness to the needs of, other shipyard departments involved in nuclear work.
4. Ensure that cognizant department head(s) and the Shipyard Commander are informed of work in other departments that is not adequate and that impacts on supply support of nuclear work.
5. He has direct access to the Shipyard Commander on matters related to supply support of naval nuclear propulsion programs.

APPENDIX F

DEPARTMENTS AND OFFICES OF A REPRESENTATIVE PRIVATE SHIPYARD

(Derived from an Analysis of the Organizations
of Various Commercial Shipyards)

DEPARTMENTS AND OFFICES OF A REPRESENTATIVE PRIVATE SHIPYARD

The organizations of various private shipyards were examined and a representative organization created. Variations from this representative organization are identified in the course of the discussion below.

A. INDUSTRIAL RELATIONS OR PERSONNEL

Most private shipyards have personnel or industrial relations departments that perform the standard personnel functions of employment, manpower control, labor relations, industrial health (including a dispensary), and safety and security. In some private shipyards security and safety are separate offices, reporting to an assistant general manager, or both functions may be under operations.

B. FINANCE AND ACCOUNTING

The finance, accounting, and comptrollership functions are usually included in one department; however, the title of the department varies. Some of the titles encountered were finance and comptroller, finance and accounting, financial operations and treasurer. The main branches within the Finance and Accounting Department are accounting, data processing, timekeeping, and budgeting. Some private shipyards may add separate offices for financial planning and for cost control. In some of the smaller private shipyards, purchasing and material control and contract administration are included under finance.

C. MARKETING OR SALES

The marketing or sales function may be under the direction of a vice president for marketing or, in the smaller private shipyards, a single sales representative. In the more highly structured private shipyards the vice president for marketing is responsible for evaluating business opportunities, making bid-no-bid decisions, research and analysis of market data and assuring that proper relations are maintained with present and potential customers.

D. ENGINEERING

In private shipyards, engineering is normally a separate department; however, it may be located with marketing or under the assistant general manager for operations. The basic engineering functions are very similar regardless of where engineering is organizationally located. These functions are usually subdivided into hull, mechanical or machinery, and electrical. These three subdivisions may also be found in the organizational unit that performs technical engineering and drafting. In addition, production engineering and laboratory and metallurgy are included as separate entities in the more highly structured private shipyards. In some private shipyards welding engineering is separated from general and production engineering. Many private shipyards that have an engineering department also rely on subcontracting for engineering services when undertaking new construction involving extensive design work.

E. QUALITY ASSURANCE

There is considerable variation among private shipyards with regard to the quality assurance function. In many private shipyards quality assurance is a separate department. In others it may be placed under a program administrator or the engineering manager. Effective quality assurance is considered to be more a function of good supervision on the job than spot inspection. The quality assurance department may include destructive and nondestructive testing, and tests and trials with a separate quality assurance group for new construction. In at least one private shipyard the test and trials functions were under the production manager rather than the quality assurance manager.

F. OPERATIONS OR PRODUCTION

The heart of any shipyard is its direct productive labor work force. The individual responsible for production is the vice president or assistant general manager for operations. The large majority of the shipyard employees are in the production or operations department. The production manager is the principal subordinate reporting to the vice president or assistant general manager for operations. The night or second shift superintendent reports to the production manager.¹ Below this level of supervision the production functions are split between a superintendent for repair and a project manager for new construction. Under each of these two

¹Most private shipyards work basically a single shift with some second-shift work as required.

managers are ship superintendents assigned to manage and coordinate the repair of ships on the one hand and the new construction of ships on the other. As most private shipyards build ships on ways, there is also a ways superintendent who reports to the production manager, as does a tool room manager. In addition to the ship superintendents for repair, a water front superintendent and a dock master report to the repair superintendent.

Three superintendents, designated as the structural, machinery, and outfitting superintendents, head the various trades employed in most private shipyards. These three superintendents report to the production manager. Under each superintendent are foremen and supervisors of the trades that provide the skills required in shipbuilding or repair. The panel line, the assembly shop and the ways/ship area are under the supervision of the structural superintendent. The panel line receives steel plate which, through various lofting processes, is templated or laid out for cutting and shaping. Stiffeners and braces may also be added on this line. Skills involved on the panel line are lofting, layout, burning, welding, and general shipfitting.

The assembly area receives completed panels and other steel components and assembles them into subassemblies, which are moved to the ways to be placed in the ship. Skills involved in the assembly area are welding, shipfitting, burning and rigging. If the ship is being constructed on a pre-outfitting basis, pipefitters and other trades are also involved.

The ways/ship area is where the hull is erected and the various subassemblies are delivered to become an integral part of the ship. Here, like the assembly area, the primary skills involved are welding, shipfitting and rigging. Boilermakers are also included in the structural trades since they erect the boilers in the shop, before the boilers are lifted to the ship and installed.

In some private shipyards the shipfitter trade is not identified by that title, but instead is called ironworker. The ironworkers may be further divided into ironworkers-new construction and ironworkers-repair, each with their own foreman. Certain shipyards engaged in new construction and repair have more or less formally split their work force into these two functions. A new construction project manager may have under him superintendents for steel, electrical and sheetmetal, and pipe and machinery.

The machinery superintendent heads the second trades group and has under his supervision the machine shops (inside and outside), the pipefitting shop and the electrical shop. These trades are most heavily involved in repair work although they perform a major part of outfitting for new construction. In those shipyards that maintain a cadre of electronics technicians and mechanics, these skills usually will be located within the machinery or mechanical group.

The third group of trades is under the outfitting superintendent or the support service superintendent, as he is sometimes known. The trades comprising this group are sheetmetal workers, carpenters, painters, laborers, yard riggers, and temporary services. The

composition of the outfitting group will vary among yards. Some private shipyards may have a material handling foreman while other private shipyards split the riggers between those handling structural steel and others handling general yard rigging. Also some private shipyards combine carpenters with sheetmetal workers while others include sheetmetal workers under the structural superintendent.

The vice president or assistant general manager for operations usually has two other managers reporting to him. They are the facilities manager, who is responsible for shipyard maintenance and ecology, and the production control manager, who is responsible for planning, scheduling, management information and analysis. Other administrative or staff assistants may also report to the vice president or assistant general manager for operations.

Some private shipyards have expanded their operations into the manufacture of industrial products. These activities generally require the employment of the structural trades. The manufacture of industrial products is under the direction of an industrial manager, who reports to the vice president or assistant general manager for operations.

Certain private shipyards are surrounded by other industries so it is impossible to expand their facilities into adjacent areas. To provide for additional facilities, particularly the cutting, bending, shaping and assembly of steel, a separate steel structural handling and assembly plant may be established at a location removed geographically from the main shipyard area. Completed steel

assemblies are transported to the shipyard, where they are joined with other structures to form a part of a ship or an industrial product. The manager of this plant would also report to the vice president or assistant general manager for operations.

G. MATERIAL

A material department is vital in support of production. A single material manager is usually responsible for purchasing, control of material, warehousing and material production support. These functions include the purchase of raw materials or complete systems from subcontractors, the receipt, storage and delivery of the material within the yard, the determination of stock levels, inventory control and cost control, and finally the assurance that the correct material is available when and where needed.

These material-related functions are not necessarily organized under a material manager in all private shipyards. In many instances these functions are divided among several activities. For example, some private shipyards have purchasing as a separate function while others have purchasing as well as material control and warehousing under the accounting department. The degree of formality in organization is to some degree a function of the nature of the business, yet some private shipyards engaged in both new construction and repair perform satisfactorily with austere material organizations.

H. ADMINISTRATION

The last department of our representative private shipyard organization is administration. Once again the title used by various private shipyards for these functions varies, e.g., estimating and negotiation, contract administration and management, and estimating and pricing. In private shipyards performing both new construction and repair the estimating and negotiating functions are frequently split into these two areas. The same is true of contract administration, with separate assistant contract administration managers established for each contract. The planning, scheduling and monitoring functions also may be divided between repair and new construction

* * * *

This representative private shipyard organizational structure provides the reader some insight on how private shipyards are organized for new construction and repair. Once again it must be emphasized that there are almost as many variations in how private shipyards are organized as there are private shipyards. This is true even in those corporations having several shipyards within their corporate entity. The IDA team found shipyards of similar size varying from five assistants reporting to the president or general manager to shipyards with twelve or more assistants reporting to the top executive. The personality of the president or general manager and various business factors affecting the particular company seem to be two strongly influencing factors in determining how a private shipyard is organized.

APPENDIX G

REQUIREMENTS AND METHODOLOGY FOR DRYDOCKING DD-963 CLASS DESTROYERS

(Derived from *Current Status of Shipyards, 1974*,
Hearings before the House Seapower Subcommittee
of the Committee on Armed Services, 93rd Cong.,
2nd sess., July-October 1974, Part 1.)

REQUIREMENTS AND METHODOLOGY FOR DRYDOCKING DD-963 CLASS DESTROYERS

The DD-963 class destroyers, named the Spruance class, are the latest class of destroyers to be built for the Navy. Thirty ships of this class are planned for construction. These ships are the largest destroyers in the history of the Navy (see Vol. I, Table 6, for a progression of ship size). The DD-963 class destroyers are 563 feet in overall length, 55 feet in beam, 29 feet in draft and displace 7,800 tons when fully loaded.

The DD-963 class destroyers have bow mounted sonar domes and two propellers to drive the ship. These are the two deepest protrusions from the hull for which clearance must be provided when docking the ship. A combination of factors (sonar dome, propellers, height of keel and bilge blocks and the maximum depth of water in the drydock) prevent bringing the DD-963 class destroyers straight in over the blocks for drydocking.

To provide adequate clearance between the drydock floor and the sonar dome when the ship is resting on the blocks, keel blocks twelve feet in height are required. This means that forty feet of water over the drydock floor is needed to float the ship over the blocks using an offset method of drydocking.

Figures G-1 and G-2 demonstrate the offset drydocking method for the DD-963 class ships. In Figure G-1, diagram A is the ship entering the drydock offcenter stern first. Diagram B is the ship being moved laterally over the keel blocks and diagram C is the ship in final position over the keel blocks ready for

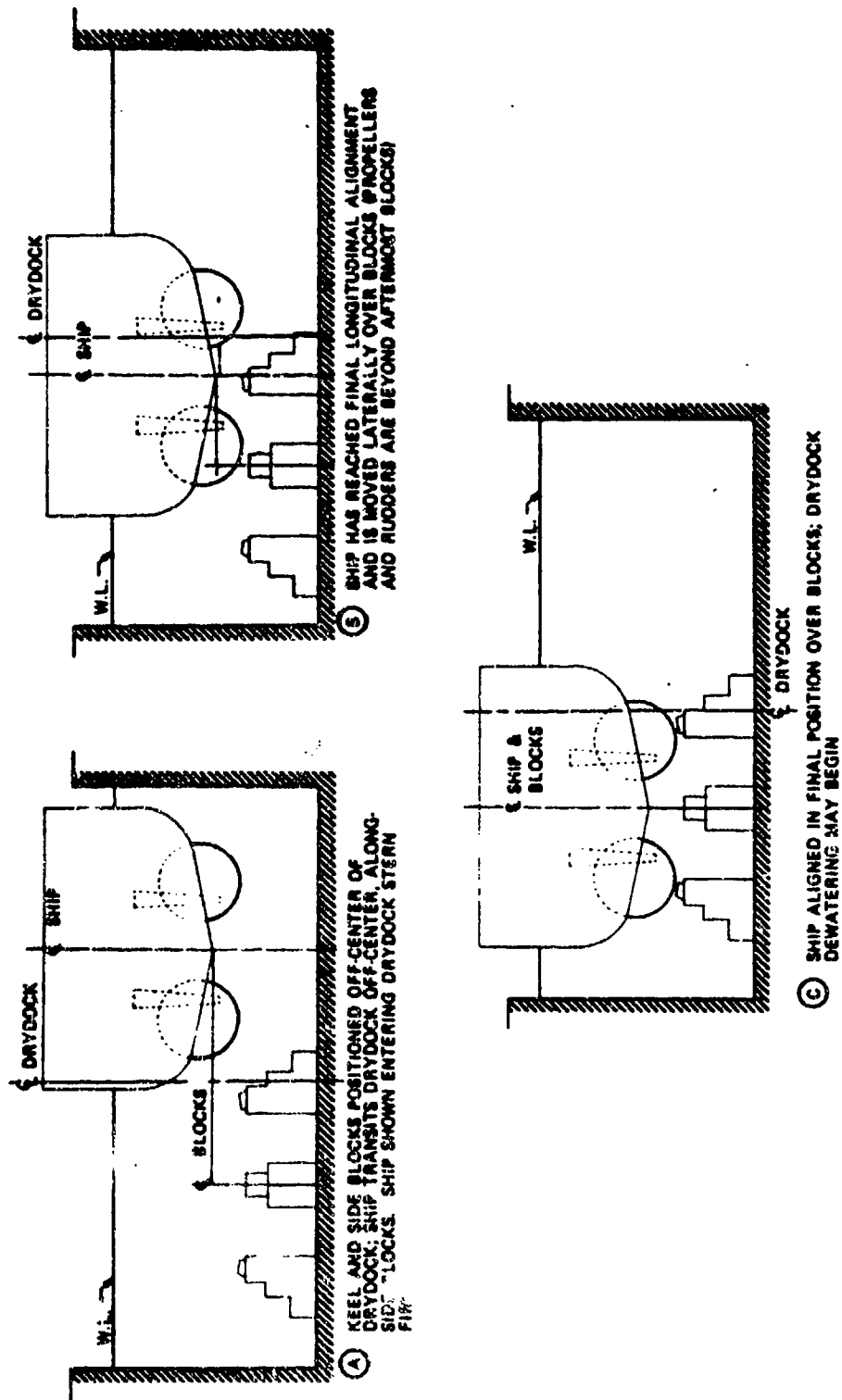


Figure G-1. DRYDOCKING PROCEDURE, SCHEMATIC FOR DD 963 CLASS SHIPS

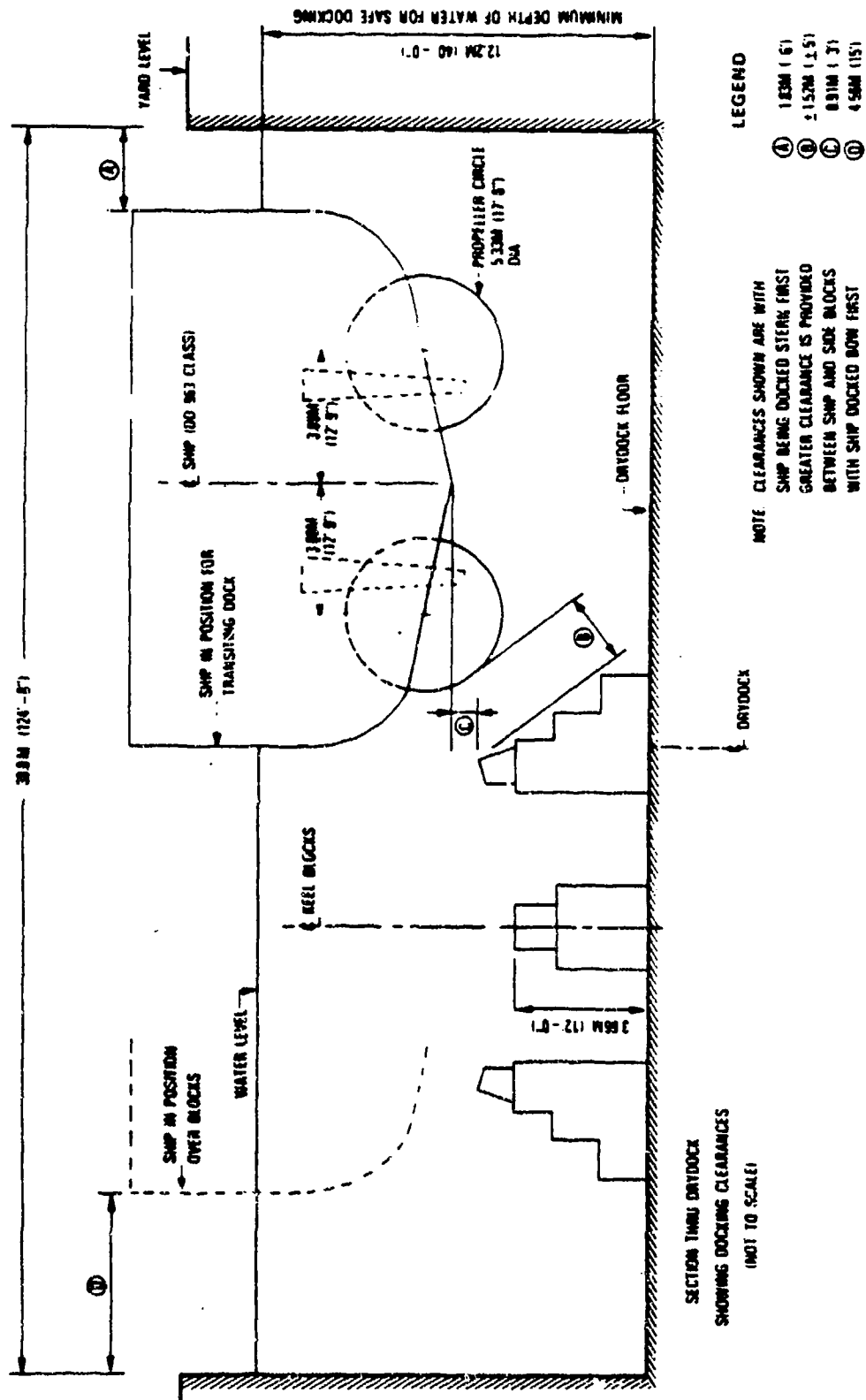


Figure G-2. DOCKING CLEARANCE DIAGRAM FOR DD 963 CLASS SHIPS

dewatering of the drydock. Figure G-2 portrays the docking clearances for the DD-963 class ships. The minimum drydock dimensions to drydock a DD-963 class ship are 650 feet in length, 124 feet 8 inches in width and 40 feet of water over the floor with 12-foot keel blocks.

A survey of facilities in the United States to identify docks capable of drydocking the DD-963 class ships reveals that nine graving docks in naval shipyards, three graving docks in former naval shipyards (Boston and Hunters Point), two graving docks in facilities owned by New York City, one inactive graving dock at the Military Ocean Terminal, Bayonne, New Jersey, and three building docks owned by Newport News Shipbuilding and Drydock Company (not normally available for repair work) are the only fixed docking facilities capable of drydocking the DD-963 class ships. Two privately owned floating docks have the potential to drydock the DD-963 class ships; however, Navy officials expressed reservations about docking these ships on 12-foot blocks in a floating drydock. This survey indicates that the drydocking of the DD-963 class ships will have to be accomplished in the five NSYs possessing large graving docks.¹ Thus, the DD-963 class ships will be in competition with aircraft carriers and other deep draft ships for these limited docking facilities.

¹Currently, Portsmouth, Charleston, and Mare Island do not have drydocks of sufficient size to drydock DD-963 class ships.

APPENDIX H

RESPONSIBILITIES, FUNCTIONS, AND OPERATIONS OF NAVAL SHIPYARD SHOPS, INCLUDING TYPICAL INDUSTRIAL PLANT EQUIPMENT USED IN EACH SHOP

(Derived from the Engineered Long Range Modernization
Program for the U.S. Naval Shipyards, Naval Sea
Systems Command, Washington, D.C., 1974, Vol. 2)

RESPONSIBILITIES, FUNCTIONS, AND OPERATIONS
OF NAVAL SHIPYARD SHOPS, INCLUDING TYPICAL
INDUSTRIAL PLANT EQUIPMENT USED IN EACH SHOP

Structural Group

Shipfitter Shop. This shop has the responsibility for structural and plate fabrication. Functions include the preparation of templates, forming, rough machining and the installation of structural components aboard ship. The following is a list of the industrial plant equipment used.

- Shears (rivet, angle, rotary, squaring)
- Drills, upright
- Furnaces (angle, plate)
- Planers, plate
- Rolls (pinch, pyramid, straightening, bending)
- Presses (straightside, horizontal, vertical, joggling, molding, flanging)
- Punches, single end
- Saws (band, circular)
- Press brakes
- Ovens (electric, drying, bake)
- Pipe bender
- Slabs (fabrication, erection, bending)
- Burning machine, automatic
- Welder, rectifier
- Flame cutter, numerical controlled

Sheetmetal Shop. Shop operations include fabrication, metal plating, repair, and installation of ventilation, heating and air conditioning ducts, furniture, cabinets, and other sheetmetal components. The following is a list of the industrial plant equipment used.

- Shear (squaring, shear and square, shear and forming machine and a shearing-piercing machine)
- Press brakes
- Rectifiers

- Saws, band
- Press, side cutting
- Punches (turret, numerical controlled, press)
- Rolls (angle, plate bending)
- Lathe (spinning, engine)
- Spot welders
- Rotary bender
- Milling machine
- Drills, upright
- Bending machine
- Driverless train

Welding Shop. This shop provides welding and burning services throughout the naval shipyard. Therefore, this shop has equipment and work areas located within many other production shops. The following is a list of the industrial plant equipment used.

- Welder generators
- Various rectifiers
- Shape cutters
- Stress relievers
- Plasma arc flame cutters
- Automatic burning machines
- Automatic vertical welder
- Pipe welding machines
- Welder-positioners
- Strip heater system

Boiler Shop. This shop is responsible for the inspection of all boiler components, repair of boilers and boiler parts including cleaning and retubing of boilers, fabrication of parts for boiler casings, uptakes, and stacks, and the installation of refractory. The following is a list of the industrial plant equipment used.

- Saws, band
- Pipe benders
- Shear (squaring & rotary)
- Punches
- Drills (radial & upright)

- Welders (spot & seam)
- Bending rolls
- Shrink and Stretch machine
- Tube end finishing machine
- Pumps, hydraulic
- Furnace, heat treating
- Slab, bending

Forge Shop. Shop functions include light forging, stress relieving, and heat treating. The following is a list of the industrial plant equipment used.

- Furnaces (forging, hardening, annealing, heat treating, stress relieving, retort)
- Induction heater
- Hammers (steam, forging)
- Saws (hack, band)
- Presses (hydraulic & trimming)
- Shear (bar, billet)
- Drill, upright

Mechanical/Machinery Group

Central Tool Shop. This shop has three main functions, (1) toolmaking for the design, manufacture and reconditioning of special tools, dies, and fixtures, (2) machine tool maintenance for installation and maintenance of plant equipment, including machine tools and hand tools, and (3) issuance and control of tools throughout the shipyard. Sections of this shop occupy space in many locations throughout the shipyard. The following is a list of the industrial plant equipment used.

- Grinders (tools and cutters, thread, drill, carbide)
- Lathes (toolmaker, engine)
- Measuring machines
- Shapers (horizontal/vertical, openside)
- Millers (vertical, horizontal)
- Drills (upright, radial)
- Furnace, electric
- Milling machines (horizontal, vertical)

- Saws, band
- Boring machines
- Lapping machines
- Dynamometers
- Comparators
- Air Compressors
- Analyzer, vibration

Inside Machine Shop. Shop manufactures and repairs propulsion shafting, bearings and sleeves; and tests, repairs and overhauls valves, regulators, governors, hydraulic elements, pump turbines, and other equipment items. Ship propellers are also repaired and balanced. This shop, because of the wide variety of work and the machines involved, may be located in several buildings. The following is a list of the industrial plant equipment used.

- Balancing machines
- Profilers, propeller
- Measuring machines, propeller
- Presses (blade, hydraulic)
- Drills (radial, upright)
- Pitchometers
- Saws, band (horizontal & vertical, contour), abrasive
- Free abrasive machine
- Lathes (turret, engine, automatic bar screw)
- Milling machines (horizontal, planer)
- Shapers (horizontal, vertical, gear)
- Grinders (cylinder, surface, internal, vertical rotary)
- Plate floors (various sizes)
- Boring bars
- Slab, erection
- Planers
- Millers, horizontal
- Threading machines
- Lapping machines
- Honing machines
- Test tables
- Test stands, hydraulic
- Test boiler
- Pumps (centrifugal, reciprocating)
- Compressors, air
- Test consoles
- Layout machines

Ultrasonic cleaning system
Over.
Cabinet, blast cleaning
Analyzer, vibration

Outside (Marine) Machine Shop. This shop has two major areas of responsibility--mechanical and ordnance.¹ Mechanical operations are layout, disassembly, removing, inspecting, repairing in the shop or in place, reinstalling, and testing main and secondary propulsion plants, power trains, steering and control systems, diving, flooding and venting systems, fuel and diesel system components and equipment, elevators, hydraulic systems, snorkels, oxygen generating plants, distilling plants, air conditioning and refrigeration plants and sonar systems. Ordnance operations are removal, overhaul, repair, test and installation of guns, gun mounts, torpedo tubes, launchers and the other mechanical portions of the associated equipment and components. The following is a list of the industrial plant equipment used.

Boring bars
Turning machines
Milling machines (portable, horizontal)
Compressors, air
Lathes (toolmaker, engine)
Saws (band, power)
Plate, layout
Drills (radial, upright)
Shapers, hydraulic
Monorails
Dynamometers
Recorders, torpedo
Press, punch
Grinders (surface, valve, valve seat)

¹In some naval shipyards, ordnance work is the responsibility of a separate ordnance shop.

Lapping machine, rotary
Collimators
Telescope, alignment
Pumps (hydraulic, portable)
Test stands (governors, hydraulic, diesel fuel, gunsight)

Pipe Shop. The Pipe Shop is responsible for layout, preparation, bending, fitting, fabricating, installing and testing all pipe systems used aboard ship, including ship air conditioning and refrigeration systems, radar wave guides, coaxial tubing, and all other radio-frequency piping.¹ This shop also installs pipe hangers and covers and insulates pipes and heat-exchange equipment. Special pipe and fittings also are manufactured from sheet copper, brass, copper-nickel, and other copper-bearing metals. The following is a list of the industrial plant equipment used.

Bending machines (pipe, wave guide)
Saws, band
Drills, upright
Threading machines
Expanders, pipe
Shear, squaring
Annealing oven
Compressor, air
Chlorinators
Roll, bending
Press brake
Induction brazing units
Cleaning system, Freon

Foundry. (In some naval shipyards this shop is under the Boiler Shop.) The foundry manufactures ferrous and non-ferrous castings. The Philadelphia Naval Shipyard foundry, the

¹Radio-frequency piping refers to wave guides, coaxial tubing, or other piping that guides a signal from an external antenna aboard ship to an internal receiver or console.

amalgamated foundry for the East Coast, also manufactures propeller castings. Puget Sound Naval Shipyard has the central foundry for the West Coast. The following is a list of the industrial plant equipment used.

- Furnaces (annealing, melting)
- Saws, band
- Briquette machine
- Mixer, moulding sand
- Casting machines
- Rotoclones
- Shake out machine
- Moulders, sand
- Ovens (molding, core)
- Charging machine
- Shearing machine
- Press, hydraulic
- Ladle
- Roto cleaners

Pattern Shop. This shop manufactures patterns for foundry castings and plastic molds, and builds models and mock-ups. The following is a list of the industrial plant equipment used.

- Joiner
- Lathes, gap, wood
- Miller, wood
- Planer, wood
- Monorail

Electrical Group

Electrical Shop. The Electrical Shop removes, overhauls, repairs, tests, and installs motors, generators, control panels, switchboards, cables, batteries, gyros, and optical equipment. The following is a list of the industrial plant equipment used.

- Drill (radial, press, upright)
- Ovens (incinerator, bake, electric, gas)
- Tanks (impregnating, degreasing)
- Dynamometers
- Brazing machine

- Balancing machine
- Bearing pullers
- Testers, insulation
- Armature machine
- Sandblasting machine
- Motor test panel
- Reactor loading
- Resistor loading
- Motor generator set
- Load banks
- Frequency converters & changers
- Power Supplies
- Rectifiers
- Saws (band, cut-off)
- Bending machine
- Presses (punch, platen, hydraulic)
- Sander, belt
- Battery chargers
- Engraving machines
- Punching and beading machine
- Pipe threader
- Embossing machine
- Test stands, units and panels
- Winding machine
- Shear, punch, cope machine
- Vulcanizer

Electronics Shop. The Electronics Shop removes, repairs, overhauls, calibrates, tests and installs navigational equipment, communications equipment, radars, sonars, anti-submarine warfare, electronic countermeasures, identification-friend or foe, ground control approach and all other shipboard electronics equipment. The following is a list of the industrial plant equipment used.

- Sandblast cabinet
- Module checker
- Degreaser
- Power supplies
- Tanks, pressure
- Screen rooms
- Tester, cable
- Cleaning machine, sonic energy
- Frequency chargers & converters
- Test sets (various)
- Drill, upright
- Motor generator sets

Lathe, toolmaker
Oven, drying
Saw, band
Electroplating unit
Balancing machines
Radiac calibration set

Service Group

Woodworking Shop. This shop is divided into four related trades: joiners, shipwrights, boatbuilders, and plastic molders. Joiners produce traditional wooden items, such as ship furniture, plugs, protective covers, battery wedges, and all insulation wraps. The shipwright group installs and maintains all drydock blocking and staging. The boatbuilders repair and build small boats. The plastic molders fabricate fiberglass fairwaters, decking, antenna supports, fresh water tanks, refrigerator skins, and other plastic components. The following is a list of the industrial plant equipment used.

Beams, lifting
Embossing machines
Scissor lift, self-propelled
Compressors, air
Chamber, decompression
Presses, swaging
Sling tester
Indicator, load cell
Fixtures, propeller and shaft handling
Sludge, removal units, tanks
Rafts, oil disposal
Cleaning machines, steam
Work platforms
Sealer, plastic, high frequency
Floats

Temporary Services Shop. Installs, maintains, repairs, and removes temporary services provided to ships undergoing repair or overhaul. These services include electric power, compressed

air, steam, lighting, telephone, ventilation, heat, and water. This shop installs welding equipment and dewatering equipment, and blankets tanks with carbon dioxide during hot work. Gas free inspection is another service provided. The following is a list of the industrial plant equipment used.

- Exhausters, battery
- Cleaner, oil tank
- Pipe threaders
- Rafts, oil disposal
- Drill press
- Transformers
- Refrigerators, walk in
- Reefer boxes

Rigging and Laborer Services Shop. This shop is divided into three sections: riggers, laborers and tank cleaners, and sailmakers. Riggers fabricate and repair wire and fiber rope products for elevator cables, nets, ladders, and life lines. Riggers also splice or install all rigging fittings, test and repair weight handling equipment (shipboard and shipyard), and provide weight handling services throughout the shipyard. Riggers perform diving work and operate diving boats, equipment and decompression chambers. The laborers and tank cleaner section cleans ships' compartments, tanks, bilges, drydocks, and piers. They also maintain shipboard fire watches and provide CO₂ fire extinguishers. The sailmaker section manufactures and installs canvas, synthetic and leather items, reupholsters furniture, and manufactures cushions, drapes and awnings. Sailmakers also repair, test, and pack inflatable lifeboats, rafts, and jackets. The following is a list of the industrial plant equipment used.

Lifting beams
Embossing machines
Propeller-handling tables and fixtures
Scissor lifts
Air compressors
Decompression chambers
Swaging presses
Sling testers
Load cell indicators
Sludge removal units and tanks
Work platforms
Steam cleaning machines
Oil Disposal rafts
Liquid flow meters
Plastic scalers

APPENDIX I

NAVSEA LETTER RESPONDING TO AN IDA REQUEST
FOR DATA CONCERNING NEW CONSTRUCTION IN NAVAL SHIPYARDS



DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, D.C. 20362

IN REPLY REFER TO

0712:JPM
Ser 415

APR 10 1975

Mr. John D. Morgan
Institute for Defense Analysis
400 Army-Navy Drive
Arlington, Virginia 22202

Dear Mr. Morgan:

Enclosed analysis is forwarded in response to your February 7, 1975, request for assistance in IDA's task of comparing the differences in organization, manpower, and facilities needed for resumption of a new construction program in a naval shipyard in conjunction with conversion, alteration, and repair (CAR) shipwork versus just CAR work. This is understood to be a sub-task of your major study of depot utilization and of factors relating to the economy and flexibility of operations of the shipyards, i.e., OSD (PA&E) task order 81.

Any questions regarding this analysis should be made directly to Mr. John P. McGough, NAVSEA 0712, telephone 692-7701.

Sincerely yours,

R. C. COOCHING
Vice Admiral, USN
Commander, Naval Sea Systems Command

Encl. (1) Analysis - Comparative
Data for New Construction
Versus CAR

Copy to:
OSD (PA&E)

Prepared by: John P. McGough
Code: SEA 0712 Ext: 27701
Date: 7 April 1975

INSTITUTE FOR DEFENSE ANALYSES STUDY:
COMPARATIVE DATA FOR
NEW CONSTRUCTION VERSUS CAR

Ref: (a) IDA ltr of 7 February 1975 w/attachment

BACKGROUND:

Office of the Assistant Secretary of Defense (PA and E) task order 81 directs the Institute for Defense Analyses (IDA) to study factors relating to economy and flexibility of operation of the shipyards. As part of this task, IDA is comparing the differences in organization, manpower and facilities needed in a Naval Shipyard for new construction versus conversion, alteration and repair. In this regard, reference (a) sets forth a proposed scenario for SSN 688 class submarine construction in a Navy yard and requests information as outlined below.

DISCUSSION:

The requested information is presented in the same order as listed in the attachment to reference (a). For convenience each IDA data requirement is restated above the NAVSEA reply.

- (1) IDA Data Requirement "Building rate: Series construction such that as the structural work on the first ship declines, work on the second ship begins, etc. Deliver the first ship 48 months after construction begins."

NAVSEA Reply: A construction duration of 48 months as specified above has not been attained by the shipyards presently engaged in construction of SSN 688 Class Submarines. NAVSEA considers that a 48 month construction schedule is feasible only after series production has been achieved by a shipyard largely dedicated to new construction. Therefore the information that follows is based upon a more realistic construction duration of 54 months.

Enclosures (1) through (3) depict typical manning patterns for industrial shops in total and for the shipfitters and the welders shops. It can be seen that a ship start every third year would result from the IDA specification that the second ship start when the structural work on the first ship begins to decline and a sine curve manning pattern for the production shops would result. A more even and efficient manning pattern for the production shops would result by starting a new ship every 12 months. The information which follows was prepared on that basis.

- (2) IDA Data Requirement "Manpower: Hire additional manpower as required to sustain the proposed program with minimum degradation to the current CAR effort. Manpower is not a constraint. Consider two dedicated work forces, one for NC and one for CAR.:

NAVSEA Reply: Establishment of our workforce for CAR is not practical if efficient use of all trades is to be maintained. The additional manpower required for a CAR shipyard to accommodate new construction is dependent on the CAR workload in the yard at the time. Other factors such as DOD personnel ceilings, overtime restrictions, and attrition also have a bearing. If the level of CAR workload is assumed to be 3000-32000 production shop manyears, approximately 1700 additional production shop employees would be required to meet peak new construction requirements. That would primarily be needed in five production trades as follows:

Shop	56	Pipe	- 250
	26	Weld	- 350
	11	Structural	- 400
	31	Machinist	- 170
	38	Machinist	- 170

NOTE: The above numbers are an order of magnitude approximation which would vary with the total workload mix and the actual numbers employed in those trades at the time. Other skilled labor would be required in less significant numbers. Design, engineering, planning, quality assurance, quality control, supply and material control areas would have to be increased as would other direct and indirect areas. Design would require approximately 240-300 men build-up within the first 16 months. A detailed analysis by the specific shipyard involved would be required to ascertain accurately the exact numbers of personnel required in each of the above areas

The total shipyard employment increase required to meet the new construction requirements on top of normal CAR work at either Mare Island or Portsmouth Naval Shipyards would be approximately 3200-3600 employees. Since heavy manpower requirements of the assumed building program would not be reached until approximately the fourth year after the start of construction of the first ship. A hiring/training rate of 300-800 men per year commencing before start of the first ship, would be required.

- (3) IDA Data Requirement "Facilities: Start with existing building ways and facilities, and indicate what additional facilities and equipment would be (1) required and (2) desired to improve efficiency."

NAVSEA Reply: Clearly the facilities needed depends upon the particular shipyard involved. The following is a summary of new facilities/equipment requirements if either of the shipyards listed below were to engage in new construction:

<u>SHIPYARD</u>	<u>COST*</u>	<u>PROJECT(S)</u>
Mare Island	\$1.5M	(a) Increase weight handling capacity over the ways.
	\$.2M	(b) Upgrade elect power supply on building ways.
	\$.5M	(c) Additional power at fitting out berth (already planned).
Portsmouth	\$1.2M	(a) Additional power for testing.
	\$2.0M	(b) Dredging at ways and pier

The following is a summary of additional facilities which might be desirable to improve efficiency:

<u>SHIPYARD</u>	<u>COST*</u>	<u>PROJECT(S)</u>
Mare Island	\$3.7M	Rearrange plate yard
	\$7.5M	Extension of structural shop
	\$21.0M	New enclosed building ways
Portsmouth	\$1.5M	128 ton special purpose lift capacity
	\$1.5M	Increase capacity of test boiler
	\$1.6M	Expanded feeder capacity from Public Service Company

*NOTE: All cost estimates are in current fiscal year dollars.

- (4) IDA Data Requirement "Organization: Start with the existing organization as prescribed in the Standard Naval Shipyard Organization Manual and identify all organizational changes that would be required to include identification of changes in numbers of personnel assigned by function, e.g., the number of planners would increase but the emphasis would be on hull or structural planning."

NAVSEA Reply: The only major organizational change would take place in the Production Department by the addition of a Shipbuilding Division (see enclosure (4) which shows the current Production Department organization). The Shipbuilding Division organization would parallel that of the Ship Repair Division. Technical repair superintendents would be double billeted from officers/civilians filling assistant repair superintendents or shipbuilding superintendent billets. No other major organization changes would be required.

- (5) IDA Data Requirement "Lead time: Estimate the lead time needed to hire and train the NC workforce, and to order and receive required materials."

NAVSEA Reply: Approximately 18 months lead time would be required from the time of award to actual start of construction. This is based on building a follow on SSN 688 class ship with detail or working plans being provided by the lead yard. Long lead time materials for ship construction and for required facility improvements outlined above can be provided by the time they are needed in the construction process with this overall lead time. As outlined above the design force must be supplemented within the first 16 months with some reliance on subcontracting initial design work. The initial group of production shop trade personnel for new construction could be hired and trained within the above lead time.

- (6) IDA Data Requirement "Nuclear: Identify the changes required in organization, manpower (by function), and facilities and equipment to shift from total CAR work to NC and CAR as outlined above. Start with the nuclear designated organizational codes and identify the number of personnel assigned for CAR and NC."

NAVSEA Reply: Detailed analysis by the shipyard involved would have to be made to ascertain the numbers of additional personnel required in nuclear organizational codes for NC as well as CAR work. As outlined above no other major organizational changes would be required other than the establishment of a Shipbuilding Division in the Production Department.

- (7) Cost: IDA requested no information about this factor. However, NAVSEA considers that it must be recognized that the cost differential is estimated initially to be at least one third higher for public vs current private yard construction of SSN 688 class submarines. This differential could be decreased as the Navy yard gained experience in a series production. Increased costs would also be encountered in a new private yard entering this program. The least expensive means for the Government to build 688 class submarines is to allow the two private yards now engaged heavily in this program to continue to build all of the class.

1600

1400

1200

1000

800

600

9-1

400

200

0

MEN PER DAY

54

42

30

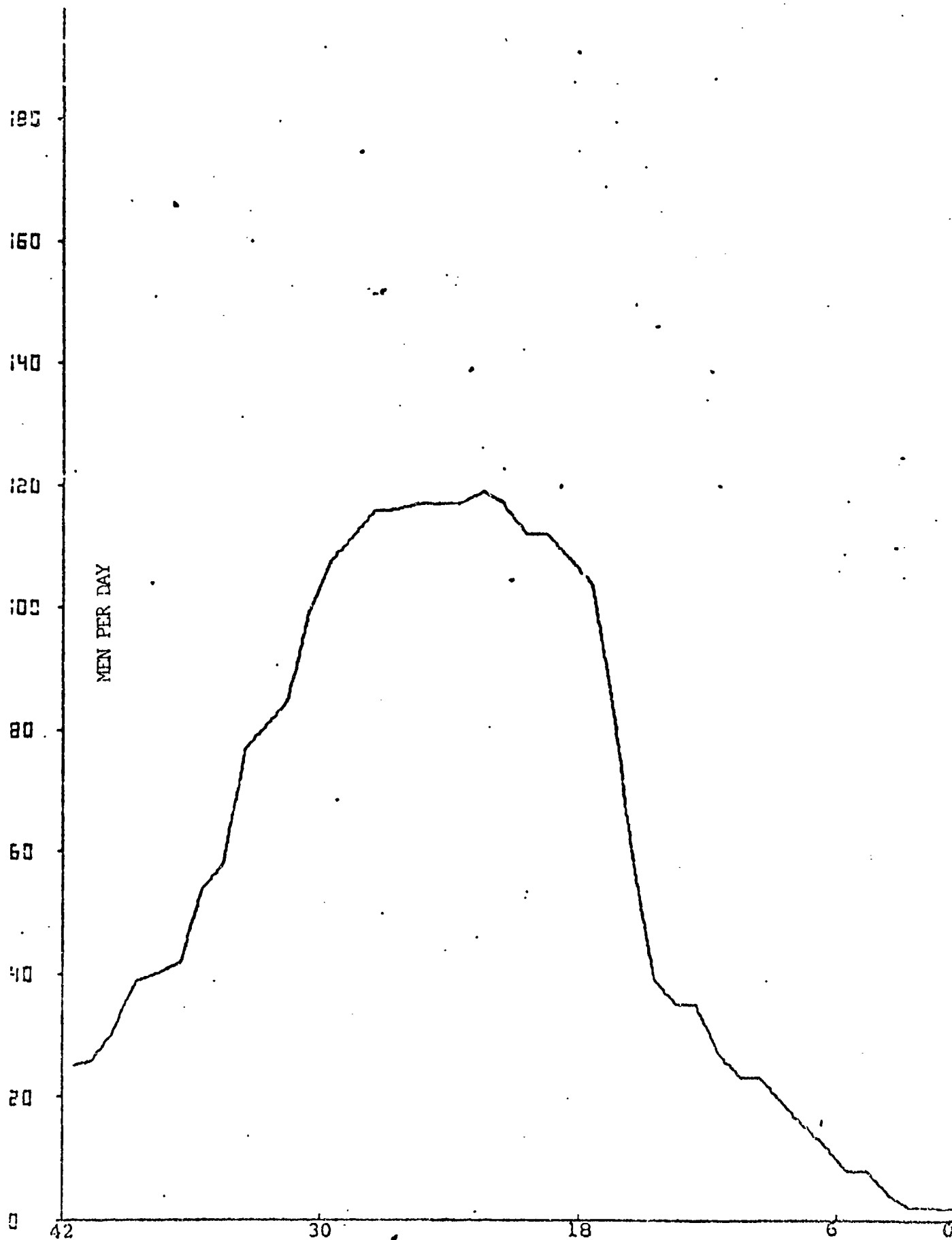
18

0

6

MONTHS TO DELIVERY
TOTAL DIRECT LABOR CURVE FOR A TYPICAL
SSN688 CLASS SUBMARINE

ENCLOSURE (1)



MANPOWER CURVE - SHIPFITTERS (X11) FOR A
TYPICAL SSN688 CLASS SUBMARINE

I-7

EXCLUDED (2)



MONTHS TO DELIVERY
MANPOWER CURVE - WELDERS (X26) FOR A
TYPICAL SSN688 CLASS SUBMARINE

I-8
ENCLOSURE (3)

APPENDIX J

STANDARDIZED SHOP FUNCTIONS, NUMBERS AND FUNCTIONAL WORK GROUPS FOR NAVAL SHIPYARDS

(Extracted from "Functional Work Groups," A Document
Prepared by the Long Beach Naval Shipyard
for the Naval Sea Systems Command, July 1972)

Structural Group

Shipfitting - Shop 11

Shipfitting, Ship
Shipfitting, Drydock
Shipfitting, Lofting
Shipfitting, Layout
Shipfitting, Machine
Shipfitting, Shop Assembly
Pneumatics, Ship
Pneumatics, Shop

Sheetmetal - Shop 17

Sheetmetal, Ship
Sheetmetal, Sketch and Layout
Sheetmetal, Shop

Welding - Shop 26

Welding Service, Ship
Welding Service, Inside Shipfitting Shop
Welding Service, Inside Sheetmetal Shop
Welding Service, Inside Machine Shop
Welding Service, Inside Boiler Shop
Welding Service, Inside Electrical Shop
Welding Service, Inside Pipe Shop
Welding Service, Shop

Boilermaking - Shop 41

Boilermaking, Ship
Boilermaking, Shop

(continued on next page)

Figure J-1. STANDARDIZED SHOP FUNCTIONS, NUMBERS
AND FUNCTIONAL WORK GROUPS FOR NAVAL
SHIPYARDS

Mechanical Group

Central Tool - Shop 06

Electrical Maintenance, Industrial Production
Equipment

Mechanical Maintenance, Industrial Production
Equipment

Toolmaking

Tool Issue and Control

Forge and Heat Treatment - Shop 23

Forge and Heat Treatment

Chain Manufacture

Tumble and Paint Anchor Chain

Inside Machining - Shop 31

Propeller Balance and Repair

Propeller Machining

General Machining

Machinery Test

Machine Shop Processes

Pump, Valve and Turbine, Shop Repair

Machinist Inter-Shop Support

Marine Machinery - Shop 38

Marine Machinist, Ship

Marine Machinist, Drydock

Marine Machinist, Shop

Hydraulics Shop, NAVSHIPS

Internal Combustion Engine, Shop

Aircraft Support, Shop

(continued on next page)

Figure J-1 (continued)

Pipefitting - Shop 56

Pipefitting, Ship

Pipecovering and Insulating, Ship

Pipefitting and Coppersmith, Shop

Pipecovering and Insulating, Shop

Refrigeration and Air Conditioning,
Shop/Ship

Radar Waveguide, Shop/Ship

Foundry - Shop 81

Foundry, Shop

Ordnance - Shop 36

Weapons Mechanical Systems, Ship

Weapons Fire Control Systems, Ship

Weapons Fire Control Systems, Shop

Weapons Mechanical Systems, Shop

Optics, Ship and Shop

Electrical Group

Electrical - Shop 51

Electrical General, Ship

Rotating Electrical Equipment, Shop

Electrical Test, Ship/Shop

Switchboards/Controllers, Shop

Electrical Instruments/Indicating Equipment,
Ship/Shop

Batteries, Storage, Ship/Shop

Electrical Fabrication/Engraving, Shop

Degaussing and Minesweep Cable, Ship/Shop

Gyro, Ship/Shop

(continued on next page)

Figure J-1 (continued)

Electronics - Shop 67

Radar, Ship/Shop
Sonar, Ship/Shop
Communications, Ship/Shop
Navigational Aids, Electronic, Ship/Shop
Electronic Test Instruments, Shop
Cryptograph, Ship/Shop
Electronic Countermeasures, Ship/Shop
Antennas, Ship/Shop
Electronics Fabrication, Shop
Electronics Restoration, Shop
Radiac, Ship/Shop

Service Group

Woodworking - Shop 64

Joiner, Ship
Shipwright - Joiner
Joiner, Shop
Small Boats, Shop
Plastics

Painting and Sandblasting - Shop 71

Painting, Ship
Sandblasting, Ship
Sandblasting, Shop and Yard
Painting, Shop and Yard

Rigging and Laborer Services - Shop 72

Rigging, Ship
Laborers and Tank Cleaners
Divers, Ship and Shop
Loft Rigging, Ship and Shop

(concluded on next page)

Figure J-1 (continued)

Test Rigging
Sail Loft
Rope Manufacture

Temporary Services - Shop 99

Temporary Service Electrical, Ship
Temporary Service Pipefitting, Ship
Gas Detection, Ship
Rubber Products, Shop

Patternmaking - Shop 94

Pattern Shop Work

Figure J-1 (continued)

APPENDIX K

COMPARISON OF THE PRODUCTION SHOP TITLES
AND ASSOCIATED TRADES IN NAVAL AND
PRIVATE SHIPYARDS

Shops		Trades in Private Shipyards
Naval Shipyard	Private Shipyard	
Central Tool	Tool Room	Toolroom keeper, toolroom checker, toolroom man, tool repairman, saw filer
Shipfitter	Shipfitter Plate Hull Platen Assembly Boiler	Anglesmith, assembler, boilermaker, iron shipbuilder, ironworker, layer-out or layout man, loftsmen, marker, erector, marine waysman, pneumatic tool operations (e.g., bolter-up, chipper and caulker, drillers and reamer, riveter, rivet heater, holder-on, passer, tank tester, grinder), cold pressman, rollman, straightener, planner, punch and shear operators, template man, slabman, hot slabman, plate shop mechanic, brakeman
Sheetmetal	Sheetmetal	Sheetmetal worker, sheetmetal fitter, sheetmetal mechanic, sheetmetal welder, sheetmetal sketcher, tinsmith
Forge	Forge Blacksmith	Blacksmith, blacksmith (heavy fire), heavy forges, fireman, furnace man, press operator, heater, hammer operator, burner
Welding	Welding- Burning	Welders, ¹ burners, tack welders, weld heat treat man, weld sequence man, marker, weld examiner
Inside Machine	Machine Inside Machine	Machinist, tool maker or tool and die maker, machine operator
Outside Machine	Outside Machine Marine Machine Machine ²	Outside machinist Marine machinist

(concluded on next page)

¹Welders may be designated by various types of welding such as electric arc, acetylene, etc.

²Combined with inside machine shop in some private shipyards.

Source: MARAD Standard Forms 17 and various labor agreements with private shipyards.

Figure K-1. COMPARISON OF THE PRODUCTION SHOPS AND ASSOCIATED TRADES IN NAVAL AND PRIVATE SHIPYARDS

Shops		Trades in Private Shipyards
Naval Shipyard	Private Shipyard	
Boiler	Boiler	Boilermaker, ³ ironworker, mason or brick mason
Electrical	Electrical	Electricians, motor winder
Pipe	Pipe Pipe and Copper	Pipefitter, coppersmith, insulator, pipe coverer, pipe sketcher
Woodworking	Woodworking Carpenter Joiner Shipwright	Carpenter, caulker, joiner, stagebuilder, shipwright
Electronic	Electronic	Electronic technician or mechanic
Paint	Paint	Painter, sign painter, paint sprayer, sandblaster, scaler, abrasive blaster
Rigging	Rigging Stage Rigging Heavy Rigging Labor Crane Drydock	Rigger, laborer, crane operator, stage rigger, heavy rigger, yard rigger, dock hand, drydockman or dockman, hooker-on or hooktender, slinger, tank cleaner and scaler, rigger (loft), plate hangers, fire watch
Foundry	Foundry	Molder
Pattern	Mold Mold Loft	Patternmaker, molder

³At some private shipyards the boilermaker classification involves the following trades: riveters, chippers, caulkers, boilermaker riggers, drillers and reamers, burners, shipfitters, cold pressman, layers-out, roll operators, straighteners, tank testers, bolters-up, grinders-on, joggle machine operators, punch and shear operators, template man, welders and loftsmen.

Figure K-1 (concluded)

APPENDIX L

SUPERVISOR OF SHIPBUILDING, CONVERSION, AND REPAIR
USN, PRE-PLANNING CHECK LIST FOR REGULAR OVERHAULS

(Extracted from a Pre-planning Check
List furnished by SUPSHIP, Portsmouth)

Table L-1. SUPERVISOR OF SHIPBUILDING, CONVERSION, AND REPAIR,
USN, PRE-PLANNING CHECK LIST FOR REGULAR OVERHAULS

USS _____

Availability Dates _____

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Receive NAVSEA advance planning letter.	A-360			
Check planning yard for plan status of first time alterations.	A-355			
Request copies of all follow-on ship alteration plans.	A-355			
Request authority for design services from Type Commander for Type Commander-funded alterations listed in NAVSEA letter for which plans have not been previously prepared.	A-350			
Review ship alterations and follow-on plans for long-lead-time material, advise NAVSEA and PERA of anticipated problems.	A-340			

(continued on next page)

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Receive PERA advance planning letter.	A-338			
Receive Type Commander advance planning letter, compare list of ship alterations with those previously received.	A-328			
Verify planning yard shipcheck dates for first time alterations.	A-310			
Receive advance planning funds from NAVSEA based on NAVSEA advance planning letter.	A-278			
Request ships operational schedule and forward to naval shipyard design.	A-275			
Forward SUPSHIP's overhaul letter to Type Commander, PERA, and ship.	A-275			

(continued on next page)

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Task naval shipyard design to shipcheck, follow-on ship alterations, and furnish information for shipcheck report.	A-270			
Receive list of special material for NAVSEA authorized first time alterations.	A-270			
Request funds for preparation of ship alteration drawings.	A-269			
Job orders to naval shipyard design for ship alteration drawings.	A-259			
Furnish drawing schedule for ship alteration drawings to PERA.	A-245			
Receive NAVSEA 240-day letter and check for changes from NAVSEA advance planning letter.	A-240			

(continued on next page)

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Start government furnished material procurement resulting from a review of the Ship Alteration Material Summary.	A-239			
Follow-up on all ship alteration plans.	A-239			
Receive rough copy of Pre-overhaul Test and Inspection Report for estimating.	A-230			
Receive long-lead-time material list from PERA, review for duplication of material previously ordered, commence ordering government furnished material for anticipated repairs.	A-230			
Receive list of repair items from PERA that require design assistance.	A-230			

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Provide estimate for additional funds to cover advance planning and long-lead-time material.	A-229			
Request additional advance planning funds from Type Commander.	A-228			
Order all known long-lead-time material.	A-228			
Forward Pre-overhaul Test and Inspection Report with estimates to PERA	A-220			
Receive lists of special material for ship alteration drawings from design and order as government furnished material.	A-210			
Furnish estimates for Type Commander-funded and ship alterations to Type Commander, NAVSEA, and PERA.	A-200			

(continued on next page)

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Forward Ship Alteration and Repair Package (proposed) with estimates to PERA.	A-180			
Receive completed copies of ship alteration drawings.	A-180			
Receive design information for repair items.	A-180			
Arrange with Type Commander time and place to conduct preoverhaul inspection.	A-171			
Complete ordering of all government furnished material for ship alterations and known repairs.	A-165			
Receive ordnance alterations letter.	A-150			

(continued on next page)

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Prepare letter to NAVSEA (ORD) listing ordnance alterations planned for accomplishment with estimated cost.	A-145			
Receive notification of any discrepancies in the electronic preliminary equipment index for overhauls scheduled in excess of 60 days.	A-142			
Receive screened copy of Ship Alteration and Repair Package from PERA.	A-140			
Turn over all information and files to Type Desk.	A-140			
Screen Ship Alteration and Repair Package for trade cognizance and forward to print shop for reproduction.	A-139			

(continued on next page)

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Forward planning and estimating security clearances to ship.	A-137			
Prepare navigation lights, degaussing and keel block pressure job orders.	A-136			
Forward Ship Alteration and Repair Package to Job Planning Branch.	A-136			
Commence ordering plans and material required by work package.	A-134			
Start Planning Inspection.	A-134			
Forward Boat and Boiler Inspection Reports to Type Commander for screening.	A-120			
Receive Boat and Boiler Inspection Report screening.	A-110			

(continued on next page)

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Cut-off date for supplemental items from Type Commander.	A-107			
Start follow-up for reproductions from design.	A-107			
Cut-off date for investigating and recommending memoranda to Type Desk which would change or alter original work.	A-96			
Latest date for receipt of material information from the Technical Material Section.	A-96			
Rough specification date/all plans and material ordered.	A-95			
All rough specifications typed on mats, mats forwarded to print shop for reproduction.	A-88			

(continued on next page)

Table L-1 (Continued)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Furnish Type Desk estimate of funds required (ship alterations, repairs, special funding).	A-85			
Request funds from requiring activity.	A-85			
Finished specifications to Contracts Division, ship, and Type Commander.	A-85			
Invitation for bid to contractors.	A-75			
Conduct pre-arrival conference.	A-73			
Rough specifications for ammendments that result from pre-arrival conference.	A-65			
All ammendments to Contracts Division.	A-63			

(concluded on next page)

Table L-1 (Concluded)

30 Day Award

Event	Target Point	Completion Due Date	Completed Action Date	Action Code
Bid opening.	A-50			
Award.	A-30			
Award message to ship advising location of overhaul yard and date and time to meet contractor's tug.	A-30			
Arrange with contractor time and place of Arrival Conference.	A-4			
Inform Type Commander and ship time and place of Arrival Conference.	A-4			
Start.	0			
Arrival Conference.	+1			
NOTE: When the Target Point falls on a holiday, Saturday or Sunday, the Completion Due Date will be shown as the last working day prior to Target Point.				

Source: Pre-planning Check List furnished by SUPSHIP, Portsmouth

Planning Yard	Ship	Overhaul Activity	Type Commander	NAVSEA	PERA (ASC)	ITEM NO.	Legend: L-Lead Action S-Support Action	Fiscal Year Calendar Year Ship's schedule	1974												1975											
									1974												1975											
									CONUS Ops.*												Deployed											
									9/23/74																							
Days prior to/during/after overhaul									Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb											
Month									18	17	16	15	14	13	12	11	10	9	8	7	6											
No. of months prior to/during/after overhaul									18	17	16	15	14	13	12	11	10	9	8	7	6											
Milestone Events									TGT																							
		L			S	41	Submit departure report	C+60																								
	S	L	S		S	40	Critique regular overhaul	C+30																								
		L				39	Complete overhaul	C																								
	L	S				38	Conduct post repair trials	C-15																								
	L	S				37	Conduct fast cruise	C-20																								
	L	S				36	Conduct dock trials	C-30																								
	L	S				35	Boiler light-off	C-40																								
	S	L	S			34	Commence regular overhaul and arrival conference	A																								
	S				L	33	Review Ship's Force Overhaul Management Systems and install terminal	A-30																								
		L				32	Award contract	A-30																								
	S	L	S			31	Contractor inspection period	A-75--60																								
		L				30	Invitation for bid to contractors	A-75																								
	S	L	S		S	29	Pre-arrival conference (Review bid specifications)	A-85--75																								
		L				28	Complete bid specifications	A-85																								
		L				27	Boat inspection	A-90																								
		L	S		S	26	Recommend SHIPALT cancellations to NAVSEA	A-100																								
	S		L		S	25	Screened supplementary repair work requests	A-105--85																								
					L	24	Ship alterations and Repair Package turnover	A-140																								
		L				23	Weight and moment report	A-150--100																								
	L				S	22	Complete Ship's Force Work Package	A-150																								
		L				21	Complete ordering all material	A-165																								
	S	S	S	S	S	20	Work definition conference	A-165																								
	S				L	19	Define/build the Ship's Force Overhaul Management Systems data base	A-170																								
S		L	S	S	S	18	Complete ship alteration drawings for SHIPALTS and design for repair	A-180																								
		S			L	17	Complete proposal Ship Alteration and Repair Package with estimates	A-180																								
	S				L	16	Assist ship's force to prepare ship's force work package	A-210																								
		S			L	15	Pre-overhaul test and inspection report with estimates	A-220																								
		L	S	S	S	14	Order long-lead-time material for SHIPALTS and repairs	A-230																								
S		S	S		L	13	Identify long-lead-time material for SHIPALTS and repairs	A-240																								
L	S			S	S	12	Complete basic alteration class drawings for SHIPALTS	A-240																								
					L	11	Validate government furnished material and equipment procurement	A-240																								
				L	S	10	NAVSEA 240 day SHIPALT letter	A-240																								
	S	S	L		L	9	Identify and authorize design for repairs	A-250																								
	S	S			L	R	Conduct pre-overhaul test and inspection	A-270																								
S	S	L	S	S	S	7	Shipcheck follow-on SHIPALTS	A-270																								
	S				L	6	Ship's Force Overhaul Management System indoctrination	A-270																								
L	S					5	Shipcheck first time SHIPALTS	A-310																								
	S				L	4	Ship advance planning indoctrination	A-320																								
			L		S	3	Type commander advance planning letter	A-330																								
				S	L	2	PERA advance planning letter	A-340																								
				L	S	1	NAVSEA advance planning letter	A-360																								
	S		L				Board of Inspection and Survey inspection	*	If not accomplished, previously conducted inspection will be utilized to assist in developing work pack																							
	S		L				Naval Air Engineering Center helicopter operational facilities inspection	*																								

*Continental United States Operations

Table L-2. PERA OVERHAUL PLANNING
MILESTONE CHART

[illegible]

APPENDIX M •

DUTIES AND RESPONSIBILITIES
OF THE SUPSHIP DEPARTMENTS AND DIVISIONS

(Extracted from the Navy Ship Repair
Contracting Manual)

DUTIES AND RESPONSIBILITIES OF THE SUPSHIP DEPARTMENTS AND DIVISIONS

ASSISTANT OFFICER-IN-CHARGE, SUPSHIP

The duties and responsibilities of the Assistant Officer-in-Charge are delegated by the SUPSHIP. In those districts where the SUPSHIP is the Commander of the local naval shipyard or the head of another activity, the Assistant Officer-in-Charge, normally the Planning Officer of the shipyard, serves as the administrative head of the SUPSHIP organization. More specifically, he administers, coordinates, and provides general guidance over the work and activities of the SUPSHIP organization to ensure proper placement and administration of Master Contracts for Repair and Alteration of Vessels and job orders, timely and economical completion of overhaul and repair work, conformance of such work with specification requirements, maintenance of acceptable quality standards, and employment of safe practices. In addition, he administers public relations matters and ensures effective use of SUPSHIP personnel.

SUPSHIP SUPERINTENDENT

In those locations where the SUPSHIP and the assistant Officer-in-Charge concurrently serve as the naval shipyard Commander and the Planning Officer, respectively, their duties may require assigning a fulltime administrator over the regular operations of the SUPSHIP activity who is designated the SUPSHIP Superintendent.

ASSISTANT FOR WEAPONS

The Assistant for Weapons serves as the primary liaison between the SUPSHIP and NAVSEA, and acts as principal advisor to the SUPSHIP on weapons systems matters and the technical direction thereof. His responsibilities include:

1. Reviewing specifications and drawings and exercising technical control over inspection, test and design changes in weapons systems, to ensure the proper installation of ordnance material. This embraces:
 - a. Reviewing that portion of the contractor's inspection system pertinent to weapons systems, including related NAVSEA electronics equipment in accordance with requirements for a contractor's inspection system contained in the contract.
 - b. Reporting the results of his review and appropriate recommendations to Product Assurance Engineering for inclusion in the integrated evaluation of the contractor's inspection system.
 - c. Coordinating with the Product Assurance Engineer to resolve any variations in NAVSEA policies that would affect the contractor's inspection system.
 - d. Planning and coordinating the overall SUPSHIP verification of the contractor's conformance to specifications in the installation, inspection and test of weapons systems and related NAVSEA electronics equipments.

- e. Providing technical support to the Planning Department, Quality Assurance Department, Contracts Department, and the Material Department in verification that installation of weapons systems and related NAVSEA electronics equipment is in accordance with specifications.
 - f. Verifying conformance of the contractor to approved subsystem and system test procedures, including participation in the inspection of the installation.
 - g. Reviewing the contractor's test results to determine if weapons systems fully meet the contract requirements.
2. Exercising staff administration over the procurement, expediting, receipt, storage and issue of weapons, and maintaining coordination control over weapons allowance lists and incompleated weapons work lists for the Board of Inspection and Survey.
3. Providing technical guidance and advice to the accomplishment of contractual shipbuilder functions relative to installation of aeronautical material, systems, and equipments.

PRODUCT ASSURANCE ENGINEER

The Product Assurance Engineer serves the SUPSHIP in a staff capacity and is responsible for planning, developing, and directing the Quality and Reliability Assurance Program of the SUPSHIP office. In fulfilling his responsibilities, the Product Assurance Engineer shall:

1. Plan and direct the overall program of quality and reliability assurance for the SUPSHIP.
2. Coordinate the quality and reliability assurance efforts of all departments of the SUPSHIP.
3. Provide liaison between the SUPSHIP, NAVSEA, and the contractor in the development and application of quality and reliability assurance techniques.
4. Develop and administer training programs for quality and reliability assurance.
5. Provide objective evidence and a statistical measure of the degree of conformance to instructions by all departments relating to the quality of the product under contract.
6. Analyze and determine the acceptability of the contractor's quality program or inspection system in accordance with the terms of the contract and recommend corrective action required.
7. Provide guidance to the SUPSHIP office relative to quality assurance techniques.
8. Analyze and determine that process control procedures of the contractor will provide the required degree of assurance.
9. Analyze reliability requirements imposed on a contractor and ascertain conformance.

ADMINISTRATIVE DEPARTMENT

1. The Administrative Department serves the SUPSHIP in matters concerning naval and civilian personnel, industrial relations, public relations, security, and office services. The Administrative Officer (military or civilian) shall serve as the Security Officer for the activity and shall be responsible for establishing procedures respecting both internal and industrial security administration for the SUPSHIP organization. He is also responsible for administrative matters in connection with precommissioning detail, as set forth in NAVSHIPS 250-710, Orientation for Nucleus Crew assigned to New Construction and Conversion Ships.
2. The Administrative Department shall consist of the Military Personnel Division (optional), Civilian Personnel Division, Security Division (optional), and the Administrative Services Division.

Military Personnel Division (Optional)

The Military Personnel Division is responsible to the Administrative Officer for:

1. Administering military personnel matters in accordance with the Bureau of Naval Personnel Manual (BUPERS Manual) and other pertinent directives.
2. Administrative matters in connection with the precommissioning detail, as discussed in the Administrative Department (1), above.

Where workload does not warrant staffing of this function, it will be combined with functions of the Civilian Personnel Division.

Civilian Personnel Division

The Civilian Personnel Division is responsible to the Administrative Officer for:

1. Administering civilian personnel matters in accordance with Navy Civilian Personnel Instruction (NCPI), the Federal Personnel Manual, and other pertinent directives.
2. Keeping the SUPSHIP informed of instructions and policies of the Department of the Navy and other government agencies relating to local labor conditions. Providing contractors with any useful information that may promote industrial health and safety.
3. Performing necessary public relations functions in connection with prepared statements, information releases, inquiries from the local press, and launchings and other ceremonial matters, in accordance with the instructions of the SUPSHIP, the U.S. Navy Public Affairs Regulations (NAVSO P-1035) and other instructions.

Security Division (Optional)

The Security Division is responsible to the Administrative Officer for:

1. Administering the internal security program of the SUPSHIP office in accordance with the Department of the Navy Security Manual for Classified Information (OPNAV Instruction 5510.1C).
2. Administering the DoD industrial security program at shipyards and repair activities assigned to the SUPSHIP in accordance with the provisions of the Department of Defense Industrial Security Regulation, DOD 5220.22-R (implemented for the Navy as indicated in ASPR 1-320), and the Department of the Navy - Defense Supply Agency Agreement of 30 March 1965.

Where the nature or scope of the SUPSHIP's workload, or other local conditions, is such that security functions do not warrant full divisional status, the SUPSHIP shall otherwise assign these responsibilities so as to result in the most effective handling of security matters under the direction of a single Security Officer.

Administrative Services Division

The Administrative Services Division is responsible to the Administrative Officer for:

1. Providing complete office services for the operation of the SUPSHIP office, including transportation and maintenance of transportation equipment and communications in accordance with U.S. Navy Communications instructions and the District Commandant's Land Line Manual.
2. Recording, distributing and controlling classified matter within the SUPSHIP office in accordance with procedures established by the Security Officer.

3. Preparing budget estimates.
4. Maintaining fiscal records for the activity in accordance with instructions issued by NAVSEA.

PLANNING DEPARTMENT

1. The Planning Department shall consist of the Planning and Estimating Division and the Design Division.
2. The Planning Department shall:
 - a. Provide work planning and design services required for the administration of contracts under the Supervisor's cognizance, including preparation of definitive work specifications for overhaul, repair, or conversion of ships assigned.
 - b. Coordinate the activities of the Planning and Estimating Division and the Design Division, particularly on technical problems involving joint responsibilities.
 - c. Coordinate the efforts of contractors and the Planning Department to make sure that requirements for design schedules conform to ship construction schedules.
 - d. Maintain liaison among the Planning Department, contractors, and other naval activities with which the SUPSHIP does business to ensure the effective flow of technical information.
 - e. Administer the Value Engineering program of the office.

Planning and Estimating Division

The Planning and Estimating Division is responsible to the Planning Officer for:

1. Planning, estimating, and arranging for ship repair, overhaul and alterations for work performance, including the preparation of schedules, instructions, preliminary estimates, and definitive work specifications.
2. Reviewing material requirements and maintaining liaison with the Material Department regarding procurement matters.
3. Performing planning services in the administration of contracts placed by other Department of Defense agencies with shipyards or other plants.

Design Division

The Design Division is responsible to the Planning Officer for:

1. Providing engineering and technical design services for the SUPSHIP and NAVSEA.
2. Receiving, examining, developing, and distributing drawings, specifications, technical manuals, and other design information to naval and civilian activities.
3. Reviewing, within the authority granted the SUPSHIP, contractors' design work, manufacturers' drawings, technical manuals, and test memoranda for conformance with the intent of the prime contract.
4. Reviewing contractors' purchase orders for technical correctness.

5. Providing timely engineering and technical feasibility studies to the Proposal Evaluation Division of the Contracts Department for use in the conduct of analyses of contractors' proposals.
6. Maintaining liaison with contractors and other activities with whom exchange of technical information is necessary.
7. Assembling and maintaining a technical library of specifications, manuals, standards, bulletins, classified technical matter, and other publications necessary to meet the requirements of the division.
8. Establishing and administering the Value Engineering program of the office.

QUALITY ASSURANCE DEPARTMENT

1. The Quality Assurance Department, including Resident Inspection Offices, is responsible for determining physical progress of work, reviewing and evaluating contractors' systems for the control of quality in the production phase, inspection, final acceptance testing, trials and deliveries of work under contract to ensure compliance with approved drawings, contract specifications, and completion dates.
2. The Quality Assurance Department shall consist of the Planning and Process Control Division, the Inspection Division, the Ship Progress Division, and the Resident Inspection Office(s). Specific functions shall include, but not be limited to:
 - a. Providing quality assurance and inspection services required in the administration of contracts under the cognizance of SUPSHIP.
 - b. Assisting in the conduct of pre-award surveys of contractors' facilities.
 - c. Administering the Defect Prevention Reporting Program.
 - d. Determining the physical progress of work.
 - e. Providing liaison with source inspection activities.
 - f. Participating in sea trials and tests preparatory to delivery of the ship or boat.

Planning and Process Control Division

The Planning and Process Control Division shall:

1. Develop and coordinate the Quality Assurance Program for the Quality Assurance Department.
2. Prepare, schedule, and monitor audit plans for the department.
3. Administer the Defect Prevention Report Program.
4. Coordinate test memo review and documentation for the department.
5. Conduct analysis of feedback information and follow-up of the corrective action required.
6. Maintain appropriate control charts of contractor's processes.
7. Provide services to the Quality Assurance Department on such areas as:
 - a. Blueprint files.
 - b. Technical manuals.
 - c. Test calls and reporting.
 - d. Central files.

Inspection Division

The Inspection Division shall:

1. Witness inspections and tests as required.
2. Perform surveillance of the contractor's Quality Assurance Program or inspection system.
3. Assist the Planning and Process Control Division in conducting audits of the contractor's Quality Assurance Program or inspection system.
4. Report all instances of apparent failure of the contractor's Quality Assurance Program or inspection system.

5. Administer the qualification of special process operators and equipments and verify that processes are maintained within control limits.
6. Perform receipt inspection of government-furnished material.
7. Initiate Defect Prevention Reports (DPR) as required.
8. Record inspection data for analysis of quality assurance problems.
9. Coordinate with Ship Progress Division to assure that work presented for progress payment has been inspected in accordance with the contract requirements.
10. Administer safety and fire protection programs at assigned plants.
11. Perform product inspections as required in connection with verification/validation of contractor technical data.

Ship Progress Division

The Ship Progress Division shall be responsible for:

1. Assembling and disseminating information concerning current status of all shipbuilding, conversion, and repair work assigned to SUPSHIP.
2. Reviewing and approving the distribution of weighted progressing factors.
3. Originating and maintaining progress charts and schedules as required.
4. Submitting required reports.

CONTRACTS DEPARTMENT

1. The Contracts Department is responsible for:
 - a. All contractual, accounting, and financial matters relating to prime contracts.
 - b. Awarding and administering all Master Ship Repair Contracts and job orders placed thereunder for repair and overhaul work.
 - c. Review, analysis, negotiation, issuance, and adjudication of all changes to assigned contracts for which SUPSHIP is so authorized.
2. The Contracts Officer is the head of the Contracts Department. Personnel appointed to this position shall report to the Command one month after entering on duty for appropriate indoctrination, including discussion of any required training.
3. The Contracts Department shall consist of the Contract Administration Division, the Proposal Evaluation Division, and the Financial Division.

Contract Administration Division

The Contract Administration Division is responsible for:

1. Reviewing and consenting, in accordance with ASPR 23-202, to subcontracts requiring business reviews.
2. Negotiating equitable adjustments in the contract price resulting from changes.
3. Preparing and assembling final settlement documents.

4. Expediting the submission and settlement of claims.
5. Entering into Master Ship Repair Contracts.
6. Accomplishing all procurements for repair and overhaul services under the Master Ship Repair Contract including:
 - a. Determining the method of procurement (formal advertising or negotiation).
 - b. Preparing the solicitation package (invitation for bid, request for proposal, drawings, specifications, etc.).
 - c. Receiving, storing, opening, and tabulating bids or offers received.
 - d. Selecting the source.
 - e. Negotiating and awarding the job order.
7. Administering job order terminations.
8. Requesting Advisory Audit Reports as required.
9. Maintaining close coordination with the cognizant contract audit office.
10. Receiving, recording, and maintaining the status of all changes and requests for changes.

Proposal Evaluation Division

The Proposal Evaluation Division is responsible for coordinating the overall SUPSHIP effort in the processing of changes and requests for changes including the following specific functions:

1. Developing a preliminary cost estimate for obligation purposes.

2. Developing an independent estimate as may be required for pricing purposes.
3. Preparing Technical Advisory Reports.
4. Determining the effect of changes in delivery schedules and the attendant disruption (if any), and utilizing inputs from the Design Division and the Quality Assurance Department as necessary.
5. Assembling all the data needed by the negotiator.
6. Reviewing contractor's changes in the scope of work and reaching work scope understanding.
7. Reviewing subcontracts when they are part of the contractor's proposal for pricing changes.
8. Reviewing and evaluating contractor's proposals and furnishing comments and recommendations to the contracting officer when negotiation will be accomplished by the contracting officer.

Financial Division

The Financial Division is responsible for:

1. Certifying vouchers for payment.
2. Maintaining records and accounting for shipwork funds allocated to SUPSHIP.

MATERIAL DEPARTMENT

1. The Material Department is responsible for:

- a. Controlling and expediting delivery of government-furnished material.
 - b. Administering property.
 - c. Preparing and revising allowance lists.
 - d. Conducting pre-award surveys.
 - e. Receiving and disposing of government-furnished material.
 - f. Administering facilities contracts.
2. The Material Department shall consist of the Material Division, the Allowance Division, and the Facility Division.

Material Division

The Material Division is responsible for:

1. Controlling and expediting delivery of government-furnished material, assisting shipbuilders in obtaining delivery of contractor-furnished material, as necessary.
2. Coordinating Navy Shipbuilding Scheduling Office and contractor relationships.
3. Administering controlled material requirements, allotments, and priority designations.
4. Providing for fitting-out and allowance material when required.
5. Insuring compliance by the contractor with the requirements of ship repair, shipbuilding, and boatbuilding contracts relative to government property and all obligations imposed on the contractor by ASPR Appendixes B and C; performing related

property administration and property disposal functions in accordance with the above requirements.

6. Preparing, reviewing, and processing requisitions to Navy supply activities for government material and equipment.
7. Maintaining close cooperation with material disposal agencies.

Allowance Division

The Allowance Division is responsible for:

1. Preparing individual ship's allowance lists for new construction or conversion; preparing and processing changes to allowance lists resulting from shipwork performed during repair availabilities.
2. Provisioning documentation.
3. Maintaining liaison with the Material Division with respect to procuring and assembling on-board repair parts, as required.

Facility Division

The Facility Division is responsible for:

1. All operations pertaining to the administration of NAVSEA facility contracts, including property administration functions under these contracts, and at NAVSEA-sponsored industrial reserve plants whether or not under a facility contract.
2. Carrying out Armed Services Procurement Officer responsibilities, as assigned.
3. Conducting pre-award surveys to determine the ability of a proposed contractor to produce; performing a wide variety

of industrial surveys, evaluations, and investigations in support of industrial security administration, industrial mobilization planning, national security clause administration, and liaison with contractors on plant and methods improvement.

PRODUCTION MANAGEMENT DEPARTMENT

1. The Production Management Department will be authorized by NAVSEA on a case basis. Generally, this department will be established when a SUPSHIP has cognizance of cost and/or fixed price incentive type contracts with a total value of \$50 million or more with any one contractor.
2. The Production Management Department is responsible for monitoring the contractor's total production effort, including surveillance of cost, schedule and control systems, evaluation of productivity, determination of physical progress, development and promulgation of procedures for the safety and protection of government property, coordination of the efforts of government and government-provided personnel in direct support of the production effort, initiation of corrective action, and, for cost estimates, work scope reviews on proposed contract modifications, cost analysis, and Technical Advisory Reports.
3. The Production Management Department shall consist of the Production Engineering Division, Shipwork Coordination Division, Combat Systems Division, and Progress Division.

Production Engineering Division

The Production Engineering Division is responsible for:

1. Maintaining surveillance of, and evaluating changes in, the contractor's cost and schedule control system to ensure compliance with contractual requirements; and identifying policies, practices, or procedures that are not effective, not in accordance with contractual requirements, or not in compliance with the procedures demonstrated in DOD Instruction 7000.2 validation.
2. Documenting the Performance Measurement Baseline budget for each contract; tracking and reporting performance trend in terms of Budgeted Cost of Work Scheduled (BCWS), Budgeted Cost of Work Performed (BCWP), and Actual Cost of Work Performed (ACWP); conducting variance analyses to identify potential cost/schedule problems, their cause(s), and proposed corrective action; and reconciling external Cost Performance Reports (CPRs) with the contractor's internal data.
3. Developing and maintaining sufficient familiarity with the contractor's cost estimating system and cost experience to participate effectively in the evaluation of the contractor's cost proposals and budgets.
4. Investigating, evaluating, and reporting on the contractor's production processes and productivity; and identifying corrective actions that could be taken to correct areas of inefficient work methods, equipment, facilities, low productivity, or adverse performance trends.
5. Investigating, evaluating, and reporting on contractor production facility matters as they relate to ship contract work,

including the allocation of facilities to contracts, maintenance actions, improvement plans, and plant equipment programs; and identifying government actions required to support or modify these activities to ensure cost-effective performance on government contracts.

6. Developing, implementing, and carrying out a continuing program to compare the costs of work items, functional work areas, and/or contracts, with similar work performed by other contractors.
7. Developing SUPSHIP's position relative to the contractor's capability to produce under new contract, as a part of a pre-award survey effort.
8. Monitoring the contractor's docking program for Navy ships. This includes surveillance of each docking operation, training of SUPSHIP personnel, reviewing written procedures of both SUPSHIP and contractor, and auditing the maintenance condition of the contractor's docks.
9. Developing and promulgating procedures for the safety and protection of government property related to the following:
 - a. Nuclear accident/incident.
 - b. Heavy weather.
 - c. Oxygen charging.
 - d. Battery charging.
 - e. Environmental protection.
 - f. Watertight integrity.
 - g. Fire protection.

Shipwork Coordination Division

The Shipwork Coordination Division is responsible for:

1. Ensuring that the shipboard activities of each ship's crew and of each government-sponsored agency are effectively interfaced with contracted tasks. This coordination explicitly excludes managing the contractor's trades and other internal production-related groups. The coordinative function applies to all shipboard systems, except Combat Systems matters. Daily liaison between the Shipwork Coordination Division and the Combat Systems Division is required for the effective control of work.
2. Monitoring, evaluating, and reporting on schedule matters for assigned ships during availabilities; maintaining schedule adherence indicators to identify problem areas or potential problem areas; and requesting appropriate corrective actions, and evaluating the contractor's recovery plans.
3. Performing studies and conducting investigations of shipboard production and/or technical system problems; preparing staff briefings for top level management on these problems when appropriate; and providing written accounts of special incidents to the cognizant Contracting Officer.
4. Attending all progress review meetings and related meetings, including Joint Test and/or Joint Refueling Groups (JTG/JRG). Immediately reporting all actual or anticipated delinquency situations to the Supervisor and other appropriate SUPSHIP officials.

5. Alerting cognizant SUPSHIP personnel when material, especially government-furnished material, or engineering information problems jeopardize production schedules.
6. Overseeing all sea trial activity and, when assigned, acting as the Supervisor's spokesman during sea trials and other special ship evaluations.
7. Initiating appropriate actions with the contractor or appropriate SUPSHIP organization to correct conditions that may jeopardize shipwork in process, or materials in which the government has an interest.
8. Continually monitoring ship manning and schedule adherence, and documenting--at least monthly--any actual or potential schedule slippage, manning problems, or disruption of productivity, with appropriate notes as to cause.
9. Assisting in developing SUPSHIP's position relative to the contractor's capability to produce under new contract as part of the pre-award survey effort.
10. Submitting reports of labor disputes to NAVSEA as required, and developing strike impact information for SUPSHIP and NAVSEA as appropriate.
11. Participating in studies of contractor productivity.

Combat systems Division

The Combat Systems Division is responsible for:

1. Ensuring, in the Combat Systems area, that the shipboard activities of each ship's crew and each government-sponsored agency are effectively interfaced with contracted tasks.

This coordinative function is performed in conjunction with the Ship Coordinator and requires daily contacts with the Shipwork Coordination Division.

2. For the Combat Systems area, reviewing, monitoring, evaluating, and reporting on schedule matters for assigned ships during availabilities.
3. Performing studies and conducting investigations of shipboard production and/or technical Combat Systems problems; preparing staff briefings for top level management on these problems when appropriate; and providing written accounts of special incidents to the cognizant Contracting Officer when requested.
4. Attending all progress review meetings and related meetings for assigned ships; and immediately reporting all actual or anticipated delinquency situations in the Combat Systems area to the Supervisor and other appropriate SUPSHIP officials.
5. Alerting cognizant SUPSHIP personnel when material, especially government-furnished material, or engineering information problems jeopardize production schedules in the Combat Systems area.
6. Administering Integrated Test Requirements Outline and Sonar Certification programs.
7. Serving as the Fleet Ballistic Missile (FBM) Project Officer at SUPSHIP for the Director, Strategic System Project Office.
8. Managing and administering the on-site implementation of test programs.

9. Administering and supervising the activities of the Combat Systems subsystems contractor field representatives assigned to the SUPSHIP.
10. Coordinating the accomplishment of Ordnance Alterations (ORDALTS) and Special Project Alterations (SHIPALTS).
11. Exercising technical control over the use and reporting of government-furnished small arms, weapon shapes, test equipment, and targets for weapons system testing and installation.

Progress Division

The Progress Division is responsible for:

1. Developing, promulgating, and maintaining a set of SUPSHIP instructions that establishes procedures for the complete progressing function.
2. Performing surveillance of the production labor, and other assigned cost areas, to confirm, at least monthly, that progress claimed by the contractor has in fact been achieved.
3. Reviewing, approving, and consolidating the progress inputs of all cognizant SUPSHIP codes to develop the SUPSHIP position on total progress for each contract.
4. Reconciling the contractor's claimed progress with the SUPSHIP position developed in (3) above.
5. Preparing monthly progress reports to NAVSEA.

6. Reviewing and providing SUPSHIP comments on the contractor's proposed progress factors and on proposed changes to established progress factors.
7. Initiating changes to progress factors as appropriate.
8. Participating in studies of contractor productivity.

APPENDIX N

NAVAL SHIPYARD OPERATION UNDER THE
NAVY INDUSTRIAL FUND (NIF)

NAVAL SHIPYARD OPERATION UNDER THE NAVY INDUSTRIAL FUND (NIF)

This appendix presents an overview of naval shipyard operation under the DoD Industrial Fund System.¹ Basic financial practices and procedures are explained. Attention is focused on the cost accounting system as a financial management tool.

A. THE INDUSTRIAL FUND CONCEPT

Industrial Funds are revolving funds used to finance the operations of designated industrial-commercial type activities. Section 2208 of Title 10, U.S.C., provides the basic authority for industrial fund operation. DoDD 7410.4 "Regulations Governing Industrial Fund Operations," September 25, 1972, sets forth the objectives of the DoD Industrial Funds.² One of the most important objectives is to create contractual relationships between the industrial and commercial-type activities that provide services (the producers) and the activities that budget for and order the services (the customers) that are similar to the producer-customer relationships that exist in the private sector. These relationships should create incentives for improved efficiency and economy by both producers and customers.

¹The primary source of the material presented is *The Navy Industrial Fund Handbook for Naval Shipyards*, NAVSO P-1242, Department of the Navy, Office of the Comptroller, November 1974.

²A complete list of these objectives is provided in Enclosure I.

B. THE NAVY INDUSTRIAL FUND

The Navy operates its shipyards under the DoD Industrial Fund System. In this system, each shipyard operates as a self-sustaining industrial activity and is reimbursed for the costs of goods and services provided from funds appropriated to its customers. The producer-customer relationships are summarized in Figure N-1. Key points are discussed in succeeding paragraphs.

1. Shipyard Customers

Most of the workload of naval shipyards is the shipwork performed for NAVSEA and the fleet and type commanders--the primary customers of the shipyards. The balance of the work is accomplished for many other activities within and outside of the Navy.¹ Each customer negotiates with the shipyard and contracts for the specific services desired.² Once the work is accepted by the shipyard, the customer records the charge as an obligation against appropriated funds made available to him to accomplish depot level workloads. Because each customer has limited funds to accomplish his total workload, he is motivated to contract only for essential requirements and to insure that

¹Other customers include, for example, NAVELEX, NAVSUP, other Military Departments, MSC, and private parties. The reader is referred to the NIF Financial and Operating Statements for a general breakdown. (The Summary of Sources of Revenue identifies customers and appropriation. The Cost and Budget Summary identifies ship and non-ship work by sub-categories.)

²See Chapter III for a discussion of how workloads are allocated among naval and private shipyards.

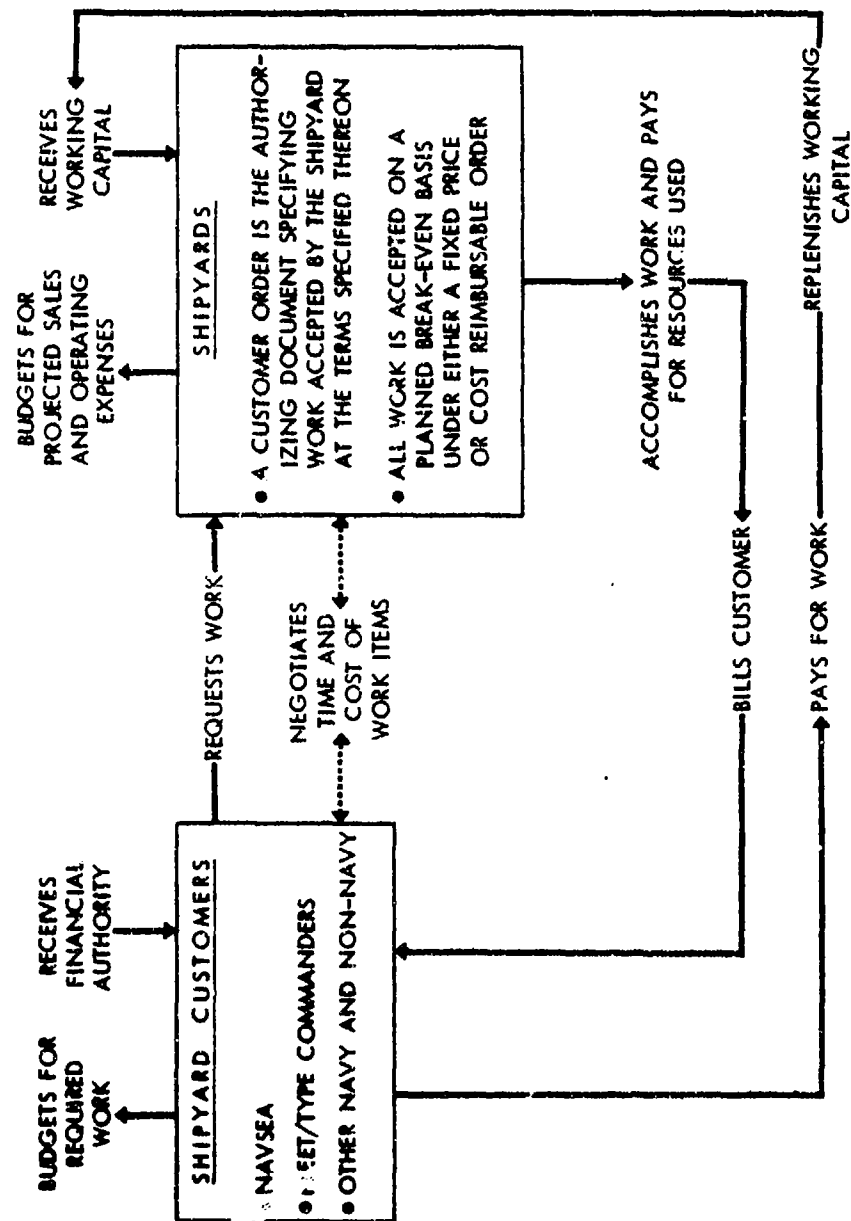


Figure N-1. MODEL OF NIF SYSTEM FOR NAVAL SHIPYARDS

quality services are provided in a timely manner and at a reasonable cost.

2. Shipyard Operation

The customer order, once accepted by the shipyard, becomes the authorizing document for work to be performed. The shipyard finances its operation from its net working capital and, as the work is accomplished, bills the customer. When the bill is collected, the shipyard is reimbursed for costs incurred and replenishes its working capital. This producer-customer (adversary type) relationship results in a constant pressure on the shipyard to define accurately all tasks to be performed and to produce quality work at a reasonable cost within the agreed-upon time span.

3. Charges to NIF Customers

Industrial Fund activities operate on a planned break-even basis (i.e., zero profit or loss). Thus, shipyard charges are set at a level designed to recover all costs expected to be incurred by the shipyard in accomplishing the work for each customer.¹ Costs such as depreciation of plant property, military pay and allowances, acquisition and improvement of

¹Differences between expected and incurred costs for individual orders serve to increase or decrease temporarily the shipyard working capital. Overhead rates are then adjusted to achieve a zero profit at the end of the fiscal year.

real property and equipment,¹ and customer furnished material are not funded by the NIF and hence are not billed to DoD customers.²

4. NIF Billing and Collecting

Under the NIF, shipyards may bill customers upon completion of the job or on a progress-payment or partial-payment basis, depending on the duration and total cost of the job. In most cases, billings are made on a Standard Form 1080³ and payment is made by a regular disbursing officer since funds are obligated at the time the shipyard accepts the work.

5. Cost Reimbursement Versus Fixed Price Orders

Under a cost reimbursement order, the customer is provided an estimate of the cost of work at the time the contract is negotiated but agrees to reimburse the shipyard for actual costs incurred. If the difference between the estimate and the actual cost of the completed work is less than \$100, the customer is billed for the amount of the estimate. If during the course of the work, but prior to completion of the work, it becomes evident that actual costs will vary more than \$100 from the estimate, renegotiations are initiated with the customer.

¹Generally, these items are financed from appropriated funds. However, minor acquisition of equipment and improvements less than \$50,000 are financed by the NIF. Also, some projects are funded initially by the NIF but funds are recovered later from appropriated funds.

²Generally, customers from outside the DoD are required to provide cash advances sufficient to cover the estimated costs of work. Bills for these customers do include allocation of costs not funded by the NIF.

³The SF 1080 is used between government departments/agencies to bill and to transfer between appropriations amounts due for services or materials furnished.

Adjustments are then made to redefine either the scope or price of the work so the final billing will be within \$100 of the actual costs incurred.

A fixed price order is defined as:

- (1) A delivered price mutually agreed upon prior to the commencement of any work on an order, or,
- (2) A cost reimbursement order converted to a fixed price basis either prior to incurring 50 percent of the total cost, or, before 50 percent of the period of performance has expired.¹

At the time this agreement is reached, the scope and price of the total effort are essentially fixed. This provides advantages to both the customer and the shipyard. The customer is able to plan work with a greater degree of confidence than he could if the final bill is not known until all work is completed. The shipyard gains additional control and flexibility in scheduling work once the work package becomes firm.

C. BASIC COST CLASSIFICATIONS

Before proceeding to a discussion of the NIF cost accounting system, several fundamental cost definitions and classifications must be considered. NIF costs are classified generally as direct and overhead or as labor, material and "other." These groups are defined in the following paragraphs.

1. Cost Categories

a. Direct Costs

Those elements of costs incurred which can economically and conveniently be identified to specific job orders for customer's work.

¹NIF Handbook, paragraph 5104, pp. 5-12. Naval shipyards are precluded from including contingencies in the fixed price to cover variances on prior work for a particular customer.

b. Overhead Costs

Those elements of costs incurred resulting from operations performed to facilitate accomplishment of work for all customers. This includes those costs which cannot economically and conveniently be charged to a specific job order. These costs are further categorized as:

Production Overhead. Expenses which are incurred in production cost centers in support of direct work.

General Overhead. All other expenses incurred to support the mission of the shipyard. These are further categorized as: (1) Administrative (i.e., costs, such as payroll, security and personnel recruitment, that benefit all activities in the yard); and (2) Manufacturing (i.e., costs, such as Quality Assurance, that benefit only the production activities)

2. Cost Elements

The basic cost elements are labor, material and "other" costs. Classification on this basis is most often made as a sub-grouping of costs under the primary direct and overhead categories. General definitions and significant points for the six groups that are used most generally are as follows:

Direct Labor. Labor identifiable to a specific customer work request. Currently, all direct labor is performed by civil service employees; there is no direct military labor in the shipyards.

Direct Material. Material that becomes a part of the finished work for a specific customer work request.

Other Direct Costs. Miscellaneous costs identifiable to specific customers -- includes contractual services as well as work performed by other naval shipyards.

Indirect Labor. Labor not identifiable to a specific customer order. Cost of supervision is generally included in this category unless the supervisor is performing direct productive work equivalent to that of his subordinates. The indirect labor cost element includes the premium portion of overtime performed for federal customers unless this overtime is authorized in writing by the customer.

Indirect Material. Consumable materials and supplies not readily identifiable to specific customers.

Other Indirect. Miscellaneous indirect charges, including work performed by other yards and by contractors.

D. COST ACCOUNTING SYSTEM

The Navy has prescribed detailed procedures for the uniform application of charges in its shipyards. An integral part of these procedures is embodied in the job order cost accounting system described in the NIF Handbook for Naval Shipyards. This system is based on the issuance of a job order authorizing and describing the work to be performed. The same job order is used to accumulate direct labor, direct material and overhead charges for the work accomplished. This section describes the shipyard job order cost accounting system. Figure N-2 provides an overview of the relationships involved.

1. Work Orders

The customer order is the basic agreement between the shipyard and the customer. The specific work requested and all

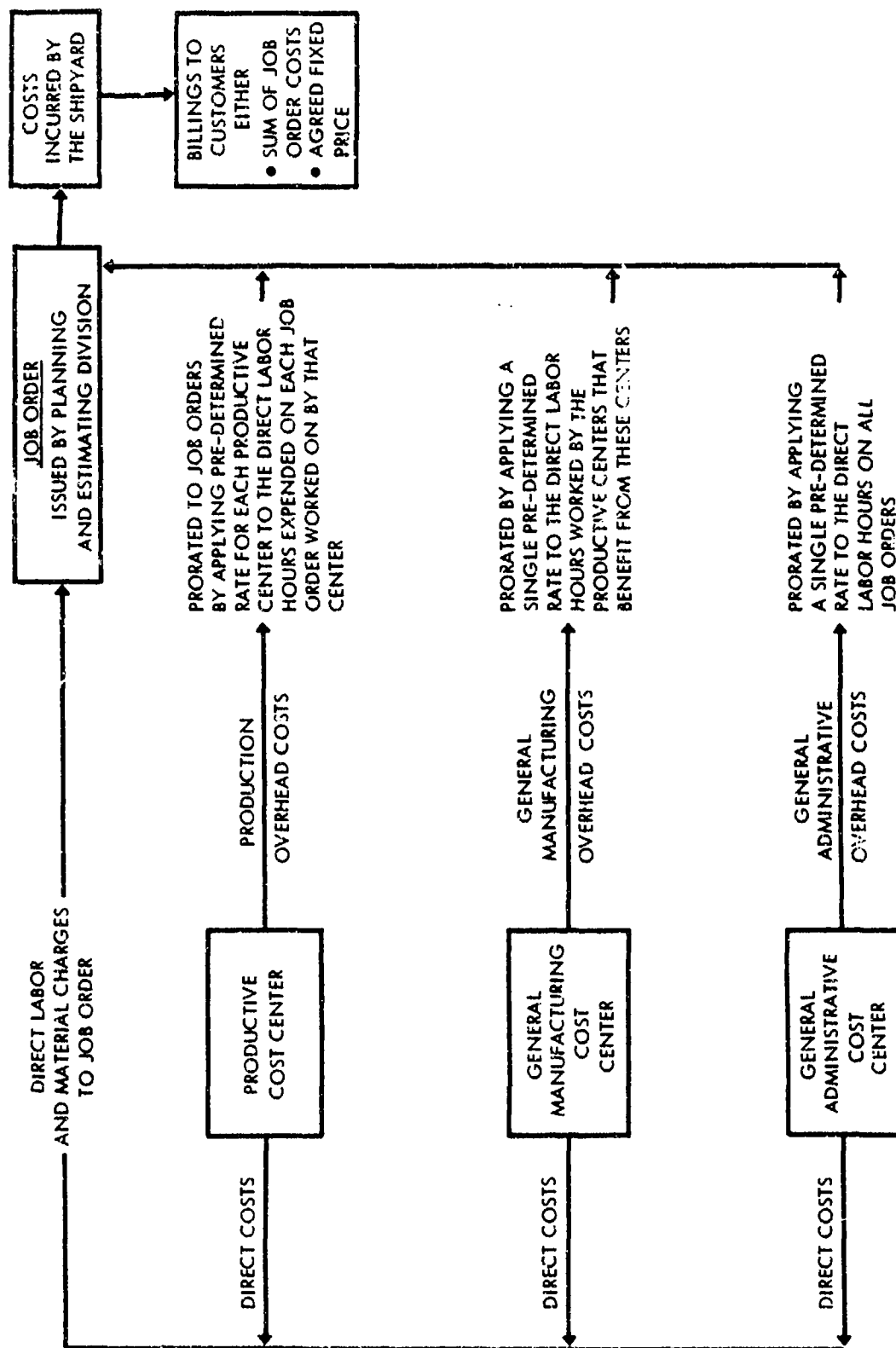


Figure N-2. OVERVIEW OF JOB ORDER COST ACCOUNTING SYSTEM FOR NAVAL SHIPYARDS

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terms for performance are included. When accepted by the shipyard, it becomes the basis for the accumulation of costs to be billed to the customer. The shipyard Planning and Estimating Division issues job orders to the activities designated to accomplish specific items under the customer order. These job orders become the basic documents for the accumulation of costs incurred by the shipyard for specific customers.

2. Work Categories

All customer orders are assigned a control number for identification purposes. The first two digits of this control number identify the category of work to be performed. These work categories, in turn, provide the basis for a standard work classification system by type of work. Thus, retrieval of data, in standardized groupings, is facilitated.¹

As shown by Table N-1, all shipyard work is classified initially as shipwork or non-shipwork.² Within each of these broad groups, summary level groups are used to facilitate retrieval of data at a lower level of detail. Within these summary groups, each two-digit code specifies a particular type of work in greater detail. For example, Code 22 is Shipwork, MSC--Overhaul and Repair; Code 50

¹See, for example, the Cost and Budget Summary in the Shipyard NIF Financial and Operating Statements or the Ship Departure Reports, both of which routinely report costs by work category.

²Shipwork is broadly defined as all work that can be identified to a specific hull. All other work is termed non-shipwork. Within the accounting system, there is some room for interpretation so that the definition of shipwork is not precise in some cases. For example, the source of funds is sometimes used as a basis for decision in cases in which classification is not clear cut. Thus all work funded with Fleet money could be classified as shipwork.

is Shipwork, Research and Development; and Code 61 is Non-shipwork, Manufacturing--Navy and Defense Stock Fund. Standard codes have not been prescribed to distinguish nuclear from non-nuclear work. Each yard, however, is required to develop a coding system, within the framework of Table N-1, that will facilitate retrieval of data on this basis.

Table N-1. CLASSIFICATION OF WORK PERFORMED
IN NAVAL SHIPYARDS

Summary Level Category	First Two Digits of Customer Job Order Number
Shipwork	
Construction and Conversion	10-15
Overhaul and Repair	16-29
Alteration	30-39
All Other	40-59
Non-shipwork	
Manufacturing	60-71
Other Productive Work	72-89

Source: Department of the Navy, Office of the Comptroller, Navy Industrial Fund Handbook for Naval Shipyards, NAVSO P-1242, November 1974, para. 3510.

3. Cost Centers¹

Cost centers are used in the NIF cost accounting system in conjunction with job orders to provide the basis for accumulating and controlling costs. A cost center is a grouping of related activities under a single management responsibility and is made up of elements which have common cost characteristics.² Cost centers may be classified on the basis of the primary purpose of each, as follows:

(1) Production Centers

Direct

Quasi

(2) General Centers

Manufacturing

Administrative

a. Production Cost Centers - (See Table N-2)

The production cost centers are activities organized for the primary purpose of performing work directly for customers. There are two basic types, direct and quasi. The direct centers are those engaged primarily in work considered to be basic to the shipyard role. For example, most of these centers are

¹Accountants generally speak of production cost centers and overhead expense centers. This technical distinction serves no useful purpose in this overview of shipyard operation under the NIF and will not be used.

²A cost center may be an entire department or a small activity within a department. Individual cost centers within a larger activity may be classified separately depending on the primary work performed. For example, some of the activities in Quality Assurance are productive cost centers while others are general. Each employee is assigned to a specific cost center but his time is charged either direct or overhead depending on the actual work performed.

Table N-2. PRODUCTION COST CENTERS

Title	Code
Planning Department	
Supply Department (Fleet Support)	901*
Shipbuilding Scheduling Office	902*
Family Housing	903*
Design Division	904
Nuclear Power Division	913
PERA	924*
Combat Systems Division	990
Production Department (Common Services)	
Common Services--Structural Group	920
Common Services--Mechanical Group	930
Common Services--Outfitting	940
Common Services--Electrical/Electronics	950
Common Services--Service	970
(At some shipyards, Cost Center 410, a general expense center is used similarly to collect common services cost of the Public Works Department.)	
Production Department (Other)	
Quality and Reliability Assurance (Shop)	905
Quality and Reliability Assurance-NDT Branch	907
Quality and Reliability Assurance-Radiological Control	908
Radiological Control and Nuclear Inspection Laboratory	909
Shipfitters Shop	910
Sheet Metal Shop	911
Forge Shop	917
Welding Shop	923
Inside Machine Shop	926
Weapons Shop	931
Outside Machine Shop	936
Boiler Shop	938
NAVSEASYS COMMGT OFFICE (WESTPAC)	941
Electrical Shop	944*
Pipe and Copper Shop	951
Woodworking Shop	956
Electronics Shop	964
Paint Shop	967
Riggers and Laborers Shop	971
Industrial Management Office	972
NAVSEA Support Office	974*
NAVSEA CLAIM TEAM	975*
Pattern Shop	978*
Computer Applications Support and Development Office (Portsmouth Naval Shipyard)	994
Temporary Services	996
	999

*Quasi Production Cost Centers

Source: Department of the Navy, Office of the Comptroller,
Navy Industrial Fund Handbook for Naval Shipyards,
 NAVSO P-1242, November 1974, para. 2201.

production shops whose workers comprise the basic shipyard work force. The quasi centers are activities assigned to the shipyard and financed under the NIF but not required for the performance of the shipyard's primary mission.

b. General Cost Centers

The primary purpose of general cost centers is to support other shipyard activities. There are two basic types of general cost centers, manufacturing¹ and administrative. The general manufacturing centers (see Table N-3) are engaged primarily in work that benefits only the production centers. The general administrative centers (see Table N-4) are engaged primarily in work that benefits all cost centers.

4. Overhead Costs and Rates

As depicted in Figure N-2, every cost center incurs both direct and overhead costs. As stated earlier, direct costs are charged directly to customer job orders. This section describes the treatment of overhead costs in the NIF cost accounting system.

a. Overhead Categories

NIF cost accounting procedures include the following separate overhead categories:

¹A more descriptive term would be "production support."

Table N-3. GENERAL MANUFACTURING COST CENTERS

Title	Code
Ship Management Office, Cost Center	120
Quality Assurance Office, Cost Center	130
Administration	132
Engineering and Analysis Division	136
Welding Engineering Division	138
Planning Department, Cost Center	200
Administrative Assistant	202
Plan Files	203
Type Desk	211
Nuclear Type Desk	218
Advance Planning Manager	219
Engineering Officer	220
Office of the Chief Planner	225
Service Branch	228
Material and Equipment Branch	229
Job Planning Branch	230
Nuclear Job Planning	238
Planning Coordination Section	239
Production Department, Cost Center	300
Administration	302
Nuclear Production Services	328
Repair Office	331
Test Coordination Branch	365
Production Control Branch	375
Methods and Standards Branch	383
Facilities and Equipment	385
Nuclear Facilities and Equipment	388
Production General, Expense Center	390
Central Tool Room, Expense Center	396

Source: Department of the Navy, Office of the Comptroller,
Navy Industrial Fund Handbook for Naval Shipyards,
 NAVSO P-1242, November 1974, para, 2201.

Table N-4. GENERAL ADMINISTRATIVE COST CENTERS

Title	Code
Shipyard Commander, Expense Center	100
Administration	102
Data Processing Office, Expense Center	110
Administration	112
Programming	113
Rental of Equipment and Cost of Installation	114
Operations	115
Control and Scheduling	116
EDP Operations	117
EAM Operations	118
NAVSEA NSY MIS Program	119
Management Engineering Office, Cost Center	140
Management Engineering Office	142
Industrial Relations Office, Cost Center	150
Administration	152
Employee Relations Division	160
Union/Association Contract Administration	161
Employee Services Branch	165
Incentive Awards	166
Personnel Operations Division	170
Employee Development Division	180
Safety Division	185
Shipyard General, Cost Center	190*
Reproduction Branch, Cost Center	245
Administration	246
Reproduction	247
Micro-photography	252
Photolithography and Metal Photos	253
Duplicating	255
Photographic	256
Graphic Arts	257
Public Works Office, Expense Center	400
Photographic and Graphic Arts	404
Engineering Division	405
Maintenance Control Division	406
Weight Handling Equipment	407
Inspection & Test Branch	
Weight Handling Equipment - Nuclear	408
Public Works Common Services, Cost Center	410*
Public Works Department Transportation	420*
Branch (Shop 02) Cost Center	
General Overhead	421*

*See note at end of table.

(Continued on next page)

Table N-4. (Continued)

Title	Code
Material Handling Equipment - Operation	422
Material Handling Equipment - Maintenance	423
Excavating and Grading Equipment - Operation	428
Excavating and Grading Equipment - Maintenance	429
Miscellaneous Construction and Maintenance Equipment Operation	430
Miscellaneous Construction and Maintenance Equipment Maintenance	431
Railway Equipment - Operation	432
Railway Equipment - Maintenance	433
Fire Fighting Equipment - Operation	434
Fire Fighting Equipment - Maintenance	435
Weight Handling and Weight Lifting Equipment - Operation	436
Weight Handling and Weight Lifting Equipment - Maintenance	437
Automotive Equipment - Operation	438
Automotive Equipment - Maintenance	439
Weight Handling Equipment (Nuclear) Maintenance	440
Public Works Department, Utilities Branch (Shop 03) Cost Center	460
General Overhead	461*
Steam	462
Electricity	463
Compressed Air	464
Potable Water	465
Salt or Non-Potable Water	466
Distilled Water	467
Sewage	468
Gas	469
Public Works Department, Maintenance Branch (Shop 07) Expense Center	470
General Overhead	471*
Maintenance of Production and Process Shop Buildings	472
Maintenance of Other Buildings	473
Maintenance of Air Conditioners	474
Maintenance of Grounds and Ground Structures	475
Maintenance of Streets, Roads and Walks	476
Maintenance of Sewage and Industrial Waste System	477

*See note at end of table.

(Continued on next page)

Table N-4. (Continued)

Title	Code
Maintenance of Berthing Facilities	478
Maintenance of Drydocks and Shipways	479
Dredging	480
Maintenance of Service Craft	481
Maintenance of Camels, Floats, Brows and Other Floating Equipment	482
Maintenance of Communications Facilities	483
Maintenance of Miscellaneous Equipment	484
Other Maintenance	485
Janitorial Services	486
Trash, Scrap and Garbage Disposal	487
Other Operating Costs	488
Supply Department, Cost Center	500
Industrial Material Liaison Division	504
Industrial Material Centers Division	505
Control Division	510
Purchase Division	530
Technical Division	540
Inventory Division	550
Material Division	560
Administration	502
Industrial Material Control Division	510
Technical Division	540
Material Division	560
Material Centers	590
Comptroller Department, Cost Center	600
Administrative	602
Internal Review	610
Budget and Statistics	620
Accounting Division	630
General Accounting (Excludes Payroll)	640
Payroll	645
Cost Accounting (Excludes Timekeeping)	650
Timekeeping	655
Disbursing	660
Appropriation and Property Accounting	670
Medical Department, Cost Center	700
Administration	702
Medical Facilities	703
General and Preventative Medicine	710
Industrial Medicine	720
Industrial Hygiene	730
Radiation Health	740
Dental Department, Cost Center	750
Treatments	752

(Concluded on next page)

Table N-4. (Concluded)

Title	Code
Administrative Department, Cost Center	800
Administration	802
Naval Personnel and Military Services	811
Ships Movement	812
Communications	813
Telephone	814
Maintenance and Operation of Service Craft (Except Nuclear)	820
Security - Other	830
Security - Police	831
Security - Fire	834
Mail, Correspondence and Files	861
Typing and Stenographic	862
Duplicating	863
Centralized Travel	864
Central Office Equipment	865
Central Stationery Locker	866
Paperwork Management	867

*The shipyards routinely publish total overhead cost for all general administrative cost centers. See, for example, the *F&O Statements* discussed in Section E. In addition, for selected general administrative cost centers, detail by cost class is also provided. These are indicated by an asterisk (*).

Source: Department of Navy, Office of Comptroller,
Navy Industrial Fund Handbook for Naval
Shipyards, NAVSO P-1242, November 1974,
para. 2201.

Production Overhead. The cost of work performed in production cost centers that supports direct efforts in those centers. Shop supervision, material expediting and shop planning are examples of this type of overhead.

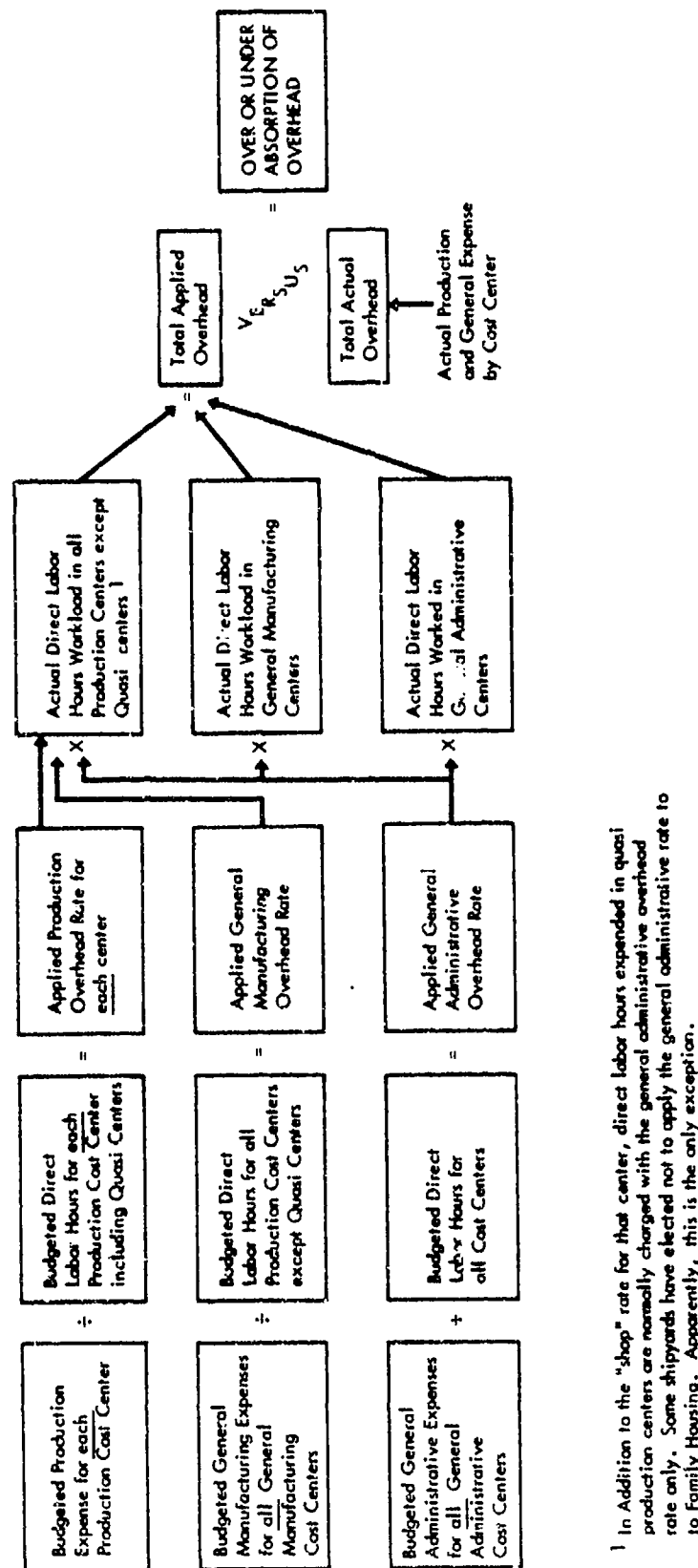
General Manufacturing Overhead. The cost of work performed in general manufacturing centers that cannot be identified to a specific customer order.

General Administrative Overhead. The cost of work performed in general administrative centers.

In conjunction with the development of the annual budget, the manager of each cost center estimates total overhead expenses for the coming year. The factors considered include projected employment, projected workload, and the estimated number of labor hours expected to be charged to direct job orders. From these estimates, various overhead rates are computed. These predetermined overhead rates are applied to the actual direct labor hours incurred for customers during the year so each customer can be charged a proportionate share of the estimated overhead expense.

b. Applied Overhead

The predetermined rates applied to the direct labor hours charged to customers are known as applied overhead rates. Figure N-3 provides an overview of the relationships between the various overhead categories and rates. These rates are used to prorate overhead expenses to the direct labor hours accumulated by job orders.



1 In Addition to the "shop" rate for that center, direct labor hours expended in quasi production centers are normally charged with the general administrative overhead rate only. Some shipyards have elected not to apply the general administrative rate to Family Housing. Apparently, this is the only exception.

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Figure N-3. OVERVIEW OF OVERHEAD RELATIONSHIPS

Production Overhead Rates. An applied overhead rate is developed for each production center¹ that distributes its estimated net overhead expense to all direct labor hours expended in that center.

General Manufacturing Overhead Rates. A single overhead rate is normally used to distribute general manufacturing overhead expenses.² This rate is applied only to direct labor hours performed in the production centers that benefit from the services provided.

General Administrative Overhead Rates. A single overhead rate is used to distribute general administrative expenses to all work performed in the shipyard.

c. Actual Overhead

Actual overhead expenses for each cost center are accumulated during the fiscal year. This procedure serves a dual purpose. First, accurate identification of actual overhead expenses provides an improved basis for estimating overhead expenses to meet future pricing and budgeting requirements. Second, comparison of actual to budgeted overhead expenses provides the manager an additional management tool to monitor planned versus actual work accomplishment.

¹The term "shop" overhead rate is commonly used to refer to the unique production overhead rates. Actually, each production center, including the quasi centers, has its own rate.

²Some of the yards have elected to use a separate applied rate for the Planning Department as a means for a more equitable allocation of costs.

Cost Classes. The NIF accounting system uses cost classes to accumulate overhead expenses within a cost center. Codes identifying cost classes provide management with a uniform classification of significant overhead expenses. This system facilitates the identification and control of overhead costs. The current codes are summarized in Table N-5.¹ The use of cost classes is mandatory in the production centers and detailed information at this level is routinely reported above the shipyard level.² The use of cost classes for general centers is controlled by NAVSEA and is limited to specific centers. As a result, much less detailed information about the composition of overhead in general is available above the shipyard level.³

Actual Composite Overhead Rates. The NIF procedures require that composite actual overhead rates be computed and published for management purposes. These rates are not used to charge overhead costs but are useful for showing the relative composition of the three major overhead categories. These composite rates are computed on the same basis as the applied overhead rates except that actual rather than estimated expense data are used. Thus, comparison of actual versus applied overhead rates is facilitated. In addition to the individual rates, a single production overhead rate is computed. This rate represents the rate that would have recovered total incurred

¹See paragraph 2204 of the *NIF Handbook* for a detailed definition of each cost class.

²See, for example, the shipyard financial statements discussed later in this appendix.

³All shipyards have elected to use, to varying degrees, detail by cost classes for internal management of general centers. However, this detail is reported outside the shipyard for only a few general centers. See, for example, the financial statements.

Table N-5. COST CLASS CODES*

Code	Cost Centers	Code	Cost Centers
Part I. Operation			
01	Supervision (Ungraded)	23	Union Activities
02	Supervision (Graded)	26	Minor Shop Stores Issues
03	Nonsupervision (Graded)	28	Alterations
04	Shop General	30	Travel
05	Shop Planning	31	Telephone Communications
07	Tool Room Operation	32	Rental and Communications
08	Safety Program	33	Printing, Reproduction and Duplicating
09	Training (Apprentice only)	34	Other Income
10	Lost Time	35	Installation of Plant Equipment
11	Time Allowed	36	Dispatching
12	Product and Material Expediting and Consumable Supplies	38	Training (Nuclear)
13	Equipment Operation	39	Training (Nonapprentice)
14	Defective Work and Spoilage	40	Purchased Utilities
15	Janitorial Services and General Clean-up	42	General Expenses Transferred
16	Process Labor and Direct Material	46	Common Services Transferred
18	Fuel	50	Human Resources Aid Programs
19	Coding Rejects	51	Variances-Manufacturing Centers
22	Product Type Services Difficult to Charge Directly	53	Shipyard-Wide Special Programs
		59	Retroactive Compensation Adjustments
Part II. Maintenance			
61	Building and Structure	67	Distribution Systems
62	Office Equipment and Furniture	68	Acquisition-Minor Property
63	Other Equipment	69	General Maintenance
64	Ship Machinery and Tools	71	Major Maintenance Accrual
65	Plant Account Under \$1,000	72	Service Craft and Floating Equipment
66	Nuclear Equipment	73	Radiological Control Barge
		74	Pollution Clean-up

*Used to accumulate overhead costs within the cost centers.

Source: Department of the Navy, Office of the Comptroller, Navy Industrial Fund Handbook for Naval Shipyards, NAVSO P-1242, November 1974, para. 2204.

production expense if it had been applied to the total direct labor hours expended in all production centers.

d. Overview of the Application of Overhead Under the NIF

Budgeted (estimated) overhead expenses are prorated among the customers that benefit from the services involved by applying various predetermined rates to the direct labor hours charged to job orders. Overhead rates for each of the three categories of overhead are applied to the actual direct labor hours expended in production cost centers. The general administrative overhead rate is the only rate applied to actual direct labor hours expended in general cost centers.

Basic NIF policy calls for stable applied overhead rates over the entire fiscal year. Theoretically these rates are to be set at the beginning of the year at a level that will provide a "no-gain-no-loss" position at the end of the fiscal year. Actually, because of unforeseen changes during the year, applied rates are adjusted by the shipyard commander as required to enable him to achieve the "no-gain-no-loss" position. Naval shipyards are precluded, however, from making major changes in applied overhead rates during the last quarter of the fiscal year for the sole purpose of achieving a position in which receipts exactly equal costs.¹

¹NAVSEASYS COM has established that a year-end gain or loss within one-half of one percent of the total NIF funded operation is considered reasonable (Paragraph 3302, *NIF Handbook*).

E. FINANCIAL AND OPERATING (F&O) STATEMENTS

DoD Industrial Fund regulations require submission of periodic financial and operating statements on all industrially funded activities.¹ These regulations prescribe the information to be provided on an annual and semi-annual basis and provide general formats. Chapter 6 of the NIF Handbook for Shipyards has expanded this requirement so that each shipyard submits various data on a monthly and quarterly basis. Shipyard F&O Statements are prepared monthly by the Comptroller and submitted to NAVSEASYSCOM. Quarterly statements are submitted to the Office of the Navy Comptroller.²

Several of the exhibits included in Financial and Operating Statements were used as primary sources of cost and man-day data for this paper. Statements as of 30 June proved especially useful since they provided summary data for the entire fiscal year. A short description of the most significant statements, together with examples of the data extracted, is presented in the following paragraphs.

1. Statement of Revenues and Costs

Summarizes the revenues and costs arising from operations and the changes in accumulated operating results from the

¹DoDI 7410.5, "Financial Reports for Department of Defense Industrial Funds," January 3, 1975, outlines procedures to respond to this requirement. Section 2208, Chapter 131 of Title 10, U.S.C., requires that reports of the condition and operations of working capital funds be made annually to the President and Congress through the Secretary of Defense.

²NIF Handbook, Chapter 6.

beginning of a fiscal year to the end of the reporting period.

Includes separate sections on--

(1) Total revenue with detail by such categories as construction and conversion; overhaul, repair and renovation; and support of tenants and satellites.

(2) Total costs incurred with detail by labor, material, and other cost elements for direct and overhead cost categories. Also provides net income and changes in retained earnings for the reporting period.

(3) Costs for depreciation, disability compensation, and military compensation, which are not paid by the NIF.

(4) Military and civilian employment as of the last day of the reporting period. For civilian employees, the number and average base pay for general schedule and wage board employees is also provided. For wage employees, the number at step three and above is shown.

2. Cost and Budget Summary of Work in Process by Work Category

Includes detail on the direct cost, applied overhead and the number of direct mandays expended for the reporting period. Subtotals are provided for ship and non-ship work as well as for lower levels of detail.

3. Summary of General Expense Distribution

Provides detailed data on adjustments to total general expense, total direct labor hours by cost center type, and computation of applied general manufacturing and general administrative overhead rates.

4. Detailed Overhead Expense Statements by Cost Center

Provides individual cost center data for labor hours, labor and material cost, and overhead expense. Detail is provided by cost class for all production centers. Production centers are also summarized by four different groupings, as follows:

- Production Department Productive Shops
- All Other Production Centers Except Quasi Production Centers
- All Production Centers Including Quasi Productive Centers
- Total all Production Centers

5. Summary of Actual Composite Overhead Rate

Provides a single overhead rate, derived from actual overhead expenses and direct labor hours, for each of the three categories of overhead expenses. Detail is provided by cost class for the production overhead rate. Detail for the general expense rates is provided by major cost center.

Enclosure I

Extract from DoDD 7410.4.

OBJECTIVES OF INDUSTRIAL FUNDS

A. Industrial Funds are designed to:

1. Provide a more effective means for controlling the costs of goods and services required to be produced or furnished by industrial and commercial-type activities, and a more effective and flexible means for financing, budgeting and accounting for the costs thereof;
2. Create and recognize contractual relationships between industrial and commercial-type activities and those activities which budget for and order the end-products or services, in order to provide management advantages and incentives for efficiency and economy;
3. Provide to managers of industrial and commercial-type activities the financial authority and flexibility required to procure and use manpower, materials and other resources effectively;
4. Encourage more cross-servicing among the Military Departments and among their operating agencies, with the aim of obtaining more economical use of facilities;
5. Support the performance budgeting concept by facilitating budgeting and reporting for the costs of end-products, and thus underlining the cost consequences of decision making, including choices between alternatives in such terms.

B. Specific objectives, when industrial funds are used, include the following:

1. To furnish managers of industrial and commercial-type activities with modern management tools comparable to those utilized by efficient private enterprises engaged in similar types of activities;
2. To provide an incentive for managers of industrial fund activities to improve cost estimating and cost control through use of cost standards by requiring a contractual relationship between producer and ordering agencies;
3. Require alert, forward-looking financial planning at industrial and commercial-type activities by making them dependent financially on reimbursements received for goods and services furnished in fulfilling orders from customers;
4. Impel producers of goods and services to coordinate labor force and inventories with workload generated. It is recognized that statutory and executive restrictions on the levels of employment and the additions or reductions of personnel frequently limit flexibility and make difficult effective control over employment in relation to workload. However, producers must avoid the tendency to maintain a labor force without regard to workload levels, taking into consideration the balancing of skills to meet the long-term anticipated workload;
5. To coordinate the financial aspects of detailed estimating and planning for job performance in terms of material requirements and labor operations, production scheduling and control, and procurement and inventory control, with budgeting and cost control;
6. To establish and use realistic cost standards as targets rather than detailed cost limitations;
7. Require ordering agencies to budget, control and account for the cost of all goods and services ordered, rather than allow them to obtain goods and services free or at non-compensatory rates. This requirement is designed to instill in the officials of these agencies a greater sense of responsibility and self-restraint in limiting their orders, and balancing the cost of specific goods and services to be ordered against the

benefits and advantages of their procurement, especially in the light of alternative or competing demands.

8. To place ordering agencies in the position of critic of purchase prices (i.e., costs of performing activities) as well as quality and delivery-speed of the goods and services ordered in consideration of relative costs of similar performing activities and outside agencies;
9. Provide meaningful bills to ordering agencies, clearly relating the goods and services furnished by a performing activity to the charges rendered, causing the ordering agencies to assess their procurement practices and specifications in full awareness of the costs involved;
10. Enable ordering agencies to budget and account on an "end-product" basis (the same as when buying from commercial contractors), simplifying budget presentations, budgetary control, and accounting procedures for both producers and ordering agencies;
11. To establish, wherever feasible, predetermined prices (tariff schedules, price lists, fixed-price orders) for goods and services furnished by industrial fund activities, thus setting standard prices on performance and enabling ordering agencies to plan and budget more confidently;
12. To encourage management of ordering agencies to improve program planning and scheduling, in response to producers' efforts to negotiate for orders as far in advance as possible.

benefits and advantages of their procurement, especially in the light of alternative or competing demands.

8. To place ordering agencies in the position of critic of purchase prices (i.e., costs of performing activities) as well as quality and delivery-speed of the goods and services ordered in consideration of relative costs of similar performing activities and outside agencies;
9. Provide meaningful bills to ordering agencies, clearly relating the goods and services furnished by a performing activity to the charges rendered, causing the ordering agencies to assess their procurement practices and specifications in full awareness of the costs involved;
10. Enable ordering agencies to budget and account on an "end-product" basis (the same as when buying from commercial contractors), simplifying budget presentations, budgetary control, and accounting procedures for both producers and ordering agencies;
11. To establish, wherever feasible, predetermined prices (tariff schedules, price lists, fixed-price orders) for goods and services furnished by industrial fund activities, thus setting standard prices on performance and enabling ordering agencies to plan and budget more confidently;
12. To encourage management of ordering agencies to improve program planning and scheduling, in response to producers' efforts to negotiate for orders as far in advance as possible.

APPENDIX O

DESCRIPTION AND EVALUATION
OF THE FEDERAL WAGE SYSTEM

DESCRIPTION AND EVALUATION OF THE FEDERAL WAGE SYSTEM

This appendix discusses the pay system used to establish hourly wage rates for federal wage employees. The first part of the appendix contains an explanation of how the system operates and is based on the procedures outlined in *Federal Personnel Manual*, "Supplement 532-1," January 1973, as amended. The remainder of the appendix presents an evaluation of several provisions of the Federal Wage System that have a significant impact on the cost of shipyard operations.

A. BACKGROUND

Employees in naval shipyards may be divided into two groups based on personnel classification and pay systems. The largest group, the wage employees, makes up approximately 75 percent of total shipyard employment. This group comprises employees in the trade, labor and craft job categories. The remaining 25 percent are the general schedule employees, those in the clerical, administrative, technical and professional job categories.¹

For the two groups of employees Congress has enacted two different pay systems, both administered by the Civil Service Commission (CSC). The fact that the pay systems are separate is apparently the result of the historical evolution of the federal work force and congressional interest in federal civil service pay factors. In any case, congressional action is required before major changes can be made in these pay systems.¹

The General Schedule System, prescribed by Chapter 51 of Title 5, United States Code, outlines procedures for the general

¹Wage employees are often referred to as blue-collar, ungraded, wage-grade, wage board or hourly workers. Other names used for general schedule employees are white-collar, graded or salaried workers. To avoid confusion in terminology, these alternate designations will not be used.

schedule workers. These workers are paid according to a single, national rate schedule. The schedule is reviewed annually and recommendations for adjustment are made based on the rates being paid for comparable work in private industry. The data on private pay are collected on a nationwide basis by the Labor Department, which submits a tentative pay proposal to the President for approval. The purpose of the system is to retain comparability of federal salaries with those paid in private industry.

The Federal Wage System, prescribed by Chapter 53 of Title 5, United States Code, outlines procedures for the wage employees. The concept here is also to align government wages with those in private industry, but, unlike the system for general schedule employees, the goal is to align wages within local areas. For this purpose, wage areas are designated and all wage workers in that area are paid according to the wage schedule authorized for that area. The schedules are reviewed annually, at different times during the year in different areas, by a Lead Agency, normally the federal agency with the largest number of employees in the area. The Lead Agency analyzes data on prevailing local private industry labor rates and develops a new wage schedule for that area. This schedule is then submitted to the CSC for approval. Data on local private pay are collected by workers assigned to federal activities within that wage area. Data are imported from the nearest similar wage area when the local area survey does not provide an adequate data base.

The extent to which these two pay systems have achieved comparability of federal salaries with those paid in private industry is an important current issue in our economy. A considerable difference of opinion exists, especially with respect

¹In total, over 60 separate compensation systems are used to pay federal employees. Congress is currently reviewing the entire federal pay structure to determine if a single, overall system is feasible.

to employees in jobs covered by the General Schedule System. For example, a recent CSC analysis¹ of wage rates for general schedule employees concludes that wage comparability has been achieved in the lower grades but not at the GS-15 to GS-18 levels. At these higher GS-15 to GS-18 levels, private industry salaries were estimated to be significantly higher than salaries for comparable federal jobs. Private industry salaries are estimated to range from 12 to 94 percent higher than the GS-15 to GS-18 levels, exclusive of bonuses, with the differential increasing markedly as the grade levels increase. Bonuses in private industry were estimated to range from 15 percent of salary at the lower levels to approximately 30 percent at the higher levels with approximately one-third of the positions at each level receiving these bonuses.

All of the CSC analysis was based on the current \$36,000 restriction on federal salaries.² The results of the CSC analysis contrast sharply with the point of view of the general public and private industry that federal salaries are higher at practically all levels than those for comparable jobs in private industry and, in fact, are a major contributor to the spiraling labor costs being incurred today in the United States.³ Time did not permit separate analysis of the impact of pay differentials for jobs covered by the General Schedule System on the cost of labor in naval shipyards.

¹Study of Private Enterprise Pay Rates for Positions Equivalent to GS/14-18, U.S., Civil Service Commission, Washington, D.C., June 1974.

²Currently, all employees at level GS-15 step 8 and above are restricted by Congress to the \$36,000 limit and, hence, lose from about \$800 to over \$10,000 per year compared with the salaries shown on the general schedule. Removal of this restriction would reduce the differential but would not reverse the CSC conclusions.

³See, for example, "The New Look in Civil Service Pay," *Wall Street Journal*, Arch Patton, November 21, 1974. Mr. Patton, a former director of McKinsey and Co., was recently chairman of the Presidential Commission on Executive, Legislative and Judicial Salaries.

There is a similar difference of opinion about the extent to which wage comparability has been achieved for jobs in categories included in the Federal Wage System. There is little difference of opinion, however, with respect to wages in the shipbuilding industry. In fact, one of the widely accepted tenets about the difference between naval and private shipyards is that average wage rates in naval shipyards are significantly higher than in private shipyards. For example, a 1972 Booz-Allen study reported that average pay rates for wage employees were 17 percent higher in naval shipyards than those for comparable jobs in private shipyards.¹ Since 1972, this estimated percentage differential has been accepted as approximately correct. For example, during the 1974 congressional Seapower Hearings the Navy presented a detailed discussion about the way the area wage survey resulted in a 15 percent pay differential.²

The impact of the Federal Wage System on the cost difference between work performed in private and naval shipyards has received considerable emphasis since 1972. Apparently, this emphasis is due to the fact that--

- (1) Over 75 percent of the employees in naval shipyards are wage employees.
- (2) The rates for wage employees can be influenced by local decisions.
- (3) The availability of skilled labor in jobs included in categories covered by the wage system is a primary constraint on the ability of shipyards to increase total work force.

¹Booz-Allen Applied Research Inc., *Study of the Relative Cost of Ship Construction, Conversion, Alteration, and Repair in Naval and Private Shipyards*, Washington, D.C., June 1972.

²*Current Status of Shipyards, 1974*, Hearings Before the House Seapower Subcommittee of the Committee on Armed Services, 93rd Cong., 2nd sess., July-October 1974, Part 1, p. 185ff.

B. FEDERAL WAGE SYSTEM PROCEDURES

1. General

Subchapter IV of Chapter 53 of Title 5, United States Code, as amended by Public Law 92.932, 19 August 1972, provides for a pay system under which wage rates for federal wage employees are fixed and adjusted from time-to-time as nearly as is consistent with the public interest in accordance with the following principles:

- (1) Equal pay for substantially equal work for all federal employees who are working under similar conditions within the same local wage area. This principle avoids wage competition among federal agencies for the available labor supply.
- (2) Relative differences in pay within the same wage area when there are substantial or recognizable differences in duties, responsibilities, and qualification requirements among jobs. This principle permits different pay for different job classifications within federal agencies.
- (3) Rates of pay in line with prevailing levels for comparable work within a local wage area. This principle pegs federal wage employee wage rates to the average rate in private industry and, thereby, strives to prevent unfair competition on the basis of wages between federal agencies and private industry for the available labor supply.
- (4) Rates of pay maintained so as to attract and retain qualified employees in the job skills included in the wage employee categories. This principle, apparently, provides the loophole through which special job descriptions and wage rates may be established to meet extraordinary situations.

The Civil Service Commission is responsible for prescribing practices and procedures governing the implementation and administration of the Federal Wage System. The overall system involves establishing a job description for each federal position, assigning a wage grade to that position, and establishing wage rates for each grade based on the results of an annual survey of the wage rates for comparable jobs in private industry

in the same local area. Wages are to be set at a level that will assure that the federal workers receive wages comparable to those received by their counterparts in private industry.

2. The Federal Wage Grade Structure

The majority of the wage employees are covered by one of the following grade structures. Separate wage rate schedules are published for each structure.

Category	Grade Spread
Regular non-supervisory	WG-1 through WG-15
Regular leader	WL-1 through WL-15
Regular supervisory	WS-1 through WS-19

Special categories and schedules exist for specific purposes. The number of employees in these special groups is relatively small, however, and omitting them in this overview will not result in a significant gap.

All grades have five within-grade pay levels (steps) with the pay rate for each successive level 4 percent higher than the preceding level. Advancement to the next higher step is automatic, based on satisfactory work performance, at the completion of the time in years in each step as shown.

CATEGORY	YEARS AT EACH STEP				TOTAL YEARS TO STEP 5
	STEP 1	STEP 2	STEP 3	STEP 4	
WG and WL	1/2	1 1/2	2	2	6
WS	1	1	2	2	6

3. Organizational and Functional Responsibilities

The overall operation of the system can be summarized as follows:

- (1) The CSC defines the boundaries of the individual wage areas and designates the Lead Agency for each area.¹
- (2) The Bureau of Labor Statistics (BLS) furnishes the Lead Agency with the statistical establishment sample (including those which the Lead Agency asked to be included with certainty) and the weighting to be assigned to each.
- (3) The Lead Agency plans and schedules the wage surveys, analyzes the survey data, and *establishes wage schedules*. Specifically, it--
 - (a) Establishes specifications for coverage of each survey including those fixed by the CSC and matters optional with the agency.
 - (b) Establishes a five-member agency wage committee and appoints a Chairman and two members. One member each is designated by the two labor organizations having the largest number of employees covered by exclusive recognition.
 - (c) Establishes a local wage survey committee of three federal employees to conduct the actual survey and designates the Chairman. The local activity recommends one member. The remaining member is recommended by the labor organization representing the largest number of wage employees covered by the survey.
 - (d) Receives and analyzes all data collected within each wage area.

¹A wage area is a defined geographic area within which are found concentrations of federal wage employees in combination with concentrations of private enterprise employees. The geographical area is treated as a single unit for purposes of fixing and applying federal wage rates. (A portion of this area is normally surveyed and the wage schedule is applied to the entire area). The Lead Agency is normally the agency with the largest number of employees in that area. As of September 1974, there were 137 wage areas with the DoD the Lead Agency for all but 28.

- (e) Determines a wage trend payline, using linear regression techniques, that reflects the average wage rate for each survey job based on the data collected during the survey. However, where a straight payline does not reflect local wages reasonably well, the Lead Agency may adjust the linear trend line to provide the best fit to the local wage data.
- (f) Considers this statistically derived payline along with the following factors¹ in developing the payline for the wage area--
 - 1 the desirable objective of a rate schedule with uniform differentials between grades
 - 2 the relationship to average wage rates for specific occupations represented in the survey jobs and having substantial federal employment in an area
 - 3 current local labor market conditions in the principal occupations used by local institutions.
- (g) Develops a wage schedule for regular non-supervisory job positions from the payline. Schedules for other categories are derived from this basic schedule.
- (4) The local wage survey committee conducts the survey and forwards the wage data to the Lead Agency for analysis. The procedure is as follows:
 - (a) The local committee determines the number of data collectors required and provides necessary training and supervision. All data collectors are federal employees from the local area with one-half recommended by labor and one-half recommended by the federal activity conducting the survey.
 - (b) The survey involves visits by two-man data collection (essentially one union representative and one non-union member) teams to establishments that cover

¹This provision apparently provides the Lead Agency considerable flexibility in developing the final payline. Unfortunately, within the time allocated for this study, no specific examples of the use of this provision to adjust the statistically derived payline could be documented.

a cross-representation of the industries with employees performing work comparable to that performed by employees of the Federal Wage System. (Cooperation by the private establishment is, of course, voluntary but this has not proved to be a problem.) During the actual interview, establishment jobs are matched with a prescribed list of survey jobs and information is obtained on wage rates and on general employment. Only regular non-supervisory jobs are surveyed.

- (c) The local committee reviews all wage data collected and makes its decision on the acceptability of the pay data reported, the accuracy of rate computations, and differences between data collectors about the comparability of job matches. All data are, however, forwarded to the Lead Agency, together with a report of the results of the survey.

4. Significant Provisions

a. Deriving Wage Schedules

In general, the data collected during the local wage survey provide information on the number and hourly wage rates of employees in private industry in jobs comparable to jobs in the federal sector. These data are collected by federal workers assigned to federal activities within each local wage area. Only when insufficient samples, in terms of the number of job-matches, are obtained are data imported from outside the wage area.

All data are forwarded to and analyzed by the Lead Agency with responsibility for developing the wage schedule for each area. The data collected during the survey are used to develop a prevailing wage rate trend line for that area. A wage rate schedule for step-two of the non-supervisory employees is developed from this trend line. Schedules for other categories are derived from this schedule as follows:

- (1) Leader Grades: The step-two rate for each grade is set at 10 percent above the step-two rate for the corresponding non-supervisory grade.

- (2) Supervisory Grades: The step-two rates for grades 1 through 10 are set at 30 percent above the corresponding step-two rate for the non-supervisory grades. Step-two rates for grades 11 through 19 are based on a parabolic curve linking the WS-10 rate to the WS-19 rate which, in turn, is set at the first step of the GS-14 rate.

b. Survey Industries

The CSC specifies the industries to be surveyed in terms of the Standard Industrial Classification (SIC) System published by the Office of Management and Budget. The designated industry groups are summarized in Table O-1. A Lead Agency may not omit an industry from this list. Other industries may be added if the Lead Agency determines that these industries account for significant proportions of local private employment of the kinds and levels found in local federal activities. In all cases, the actual list of establishments to be surveyed is provided by the BLS.

c. Survey Jobs

The CSC specifies the list of jobs to be surveyed to assure that a wide range of occupations common in skills and responsibility in both industry and government are surveyed. These jobs are summarized in Table O-2 in three groups based on the latitude available to the Lead Agency. Jobs are listed by grade to provide some indication of the grade level assigned to various skills. Jobs in the mandatory category must be included in the survey. Jobs in the optional and provisional categories may be added at the discretion of the Lead Agency if there is significant employment in the occupation in either local federal or private establishments and if the wage data for the added jobs are considered essential to the wage-fixing process. The Lead Agency must obtain prior approval of the CSC to add a job not listed in Table O-2.

Table 0-1. INDUSTRIES INCLUDED IN THE WAGE SURVEY BY STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODE

Industrial Group	SIC Number
Manufacturing	
Ammunition and ordnance	19
Food and kindred products	20
Tobacco manufacturers	21
Textile mill products	22
Apparel and related products	23
Lumber and wood products	23
Furniture and fixtures	25
Paper and allied products	26
Chemicals and allied products	28
Petroleum and coal products	29
Rubber and plastics products	30
Leather and leather products	31
Stone, clay, and glass products	32
Primary metal industries	33
Fabricated metal products	34
Machinery, except electrical	35
Electrical machinery	36
Transportation equipment	37*
Instruments and related products	38
Transportation	
Railroads	40
Local, suburban, and interurban transit, except taxi-cabs (SIC 412)	41
Motor freight transportation and warehousing	42
Air transportation	45
Communication	48
Electric, gas, and sanitary services	49
Wholesale Trade	
All wholesale trade	50

*Includes ship and boat building and repair.

Source: Derived from data in Section S5-6 of Federal Personnel Manual, "Supplement 532 1."

Table O-2. SURVEY JOBS

Job Grade	Mandatory	Optional	Provisional
1	Janitor (light)		
2	Janitor		
	Laborer		
3	Laborer (heavy)		
4	Packer		
5	Helper (trades)		
	Warehouseman		
	Fork Lift Operator		
	Power Truck Operator		
	Truck Driver (light)		
6	Truck Driver (medium)		
7	Truck Driver (heavy)	Aircraft Structures Assembler	
9	Carpenter	Aircraft Structures Assembler A	
	Painter		
10	Electrician	Aircraft Mechanic	Industrial Electronic Controls Repairer
	Automotive Mechanic	Electrician, Ship	
	Diesel Engine Mechanic	Pipefitter, Ship	
	Sheet Metal Worker	Shipfitter	
	Pipefitter	Shipwright	
	Welder	Machinist, Marine	
	Machinist	Cable Splicer (Electric)	
		Electrical Lineman	
11		Electrician (Powerplant)	Electronic Test Equipment Repairer
12			Electronic Computer Maintencemen
			T.V. Station Maintencemen
13	Tool, Die and Gage Maker		
14	Patternmaker		

Source: Derived from data in Section S5-6 of Federal Personnel Manual, "Supplement 532-1."

d. Requirement to Import Data

The Federal Wage System requires that special actions be taken whenever one of the federal activities within a wage area is a dominant industry. A federal industry is defined to be a dominant industry when the number of wage employees in the wage area in the occupations included in the survey consists either of 25 percent or more of the total wage employment in the wage area or equals or exceeds 1,000 employees. The CSC has specified about ten specialized industries which may be considered. This group includes the shipbuilding and repairing and aircraft industries.¹

As implemented, CSC procedures require the Lead Agency to make the determination as to whether a dominant federal industry is located in the wage area to be surveyed. If so, the Lead Agency must--

- (1) Add that industry to the survey establishment list.
- (2) Add specific jobs from that industry to the survey job list.
- (3) "Import" raw data for both regular and special jobs in that industry from the nearest wage area that can provide adequate data if inadequate data are available in the local wage area.

These provisions are intended to insure that the data used to develop the wage rate schedule for the local area include data that are representative of jobs in the dominant industry.

c. IMPACT OF SPECIFIC PROVISIONS

1. The Multi-Industry Data Base

As indicated above, local wage rates in naval shipyards are based on recurring surveys of comparable jobs in many different private industries. This multi-industry approach is intended to insure that data are collected on a sufficiently large number of jobs in private industry to permit statistical analysis. In addition, the wage rate schedule derived from these data is intended to

¹Because of the large number of skilled employees required, shipbuilding and repair is a dominant industry in each wage area that includes a naval shipyard.

be applicable to all federal activities in the area rather than a single agency such as a shipyard. The adoption of this approach is justifiable to the extent that the industries and jobs surveyed accurately reflect the labor supply for which the government is competing. Since at least some jobs comparable to jobs in the government are found in all of the industries in Table 0-1, a multi-industry approach appears desirable.

Navy representatives state that since private shipyard workers are traditionally among the lower paid industrial workers in most areas, the effect of the multi-industry approach to establishing the average wage rate for an area is to increase wages in naval shipyards above what wages otherwise would be. The information in Table 0-3 provides some basis for examining this statement. This table summarizes average hourly earnings for selected private industry groups. These earnings represent the actual return to the worker including overtime but excluding taxes and benefits paid by the employer. Hence, the data shown do not represent total labor costs.

Based on the aggregated data shown, the ship and boat building and repair category is not the lowest paid of the industries included in the local wage surveys. Note, however, that within the transportation equipment category, the area in which many of the skills used in shipyards are likely to be used, the ship category has the lowest average hourly earnings. Shown also in Table 0-3 are the hourly earnings for the contract construction industry group, the group often cited as a major competitor of the shipyard for such critical skilled workers as welders and metal workers. The table indicates, at least in the aggregate, that hourly earnings for the construction industry are significantly higher than wages in the ship and boat building and repair industry.¹

¹Based on conversations with members of the technical staff of the DoD Wage Fixing Authority, the construction industry is excluded from the wage survey on the basis that the federal government does not do construction in-house and therefore, has no workers in these job categories. Since many of the skills used in the construction industry can be transferred to the shipbuilding industry (and vice versa) the logic of this exclusion is questionable.

Table 0-3. AVERAGE HOURLY EARNINGS IN PRIVATE INDUSTRY,¹ BY INDUSTRY GROUP, 1970 AND 1973

Industry Group	1970	1973
Manufacturing	3.36	4.07
Durable Goods	3.55	4.32
Transportation Equipment	4.05	5.07
Motor Vehicles	4.22	5.45
Aircraft	4.11	5.00
Ships and Boats ²	3.78	4.33
Railroads	4.11	5.05
Nondurable Goods	3.08	3.69
Contract Construction ³	5.24	6.47
Transportation	3.85	5.04
Wholesale Trade	3.44	4.12

Notes: ¹The industry groups listed, except for Contract Construction, are the industries designated by the CSC to be representative of federal industries and, hence, are included in the wage surveys.

²Includes ship and boat building and repair. This aggregated category was used because many of the skills involved are common to both sub-categories. Corresponding earnings for the ship category alone are 3.96 and 4.60 respectively.

³The Contract Construction Industry, an industry often cited as one that employs many of the same skills as used by the shipyards, is shown as a point of reference.

Source: Data extracted from a summary of the Bureau of Labor statistics data provided in the *Statistical Abstract of the U.S.*, 1974, Tables 566 and 576.

Although it is impossible to draw specific conclusions from this limited discussion about the advisability of altering the procedures for establishing wage employee pay rates, the following generalization is justified. The use of a multi-industry rather than single-industry approach to determine prevailing wage rates is preferred if skills used in shipyards can be utilized by other industries and vice versa. This situation would imply that the Navy yards are competing with more than other shipyards. Personnel from both private and naval shipyards told the IDA team that skills are transferable although differences of opinion exist as to the amount of additional training and on-the-job experience required for the worker to achieve a suitable level of effectiveness in the new job. Therefore, the multi-industry approach appears to be justified.¹

2. Using the Local Prevailing Wage Rate to Establish the Pay Rate for the Second Step of Each Federal Wage Grade

As stated earlier, the Federal Wage Rate Schedule establishes five in-grade pay levels for each pay grade. The pay rate for each successive level is 4 percent higher than the preceding level. Advancement within each grade is automatic, based on satisfactory job performance, so at the end of two years the worker will advance to level three and after four more years to level five. Since 1970, over 75 percent of the workers in naval shipyards are at step three or higher. Rate schedules in private shipyards generally do not provide automatic increases in pay based on service. A single wage rate is typically specified for each job and, although the shipyard is not precluded from paying higher wages for higher skilled workers, such raises are normally based on merit rather than service. Consequently, there is no counterpart in private shipyards to the federal system of in-grade pay increases.

¹This is not to say, however, that improvements could not be made in the current system to identify more accurately the specific areas in which competition exists.

As described earlier, the Lead Agency uses the wage survey data to compute an average payline. Once this line is determined, it is used to establish the wage rate for the second-level of the wage rate schedule for each federal pay grade. The requirement to peg the step-two level at the prevailing local wage is included in the public law.

The combined effect of the federal system for in-grade pay increases and the requirement to peg the prevailing local rate in private industry to step-two of the federal system, guarantees that the average worker in naval shipyards, depending on his pay-step, will receive from 4 to 12 percent more than his counterpart in local industry. As a result, the expressed purpose of the Federal Wage System, to assure wage comparability among federal and private industry, is made impossible by the procedures established by the Congress to implement the system. Consequently, the current system is inconsistent with stated objectives and is inflationary since it pressures private shipyards to pay higher wages to compete for the available labor supply.

The further combined effect of the factors just discussed and the use of the multi-industry survey is that the pay of the average naval shipyard worker is approximately 15 percent higher than pay for the average worker in private shipyards.¹

¹This is the generally accepted differential. See, for example, the 1974 Seapower Hearings, *Current Status of Shipyards*, Part 1, p. 185.

3. Survey Data Collection

The key to the success of the survey approach to determining the prevailing rate in a wage area is the validity of the raw data gathered by the collection teams. These teams typically consist of two workers assigned to the federal activity responsible for the local survey. The teams interview local employees to obtain specific job, employment and wage rate data.

Each team consists of one employee representing the federal agency and one employee representing the local union.¹ Team members usually receive two weeks training prior to the survey.

Once the team is trained, the validity of the data gathered is highly dependent on several factors, including:

- The judgment of the collectors in making the basic determination that particular job descriptions in private industry are comparable to jobs in the federal sector. There is considerable potential here to raise the average rates reported by failing to consider jobs that may be comparable but are paid low wages by a particular private establishment.
- The accuracy of the data obtained from the private establishments may be questionable. The numbers of employees in each job and average wage rates are not audited as a part of the survey since participation by the establishments is voluntary. There is considerable potential here to influence the results by careless or indifferent reporting.

The potential to introduce inequalities into the wage system as the result of the data collection effort can be corrected by the DoD in conjunction with the CSC. Congressional action would not be required.

¹Apparently, the intent of this position is to provide an adversary relationship on each team; one union and one management representative. The extent to which management interests are protected is, at best, a variable. Even though the non-union member is generally a general schedule worker, it is difficult to imagine a federal worker who is disinterested in federal pay scales

4. Adequacy of the Survey Data Base

The Federal Wage System prescribes the type and number of jobs to be surveyed and defines the minimum criteria in terms of the number of job matches that must be obtained before the data base may be considered adequate. This information is summarized in Table O-4. As shown, the criteria are such that the entire wage rate analysis could be based on raw survey data from as few as 120 employees, in a single establishment, in 10 common job descriptions. Without a detailed review of the actual survey data, it is not possible to determine the extent to which this standard presents a problem.

The CSC procedures permit the Lead Agency to consider factors other than the wage survey in developing wage schedules. Deviations from the survey data, however, must be justified in detail and appear to be the exception rather than the practice.

The extent to which the survey results reflect local prevailing rates is a key consideration and should be subject to more detailed review.

5. Requirement to Import Data from Outside the Local Wage Area

The Federal Wage System requires that when one of the federal activities is the dominant industry among the total federal wage employment in the wage area, the Lead Agency must ascertain whether there is a sufficient number of comparable positions in private industry in the local survey area to provide representative wage data.¹ If there is insufficient data within the local area, the Lead Agency must "import" raw data for both regular and special jobs from the nearest similar wage area before developing the wage schedule.

¹Sufficient data exist when the total number of comparable positions in private industry is at least equal to the total number of federal wage positions in the dominant industry.

Table 0-4. MINIMUM CRITERIA FOR DETERMINING
ADEQUACY OF WAGE SURVEY DATA

Maximum Number of Jobs Included in the Survey		Minimum Number of Job Matches
Grade Level	Number of Jobs ¹	
Group 1 (Unskilled)		One job with at least 20 samples ²
1	1	
2	2	
3	1	
4	1	One job with at least 20 samples ²
Group 2 (Semiskilled)		
5	5	
6	1	
7	2	Two jobs ³ with at least 20 samples ² each
8		
Group 3 (Skilled)		
9	3	
10	17	
11	1	
12	2	
13	1	
14	1	Six jobs ³ with at least 10 samples ² each
15		
Group 4 (Any level)		
Minimum Job Matches 10 ⁴		

¹Includes jobs that must be included in each survey plus jobs that may be added at the discretion of the Lead Agency (see Table 0-2).

²Based on discussion with the technical staffs of the wage survey offices at both the CSC and DoD, "sample" means the number of employees.

³In the case of a survey for a wage area in which there is a dominant industry, one of the jobs in Group 3 and three of the jobs in Group 4 must be from the list of jobs added for the dominant industry.

⁴Ten is the minimum number of job matches required. Other minimum constraints are a total of 120 employees in at least three grade levels.

Source: Derived from Sections S5-10a and S5-12h of *Federal Personnel Manual*, "Supplement 532-1."

When the Lead Agency computes the prevailing wage rate trend line, the additional data required because of the fact that a dominant industry exists is considered in the following way. First, a trend line is computed using just the data from the local wage area. Next, a trend line is computed by combining the "imported" data and the local data. Finally, these two trend lines are compared with the existing wage rate schedule and a new prevailing wage rate trend line is computed that reflects the highest rate for each grade on any one of the three schedules. Thus, the requirement to import data can only increase the final wage rate.

To evaluate fully the dollar impact of this requirement on the federal payroll, an extensive analysis of the raw survey data is required. Even though the time and scope of this study precluded this effort, discussions with members of the technical staff of the DoD Wage Fixing Authority and a cursory examination of several summary work sheets from recent surveys indicate that the impact may not be as large as it might appear on the surface. For example, Table O-5 summarizes the result of implementing the requirement to import data during the FY 1974 wage surveys. As shown, the impact appears minimal in that only the two lowest grades at two yards were affected. That is, the combined data caused the pay rate for those grades to be higher than they otherwise would have been. For all other grades, the inside data provide the higher rate. The Wage Fixing Office has reported that the provision caused the DoD payroll to be \$55 million higher in 1974 than it would have been without the requirement to import data and is recommending that the requirement be abolished. Although the requirement to import data increases federal labor costs and may not be justifiable in all cases, the procedures for establishing

Table 0-5. SUMMARY OF EFFECT OF REQUIREMENT TO
"IMPORT" DATA FOR THE FY-1974 WAGE SURVEYS

Naval Shipyard	Dominant Industry	Reference Area ^{1,2}	Grades Affected
Charleston	Shipbuilding	Norfolk	1,2
Long Beach	Shipbuilding	Adequate	
Mare Island	Shipbuilding Aircraft	Adequate Adequate	
Norfolk	Shipbuilding Aircraft	Adequate Adequate	
Pearl Harbor	Shipbuilding	San Diego ³	
Philadelphia	Shipbuilding Aircraft	Adequate Adequate	
Portsmouth	Shipbuilding	Boston	1,2
Puget Sound	Shipbuilding	Adequate	

¹Nearest wage area with jobs similar to those in the dominant industry listed.

²"Adequate" means that sufficient samples could be obtained in the local area to provide a usable sample.

³In this case, the imported data were lower than the local data so that the rate was based only on the inside data.

Source: Discussion with members of the Technical Staff of the DoD Wage Fixing Authority, Jan 1975.

the pay rate of the average federal worker at the pay rate of the average worker in the local area offer a greater potential for reducing the cost of labor.

Evaluation of the requirement to consider a dominant industry is complicated because of the potential stigma that is sometimes attached to this issue.¹ However, it is not difficult to evaluate the degree to which this requirement contributes to achieving the expressed goal of the Federal Wage System--comparable wages for workers in federal and private activities in a given local wage area. Based on this criterion, the fact that the system as currently implemented caused federal wages to be higher than they otherwise would be is sufficient reason to eliminate the requirement to "import data." However, the situation is not that straight-forward. If, in fact, the federal government is forced to compete for critical skills with industries in near-by, similar wage areas, it may be in the best interest of the government to consider those outside wages, at least for critical skills. To the extent that this logic is valid, it argues for retention of the requirement but, perhaps, in a modified form with emphasis on labor supply and demand for critical skills.

6. Failure to Consider Total Compensation in Setting Wage Rates

The discussion to this point has focused on the procedures for establishing wage rates for wage employees in the federal sector. The goal of the Federal Wage System is to assure comparability of hourly wages for comparable jobs in

¹The requirement to import data was added to the Federal Wage System as the result of the "Monroney Amendment" passed by Congress in the late 1960s.

the federal and private sectors. Implicit is this approach is the assumption that by establishing comparable hourly wage rates, the government will be competing on an equal basis with private industry for government's share of the labor force. Unfortunately, this is not true since tangible and intangible differences exist on a total compensation basis that makes employment in the federal sector more attractive.

The Federal Wage System, as implemented by the CSC, specifically prohibits consideration of total compensation in developing wage rates. Procedures for the local survey are also defined so as to assure that data collected during the interview are limited to the hourly wage and number of employees. The result is that even if the average private shipyard worker received the same hourly wages as his counterpart in the naval shipyard (which is not true), the higher fringe benefits generally provided by the government would still preclude comparability. A consideration of fringe benefits in determining hourly rates would assure more equitable competition between the government and industry for the available labor supply. Among the factors to consider are: paid annual leave, paid sick leave, holidays, retirement benefits, insurance benefits, job security, opportunity for training and opportunity for advancement. It is recognized that this approach would increase significantly the complexities of the survey approach, but the change should be considered as a part of the overall evaluation of the Federal Wage System.

D. ACTUAL WAGE RATES

Table O-6 provides a summary of actual hourly pay rates for the wage employees for the period FY-70 through FY-74. The rates shown are for Wage Grade WG-10, Step 2. This is the level used by the Navy as a criterion for evaluating the impact of pay increases under the Federal Wage System. Shown also is

Table O-6. SUMMARY OF ACTUAL WAGE RATES AT THE
BENCHMARK LEVEL IN NAVAL SHIPYARDS¹

Shipyard	FY 1970	FY 1971	FY 1972	FY 1973	FY 1974
Boston	3.97	4.18	4.41	4.65	4.91
Charleston	3.78	4.18	4.41	4.70	5.02
Hunters Point	4.52	4.95	5.22	5.51	5.81
Long Beach	4.41	4.68	4.94	5.21	5.50
Mare Island	4.52	4.95	5.22	5.51	5.81
Norfolk	3.64	3.93	4.13	4.37	4.66
Pearl Harbor	4.32	4.70	5.26	5.55	5.86
Philadelphia	3.96	4.43	4.67	4.93	5.20
Portsmouth	3.87	4.13	4.36	4.54	4.82
Puget Sound	4.38	4.61	4.86	5.13	5.41
Average Rate, ² All Yards	4.14	4.47	4.75	5.01	5.30
Percent Increase All Yards ²	--	8.0	6.3	5.5	5.8
Percent Increase for GS Employees ³	--	6.0	5.5	5.14	4.77

¹Hourly rates shown are in current dollars for Wage Grade WG-10, Step 2. This level is used by the Navy as a criterion for evaluating the impact of pay increases for wage employees.

²Reflects average wage rate at WG-10-2 for all yards and the average annual wage increase.

³Reflects pay increase for all general schedule employees. A single percent applies since all of these employees are paid on a nationwide pay schedule.

Source: NAVSEA, February 1975.

the average percentage increase for both wage and general schedule employees.

Table O-7 provides a summary of the average hourly base pay for wage employees for each naval shipyard. Shown also is the average wage rate for all naval shipyards. Although the rates shown are not directly comparable to the average hourly earnings for private shipyards shown in Table O-3, some indication of the pay of the average naval shipyard workers relative to the wages received by workers in private shipyards can be deduced. Pertinent data from these two tables are as shown.

	1970	1973
Private Shipyard Annual Average	3.78	4.33
Naval Shipyard Average as of 30 June	4.29	5.40
Percent Difference	13%	24%

The data shown for private shipyards are average hourly earnings, including overtime, for the calendar years shown. Data for naval shipyards are average base pay for all wage employees as of 30 June for the same two years. The calendar year averages would logically be expected to be higher. These levels exclude overtime. As imprecise as these comparisons are, they, nevertheless indicate the extent to which a real wage differential exists.

Finally, Table O-8 summarizes the average salary of all shipyard employees to illustrate the extent to which the salaries of the general schedule employees increase the overall level of wages in naval shipyards.

Table O-7. AVERAGE HOURLY WAGE RATES¹
FOR NAVAL SHIPYARD WAGE EMPLOYEES

Shipyard	FY 1970	FY 1971	FY 1972	FY 1973	FY 1974
Boston	4.16	4.44	4.79	5.07	²
Charleston	3.91	4.35	4.64	5.01	5.57
Hunters Point	4.71	5.26	6.29	6.01	²
Long Beach	4.52	4.87	5.08	5.50	5.80
Mare Island	4.73	5.26	5.53	6.04	6.51
Norfolk	3.70	4.07	4.26	4.52	5.07
Pearl Harbor	4.49	4.97	5.63	6.01	6.53
Philadelphia	4.11	4.72	4.97	5.31	5.73
Portsmouth	4.02	4.44	4.67	4.95	5.13
Puget Sound	4.59	4.90	5.21	5.59	6.88
Average	4.29	4.73	5.11	5.40	5.90

¹All rates shown are in current year dollars and reflect the average hourly base pay for all shipyard wage employees.

²Not separately reported. Shipyard closed in FY-74.

Source: *Financial and Operating Statements* as of 30 June for each fiscal year shown.

Table 0-8. AVERAGE HOURLY BASE PAY FOR
NAVAL SHIPYARDS, ALL EMPLOYEES¹

Shipyard	FY 1970	FY 1971	FY 1972	FY 1973	FY 1974
Boston	4.37	4.71	5.12	5.40	²
Charleston	4.24	4.67	5.01	5.36	5.79
Hunters Point	4.81	5.37	6.30	6.41	²
Long Beach	4.63	4.99	5.26	5.63	5.89
Mare Island	4.88	5.47	5.79	6.29	6.66
Norfolk	3.97	4.37	4.56	4.87	5.33
Pearl Harbor	4.65	5.19	5.76	6.16	6.61
Philadelphia	4.32	4.93	5.27	5.58	5.95
Portsmouth	4.41	4.91	5.22	5.49	5.65
Puget Sound	4.76	5.12	5.48	5.83	6.98

¹All rates are in current year dollars and include both general schedule and wage employees.

²Not separately reported. Shipyard closed in FY-74.

Source: *Financial and Operating Statements*, Revenue and Costs, as of 30 June for each fiscal year.

E. SUMMARY AND RECOMMENDATIONS

The Federal Wage System has failed to achieve its stated purpose of establishing wages for all federal wage employees in each wage area at a level that is comparable to wages received by their counterparts in local private industry. As currently implemented, the Federal Wage System operates to insure that wage employees in naval shipyards receive higher hourly wages than required to achieve comparability. In addition, by tying federal wages to a level that is higher than the average in the local area, a ratchet effect is introduced as local private industry tries to compete. The result is spiraling wage rates in both sectors.

Although the above conclusion is based specifically on an analysis of the impact of current wage-setting procedures on naval shipyards, the provisions of the Federal Wage System are applicable to all federal wage employees. For this reason, the unfavorable impact on naval shipyards is probably indicative of the effect of the wage system on all federal activities that employ a large number of wage employees. The extensive analysis required to substantiate this position is, however, beyond the scope of this paper. For this reason, specific recommendations for change are not included. Rather, specific areas to be considered in an overall evaluation¹ of the Federal Wage System are presented.

Before listing specific areas, one general observation is required to put the remainder of this section in the proper perspective. The real issue with respect to wage comparability is not the extent to which wages in local private and naval shipyards are at the same level. The real issue is the extent to which wages in naval shipyards are competitive with wages for all jobs in any industry with which a specific shipyard

¹A primary question to consider in an overall evaluation of current procedures is whether a single wage schedule for all wage employees is feasible and desirable. It may be that separate schedules at least for critical skills would be more responsive to actual labor market conditions.

is competing for labor. This much more demanding objective requires that major emphasis in establishing wage schedules for each area be based on a detailed analysis of labor supply and demand relationships, by skill if necessary. This is the context in which the items identified below are presented.

The discussion in Section C substantiates the need for several actions to be taken to reduce the unfavorable impact of the Federal Wage System. These actions may be considered at two levels. First, actions should be taken at the Lead Agency level, or lower, that will tighten-up procedures within the current system. Such actions are confined largely to more careful selection of qualified data collectors, improved training programs for the survey teams and a more extensive review and audit of the data collected. In addition, the Lead Agencies should take a more active role in tailoring the list of survey jobs and firms to fit individual wage areas. Each of these actions would improve the current system but would contribute little to eliminating primary deficiencies.

Major changes in the Federal Wage System require action by the CSC or, in some cases, by the Congress. Among the changes to be considered are the following;

- (1) Retain the multi-industry approach but define each wage area based on the results of a preliminary survey. The preliminary survey would be designed to identify, by skills, the actual geographical areas in which labor competition exists. Current requirements such as a single wage schedule and the need to import data could be re-evaluated, for each wage area, on the basis of this survey.

- (2) Eliminate the blanket requirement to establish step two of the wage schedule at the level of the prevailing wages in local private industry. Since the prevailing wage represents the average wage of the average worker in local private industry, apply this rate to establish the rate at the mean or median step

of the wage employee structure in the given naval shipyard. That is, if step four is the step attained by the majority of the workers in a given naval shipyard, establish the rate for step four at the prevailing rate.¹

(3) Staff the data collection teams with full-time personnel preferably from outside the federal sector (to assure a disinterested survey) or, as a minimum, include union and management representatives from local private industry on the team.

(4) Include consideration of total compensation and such intangible benefits as job security in establishing federal wage schedules. This provision would help assure that the federal government and local employers are competing for available labor on an equitable basis.

All of these actions require major changes in the current Federal Wage System. If implemented, their impact will be felt throughout the entire economy. For this reason, an overall evaluation of the entire federal pay system is recommended.

¹As a separate issue, but one that should probably be reviewed at the same time, the provision for automatic step increases should also be re-evaluated.

APPENDIX P

QUESTIONNAIRE TO PRIVATE SHIPYARDS

QUESTIONNAIRE TO PRIVATE SHIPYARDS

A. SURVEY DESCRIPTION

To supplement the information available through other sources, the IDA study team sent a questionnaire to 95 U.S. private shipyards (about 37 percent of the total number of U.S. private shipyards). This sample survey was designed to include shipyards that were, or had the potential of, performing Navy ship workloads. The sample also represented a cross section of shipyards based on size, expressed in employment-mobilization potential, and by geographic area. Responses were received from 41 shipyards, of which 35 were considered useful.

Some of the information requested in the questionnaire was proprietary, therefore, the study team guaranteed not to divulge the identity of responders. Some of the information obtained from the questionnaire has been used in developing the body of this report. This appendix contains a compilation of information furnished by respondents to the questionnaire. A copy of the questionnaire is included as Exhibit 1.

B. MANPOWER

1. Direct Labor Manning

Question 1 asked for the direct labor manning of the shipyard. The distribution of the reported direct labor manning levels was as follows:

Number of Direct Labor Employees

Direct Labor	<100	100-499	500-999	1,000-2,999	3,000-4,999	5,000 and over
No. of Shipyards	2	12	8	8	4	1

2. Manning by Categories of Work

The question asked for a percentage of the current direct labor force devoted to four categories of work. Results of the survey indicate that:

- 5 shipyards reported performing some Navy new construction.
- 28 shipyards reported performing some CAR work for the Navy.
- 6 shipyards reported performing other Navy work.
- 33 shipyards reported performing other work.

A further analysis of the data revealed that only 2 of the 35 private shipyards devoted 100 percent of their direct labor to Navy work, while 7 devoted 100 percent of their direct labor to non-Navy work. In summary:

- 9 private shipyards devoted over 50 percent of their direct labor to Navy work.
- 24 private shipyards devoted over 50 percent of their direct labor to non-Navy work.
- 2 private shipyards reported a 50/50 split of Navy/non-Navy work.

3. Manning Strategy

Question 3 attempted to ascertain the existence of a business strategy directed toward a particular direct labor manning level. Of the 35 responses, 33 indicated that such a

strategy exists. The manning levels planned for years 1975 through 1979 based on this strategy were portrayed. Twenty-nine shipyards indicated a projected increase in manning and 4 projected level manning. The projected increase between 1975 and 1979 was 24 percent or about 6 percent per year.

4. Manning for Navy Workloads

The shipyards were asked to estimate what part of the increase in manning would be available to accomplish Navy workloads. Thirty private shipyards projected some part of the increase would be available for Navy workloads. The total estimated manyears available for Navy work by these 30 shipyards were as follows:

Year	1975	1976	1977	1978	1979
Manyears available for Navy Workloads	23,680	25,170	26,520	29,430	32,315
Increase	1,490	1,350	2,910	2,885	

The increase in manpower available for Navy workloads results from projected increased manning in the private shipyards and a higher percentage of total private shipyard manpower available for Navy workloads in later years.

5. Manpower Availability

The yards were asked to comment on the availability of manpower to achieve projected manning levels. Of the 29 yards projecting increases in manning, only two indicated that sufficient

skilled labor was not readily available. The other 26 yards indicated that they could hire the needed labor. Some yards offered these comments:

- Three stated that while, in general, manpower was felt to be available, some problems with skilled craftsmen could be expected.
- (Only) two commented that current economic conditions and especially that high unemployment rates increased labor availabilities.
- Lead times varying from 30 to 120 days were indicated.

6. Manning Ceilings

In response to a question about an employment ceiling that could be achieved in 1975, assuming that workload justified greater use of second and third shifts, all but one shipyard projected an increase over current manning. The total increase was about 1.3 times greater than end 1974 manning. One shipyard indicated the labor market was saturated and that no increase was possible. Some yards stated that lead times of up to 6 months would be required.

These responses raise a question of whether current labor market conditions and other factors were, in fact, considered properly by the private shipyards. Individual yards may have responded as if they were the only yard in the area that would be attempting to increase employment. Smaller yards probably could increase employment by about 30 percent without necessarily creating a serious impact on the labor market. As the size of the yard, in terms of employment, increases, the problem of increasing employment by a given percentage becomes more difficult.

7. Indirect Labor

A comparison of indirect labor to direct labor within private shipyards showed a range of from 6 to 25 percent. The average for the 15 shipyards reporting this data was 23 percent.

C. FACILITIES AND EQUIPMENT

1. Limitations to Perform Navy New Construction

Responses to the question of what major elements limit ability to perform Navy new construction were varied, as indicated below:

- 6 yards indicated no interest in new construction.
- 17 yards stated that they either lacked or had inadequate facilities for major new construction.
- 10 yards reported a capability to build non-nuclear surface combatant ships except for aircraft carriers.

Some shipyards said the future of commercial new construction would determine whether their facilities would be available for Navy new construction. Similar and varied responses were made concerning ability to perform other Navy work.

2. Programs to Increase Capabilities and Capacities

Some of the programs under way or planned to increase capabilities and capacities were as follows:

- 6 reported no program.
- 4 increased materials-handling capacity.
- 4 upgraded shop facilities and equipment.
- 4 plant modernization.
- 3 increased heavy plate fabrication capacity.
- 2 new shipbuilding and support facilities.

- 2 general improvement.
- Other improvements were increasing drydock capacity, adding piers, adding numerical controlled lofting and burning equipment, dredging, and improving shot-blasting facilities.

3. Capability and Capacity Limitations for Navy Workloads

The question concerning capability and capacity limitations for Navy workloads in terms of types of ships brought varied responses. Few were in terms of type of ships. A sampling of responses is given below:

- 17 indicated varied facilities constraints.
- 2 said they were limited to working on ships of DE size and smaller.
- 1 reported being limited to ships under 80,000 tons.
- 2 reported being limited to tugs and barges.
- Many indicated no constraints on repair work if performed at a location outside their yard.

D. SUBCONTRACTING

The degree to which subcontractors are used varied widely. Some of the more frequently used subcontracting areas are displayed below:

- 19 subcontracted pipe covering and insulation.
- 16 subcontracted electronics work.
- 14 subcontracted deck covering work.
- 11 subcontracted ordnance work.
- 8 subcontracted both boiler work and air conditioning and refrigeration.
- 7 subcontracted sheetmetal and heavy electrical work.
- 5 subcontracted joiner work.

Seventeen other types of work were subcontracted by four or less shipyards.

E. POLICY TO ACCEPT NAVY WORKLOADS

The vast majority of the private shipyards reported they would welcome and seek Navy shipwork. One yard stated that Navy work involved too much red tape, and another indicated it gave preference to commercial work. Other responses were grouped as follows:

- 15 yards indicated Navy shipwork was desirable.
- 8 yards stated their objective was that 50 percent of the Navy repair work should go to the private sector.
- 6 yards indicated they based their decision on the availability and profitability of Navy work.

F. PRODUCTIVITY/EFFICIENCY MEASURES

The private shipyards were asked to comment on what measures of productivity or efficiency they used. Responses were varied, but mainly fit into the following categories:

- Profit and loss statement.
- Tracked manhours expended against budgeted manhours.
- Tracked actual costs against estimated costs.
- Actual performance compared with schedule and budget.



C O S T A N A L Y S I S G R O U P
400 Army-Navy Drive, Arlington, Virginia 22202 • Telephone (703) 558-1000

EXHIBIT 1

The Institute for Defense Analyses, a private non-profit research firm is conducting a shipyard study for the Office, Secretary of Defense. One objective of this study is to determine the capability of private shipyards to perform Navy workloads in the 1975-1979 period.

We recognize the uncertainties associated with estimating capacities that might be available for Navy work five years into the future. Nevertheless, we believe it is essential to give private shipyards an opportunity to respond to this important Department of Defense planning question.

It is requested that you complete the attached questionnaire. We do not intend to identify specific companies in our report; however, we may discuss capacities in geographical areas, because of possible variations in support capacities associated with Atlantic and Pacific fleet requirements. If you specifically desire that no reference be made to your firm by name in our report or in discussions regarding our study, please so indicate. We will then ensure that no such references are made.

Our time schedule is such that we would appreciate your reply by February 14, 1975. Please return the questionnaire to:

Dr. John D. Morgan
Institute for Defense Analyses
400 Army-Navy Drive
Arlington, Virginia 22202

We appreciate your cooperation on this important research project.

Sincerely,

John D. Morgan
John D. Morgan
Project Leader

Company Name:
Address:

January 15, 1975

SHIPYARD QUESTIONNAIRE

Institute for Defense Analyses Study PA&E-81
(Request that data be as of December 31, 1974)

I. Manpower

1. What is the current direct labor manning level of your Shipyard?

2. What percentage of your current direct labor force is devoted to:

U.S. Navy New Construction _____

U.S. Navy Conversion, Alteration and Repair _____

Other U.S. Navy Work _____

Other _____

3. Does your business strategy contemplate a particular direct labor manning level that you wish to achieve and maintain to optimize use of facilities or to achieve other company objectives? _____

(Yes or No)

If so, what is that manning level for each of the following years:

1975 _____ 1976 _____ 1977 _____ 1978 _____ 1979 _____

(Note: For the purposes of this questionnaire this manning level should be based on current known factors and not on special programs such as possible new federal legislation or other new special incentive programs for the ship building and repair industry.)

4. If the manning levels shown in question 3 exceed the level shown in question 1 what part of these excesses would be available for additional U.S. Navy workload based on current plans and forecast workloads?

1975 1976 1977 1978 1979

U.S. Navy New Construction

All Other U.S. Navy

Total

(Note: If there is no difference between what might be available for possible U.S. Navy new construction versus all other U.S. Navy work please so indicate.)

5. If your desired direct labor manning levels exceed current levels do you believe you could achieve the desired level if workload was available? _____ . In other words, do you believe the number of employees with proper skills could be hired with relatively short lead time? _____. If not, please list the skills in which you could not employ sufficient personnel.
6. What reasonable ceiling employment level could you achieve in your shipyard in 1975 assuming that workload justified greater use of second and third shifts? _____. (Note: This should recognize local labor market conditions and management and facility constraints but assumes that the shipyard would be provided adequate lead time to achieve the needed employment level.) If lead time is a critical factor please give your estimate of the minimum lead time required to reach ceiling employment level.
7. Please provide a listing of all of the direct labor trades or skills normally employed by your company. (Space continued on next page).

7. (Continued)

8. Please provide employee profile data showing the number of direct and indirect employees, average hourly wage rates, and average cost of fringe benefits expressed as a cost per hour worked. Combine employees into categories to show differences in job assignments and the various supervisory or skill levels used in your yard--see table below. Please indicate the cost elements included in fringe benefits (e.g., vacation, holiday, social security taxes, workman's compensation, insurance, pension, sick leave, etc.)

	<u>Number of Employees</u>	<u>Average Hourly Wage</u>	<u>Average Hourly Cost of Fringe Benefits</u>
A. Direct	(Combine employees according to the classification used in your yard - e.g., foremen, leader, journeyman, mechanic, laborers...)		

8. (Continued)

B. Indirect (Combine employees according to the classification used in your yard - e.g., supervisors, clerks, security...)

9. Please provide a copy of your management organization chart which depicts functions and levels of management from the chief executive officer to the shop foreman.

II. Facilities and Equipment

1. a. Considering your existing industrial structure, what are the major elements that set the limit on your ability to perform new construction work for the U.S. Navy?

1. b. What are the similar elements that set the limit on your ability to perform other U.S. Navy work?

2. a. What programs do you have underway or planned to increase your capabilities and capacities in terms of facilities and equipment?

2. b. How will these programs affect your ability to perform U.S. Navy new construction or other U.S. Navy work?

III. Other

1. Discuss specifically your capability or capacity limitations for U.S. Navy new construction or other U.S. Navy work in terms of types of ships. For example, if your manpower, management, facilities, and equipment are oriented toward work on a particular category of ships such as surface ships of a given maximum size, please indicate.

2. Discuss the extent to which you use or would use subcontractor support to complete U.S. Navy workloads. What are the hardware or other areas in which this subcontractor support would be used?

3. Assuming that you will have capacities to assume additional ship workloads in the 1975-1979 time period do you anticipate using part or all of these capacities for work for other than U.S. Navy? _____
If so, what percentage do you estimate might reasonably be available for U.S. Navy workloads? _____.
4. Please comment on your company's policy relative to acceptance of U.S. Navy workloads. In other words, if your company anticipates future available capacity for ship work but would not plan to seek work from the U.S. Navy please so indicate. Please indicate reasons if you desire to do so. (Note: the purpose of this question is to enable IDA to develop realistic, reasonable estimates of possible capacities for U.S. Navy work and avoid overstating these possible capacities.)