SHIP PRODUCTION COMMITTEE
FACILITIES AND ENVIRONMENTAL EFFECTS
SURFACE PREPARATION AND COATINGS
DESIGN/PRODUCTION INTEGRATION
HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
EDUCATION AND TRAINING

September 1981
NSRP 0008

# THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

## Proceedings of the IREAPS Technical Symposium

## Paper No. 28: U.S. Shipbuilding Standards Program: Long-Range Plan

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER

# Report Documentation Page

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE | 2. REPORT TYPE | 3. DATES COVERED |
|---|---|---|
| **SEP 1981** | **N/A** | **-** |

| 4. TITLE AND SUBTITLE | 5a. CONTRACT NUMBER |
|---|---|
| **The National Shipbuilding Research Program Proceedings of the REAPS Technical Symposium Paper No. 28: U.S. Shipbuilding Standards Program: Long-Range Plan** | 5b. GRANT NUMBER |
| | 5c. PROGRAM ELEMENT NUMBER |
| 6. AUTHOR(S) | 5d. PROJECT NUMBER |
| | 5e. TASK NUMBER |
| | 5f. WORK UNIT NUMBER |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>**Naval Surface Warfare Center CD Code 2230 - Design Integration Tools Building 192 Room 128 9500 MacArthur Blvd Bethesda, MD 20817-5700** | 8. PERFORMING ORGANIZATION REPORT NUMBER |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) | 10. SPONSOR/MONITOR'S ACRONYM(S) |
| | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) |

12. DISTRIBUTION/AVAILABILITY STATEMENT
**Approved for public release, distribution unlimited**

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

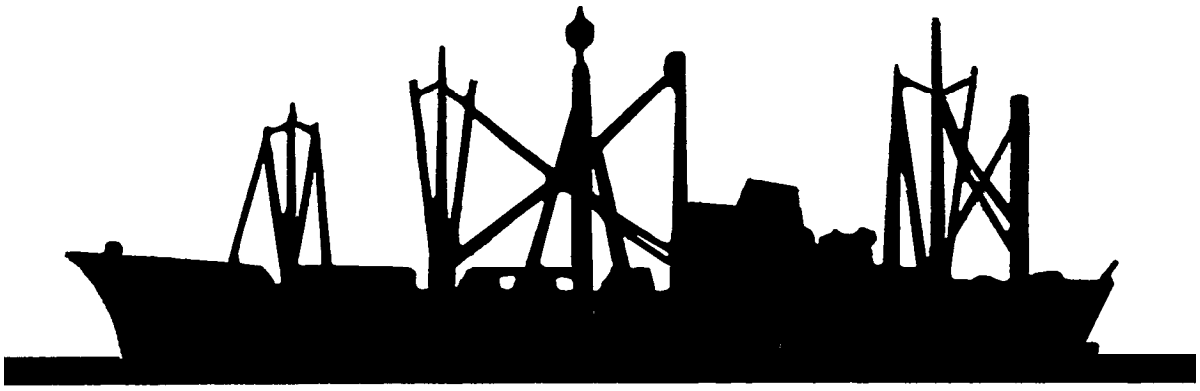
| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | |
| **unclassified** | **unclassified** | **unclassified** | **SAR** | **48** | |

# DISCLAIMER

These reports were prepared as an account of government-sponsored work. Neither the United States, nor the United States Navy, nor any person acting on behalf of the United States Navy (A) makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness or usefulness of the information contained in this report/ manual, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or (B) assumes any liabilities with respect to the use of or for damages resulting from the use of any information, apparatus, method, or process disclosed in the report. As used in the above, “Persons acting on behalf of the United States Navy” includes any employee, contractor, or subcontractor to the contractor of the United States Navy to the extent that such employee, contractor, or subcontractor to the contractor prepares, handles, or distributes, or provides access to any information pursuant to his employment or contract or subcontract to the contractor with the United States Navy. ANY POSSIBLE IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR PURPOSE ARE SPECIFICALLY DISCLAIMED.

0008

# Proceedings
# IREAPS Technical Symposium
# September 15-17, 1981
# Baltimore, Maryland



INSTITUTE FOR RESEARCH AND ENGINEERING FOR AUTOMATION AND PRODUCTIVITY IN SHIPBUILDING

IREAPS

# U.S. SHIPBUILDING STANDARDS PROGRAM: LONG-RANGE PLAN

Yoshinonu Ichinose
Vice President
IHI Marine Technology Inc
New York, New York

## ABSTRACT

Ishikawajima-Harima Heavy Industries/IHI-Marine Technology is developing a long-range plan for the U.S. shipbuilding standards program under a sub-contract with Bath Iron Works Corporation acting in its capacity as manager of the Ship Producibility Program.

Primary emphasis of the long-range plan is directed at near term (2 to 3 year) priorities to achieve maximum benefits at both industry and individual shipyards levels. Secondary emphasis is aimed at developing midterm (5 to 7 year) and long-term (10 to 20 year) goals to serve as planning guidelines for ongoing efforts.

The basic goals and objectives of the U.S. shipbuilding standards program long-range plan are summarized. Included are such examples as the need to reduce design and engineering cycle time costs, the need to shorten manufacturing lead times for critical materials, and the desirability of implementing outfit unit construction and accuracy control concepts. The recommended organizational infrastructure for standards development is addressed, and appropriate divisions of responsibility among ASTM Committee F-25 on standards, SNAME Panel SP-6 on standards and specifications, the government, shipbuilders, regulatory agencies, supporting industries and other concerned parties are discussed.

## TASK s-29 U.S. SHIPBUILDING STANDARDS LONG-RANGE PLAN

1. TASK OBJECTIVE

A. PROVIDE GUIDELINE FOR THE U.S. SHIPBUILDING INDUSTRY TO ESTABLISH THEIR SHIPBUILDING STANDARDS LONG-RANGE DEVELOPMENT PLAN, BASED UPON THE KNOWLEDGE AND EXPERIENCE OF THE JAPANESE SHIPBUILDING INDUSTRY ON STANDARDIZATION

B. DIRECT PRIMARY EMPHASIS AT SHORT-TERM(2-3) YEARS) PRIORITY GOALS TO ACHIEVE MAXIMUM BENEFITS AT BOTH INDUSTRY AND INDIVIDUAL COMPANY LEVELS.

C. PLACE SECONDARY EMPHASIS ON DEVELOPMENT OF MID-TERM (5-7) YEARS) AND LONG-TERM (l0-20 YEARS) GOALS TO SERVE AS PLANNING GUIDLINES FOR ONGOING EFFORTS.

## 2. APPROACH

A. CONDUCT A BACKGROUND SURVEY OF THE SHIPBUILDING INDUSTRY TO INVESTGATE THEIR NEEDS FOR STANDARDIZATION, AND THE STATUS-QUO OF STANDARDIZATION EFFORTS IN U.S.A.

B. CATEGORIZE STANDARDS BY THEIR INFLUENCE TO THE INDUSTRY (I.E., NATIONAL, INDUSTRY, COMPANY LEVELS) AND BY THEIR FUNCTIONS (I.E., PRODUCTS, DESIGN/ENGINEERING, PERFORMANCE, TESTING/INSPECTION, PRODUCTION, ACCURACY STANDARDS).

C. ORGANIZE AND CATEGORIZE STANDARDS ITEMS IN A FORM OF A "TREE STRUCTURE".

D. SELECT AND PRIORITIZE STANDARDS ITEMS FROM THE "TREE STRUCTURE, AND CLASSIFY INTO SHORT-TERM, MID-TERM, LONG-TERM GOALS.

E. PROVIDE GUIDELINES. FOR- RESPONSIBLE ORGANIZATIONAL STRUCTURES TO DEVELOP AND IMPLEMENT STANDARDS, CODING, ETC.

3. STANDARDS CATEGORIES BY PREDOMINATE LEVELS

| | |
|---|---|
| NATIONAL STANDARDS | STANDARDS ENFORCED By GOVERNMENT RULES/REGULATIONS. |
| FEATURES: | STANDARDS INTERRELATED TO INTERNATIONAL STANDARDS, RULES/REGULATIONS (ISO, IMCO, IACS, ETC.) AND/OR FEDERAL REGULATIONS (USCG, USN, ETC.) |
| EXAMPLES: | UNITS, CODES, LIFE SAVING EQUIPMENTS, FIRE APPLIANCES, ANCHORS, VALVES, ETC. |
| INDUSTRY-WIDE VOLUNTARY STANDARDS | STANDARDS ESTABLISHED BY PRIVATE ORGANIZATIONS ACCEPTED BY THE INDUSTRY (ASTM, SNAME, IEEC, ETC.) |
| FEATURES: | STANDARDS USED NATION-WIDE BY THE INDUSTRY AS CRITERIA OR YARDSTICKS, |
| EXAMPLES: | DESIGN CRITERIA/SPECIFICATIONS, FITTINGS, EQUIPMENT, QUALITY, TESTING/INSPECTION, PERFORMANCE. |
| COMPANY IN-HOUSE STANDARDS | STANDARDS ESTABLISHED BY INDIVIDUAL COMPANIES. |
| FEATURES: | STANDARDS TO MEET COMPANY'S PECULIAR REQUIREMENTS. |
| EXAMPLES: | DESIGN/ENGINEERING, PRODUCTION, TESTING/INSPECTION, MATERIALS, MODULES, MANUALS, ETC. |

4. _CATEGORIZATION BY FUNCTIONS

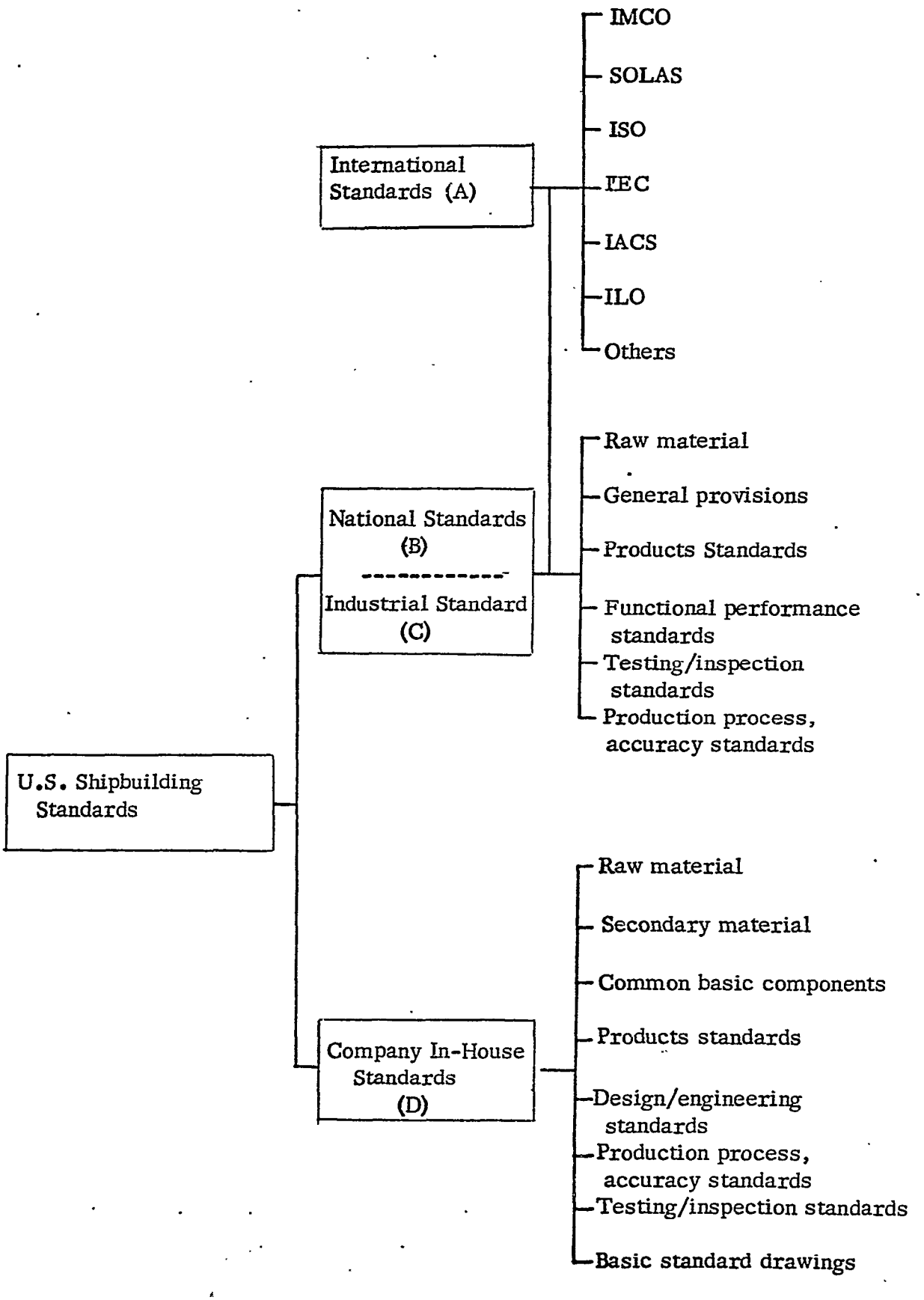
| | |
|---|---|
| PRODUCTS STANDARDS | BASIC FITTINGS, EQUIPMENTS, ETC., COMMONLY USED IN SHIP'S SYSTEMS. |
| EXAMPLES: | ANCHORS, BITTS, DOORS, PIPE JOINTS LIGHTING FIXTURES, ETC. |
| DESIGN/ENGINEERING STANDARDS | DESIGN' CRITERIA, SPECIFICATIONS, ETC., FOR SHIP'S SYSTEMS. |
| EXAMPLES: | STANDARD SPECIFICATIONS, CALCULATION FORMS,. ANALYSIS METHODS, ETC. |
| FUNTIONAL PERFORMANCE STANDARDS | STANDARD SPECS FOR MACHINERY AND EQUIPMENT, MATERIALS, COMPONENTS. |
| EXAMPLES: | STANDARD PERFORMANCE SPECS FOR LIFE BOATS, NAVIGATION EQUIPMENTS, PUMPS, GENERATORS, SWITCHBOARDS, VALVES, PAINTS, ETC. |
| TESTING/INSPECTION STANDARDS | TESTING/INSPECTION PROCESSES, ACCEPTANCE LEVELS, ETC. |
| EXAMPLES: | STANDARD PROTOCOLS OF SEA TRIALS, SYSTEMS, STANDARDS FOR SURFACE TREATMENT AND PAINTING, ETC. |
| PRODUCTION PROCESS STANDARDS | CONSTRUCTION METHODS, OUTFITTING METHODS, WELDING PROCESSES, ETC. |
| EXAMPLES: | STANDARD PROCESSES FOR HULL CONSTRUCTION, PIPE FABRICATION, SHAFT ALIGNMENT, ETC. |
| ACCURACY/TOLERANCE STANDARDS | ACCEPTANCE LEVEL OF ACCURACY TOLERANCE IN PRODUCTION. |
| EXAMPLES: | ACCURACY OF HULL STRUCTURE, PIPE JOINTS, SHAFT ALIGNMENT, ETC. |

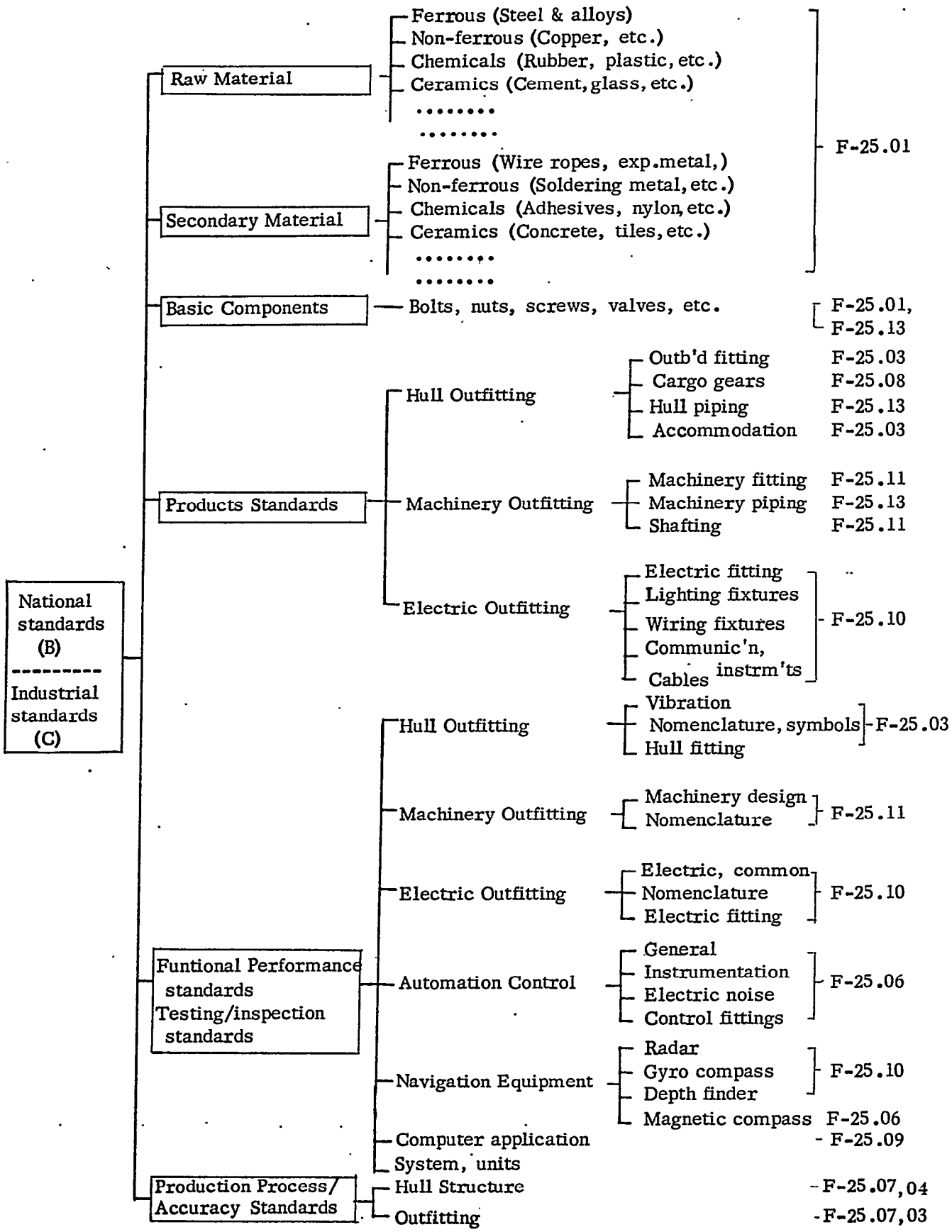
5. STANDARDS TREE STRUCTURE

PURPOSE: TO ORGANIZE AND SYSTEMATIZE ALL STANDARDS ITEMS, AND CLASSIFY THEM INTO STANDARDS CATEGORIES IN A FORM OF A TREE STRUCTURE TO IDENTIFY THE FAMILY GROUP THEY' BELONG TO.

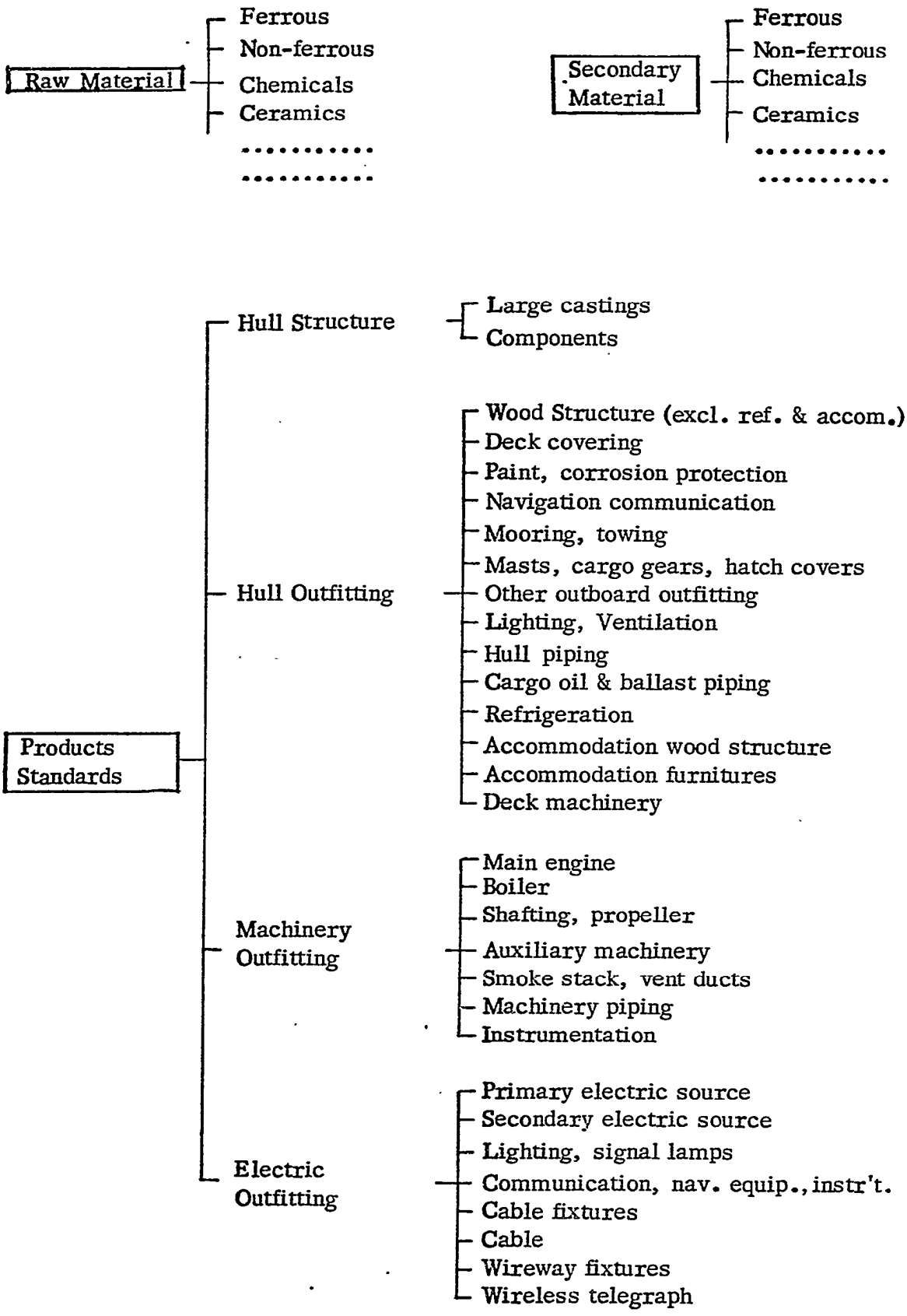
FORMAT: AT EACH STANDARDS LEVEL (NATIONAL, INDUSTRY, COMPANY LEVELS); CLASSIFY STANDARDS ITEMS INTO FUNCTIONAL GROUPS (PRODUCTS, DESIGN/ENGINEERING, ETC.) AND THEN INTO SYSTEMS OR WORK PROCESSES (HULL STRUCTURE, HULL OUTFITTING, ETC.), AND FINALLY INTO INDIVIDUAL ITEMS.

EXAMPLE OF TREE STRUCTURE

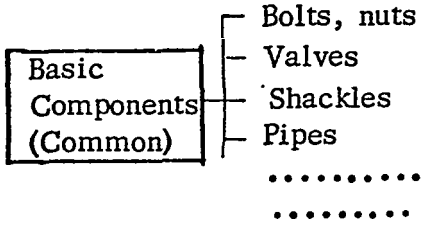


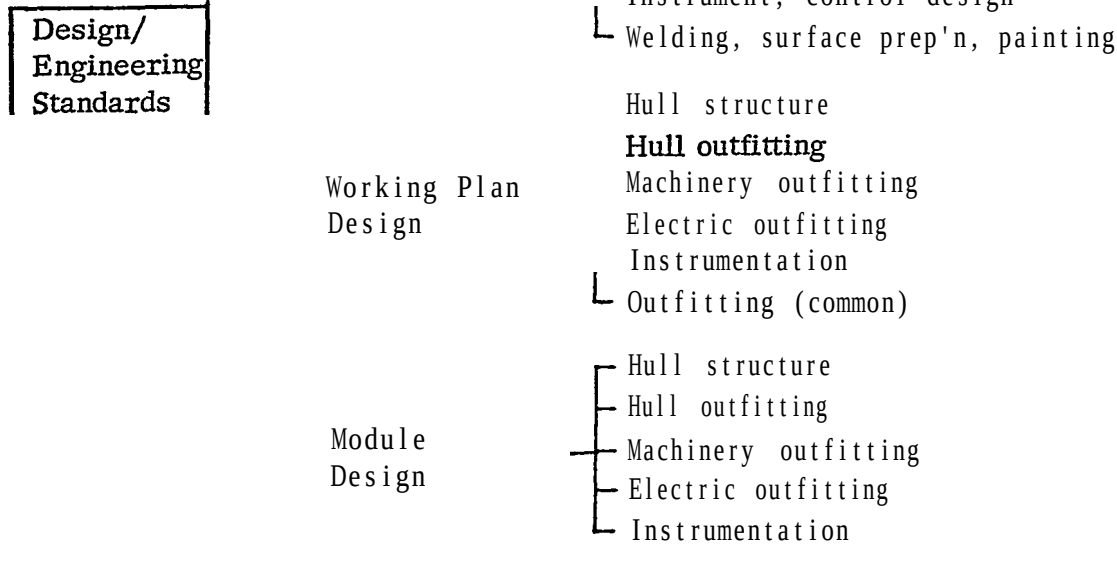

National standards (B)
Industrial standards (C)
Raw Material
Ferrous (Steel & alloys)
Non-ferrous (Copper, etc.)
Chemicals (Rubber, plastic, etc.)
Ceramics (Cement, glass, etc.)
Secondary Material
Ferrous (Wire ropes, exp.metal,)
Non-ferrous (Soldering metal, etc.)
Chemicals (Adhesives, nylon, etc.)
Ceramics (Concrete, tiles, etc.)
F-25.01
Basic Components
Bolts, nuts, screws, valves, etc.
F-25.01, F-25.13
Products Standards
Hull Outfitting
Outb'd fitting F-25.03
Cargo gears F-25.08
Hull piping F-25.13
Accommodation F-25.03
Machinery Outfitting
Machinery fitting F-25.11
Machinery piping F-25.13
Shafting F-25.11
Electric Outfitting
Electric fitting
Lighting fixtures
Wiring fixtures
Communic'n, instrm'ts
Cables
F-25.10
Funtional Performance standards
Testing/inspection standards
Hull Outfitting
Vibration
Nomenclature, symbols
Hull fitting
F-25.03
Machinery Outfitting
Machinery design
Nomenclature
F-25.11
Electric Outfitting
Electric, common Nomenclature
Electric fitting
F-25.10
Automation Control
General
Instrumentation
Electric noise
Control fittings
F-25.06
Navigation Equipment
Radar
Gyro compass
Depth finder
F-25.10
Magnetic compass F-25.06
Computer application
System, units
- F-25.09
Production Process/ Accuracy Standards
Hull Structure
- F-25.07, 04
Outfitting
- F-25.07, 03

## Company In-House Standards (D)



Company In-House Standards (D)



6. STANDARDIZATION GOALS

SHORT-TERM GOALS (2-3 YRS):

PRODUCTS STANDARDS

FUNCTIONAL PERFORMANCE STANDARDS

DESIGN/ENGINEERING STANDARDS (BASIC).

MID-TERM GOALS (5-7 YRS):

DESIGN/ENGINEERING STANDARDS (LONGER TERM)

TESTING/INSPECTION STANDARDS (BASIC)

PRODUCTION PROCESS STANDARDS (BASIC)

LONG-TERM GOALS (10-20 YRS):

DESIGN/ENGINEERING STANDARDS (LONGER TERM)

TESTING/INSPECTION STANDARDS (LONGER TERM)

PRODUCTION PROCESS STANDARDS (LONGER TERM)

ACCURACY/TOLERANCE STANDARDS

| Type of Standards | Major Users | Benefits | Circumstances | Development Time | Priority |
|---|---|---|---|---|---|
| Product Standards | Shipyard<br>Vendor<br>Regulatory Bodies | Design<br>Purchasing<br>Inspection | Can be developed independently | Short | Short-term |
| Functional Performance Standards | Shipyard<br>Vendor<br>Regulatory Bodies | Design<br>Purchasing<br>Inspection | Can be developed independently | Short | Short-term |
| Design/Engineering Standards | Shipyard | Design<br>Production | Should be based on proven standardized products | Need time to coordinate within industry or company | Short-term<br>&<br>Mid-term |
| Testing/Inspection Standards | Shipyard, Vendor,<br>Shipowner<br>Regulatory Bodies | Inspection<br>Production | No restrains | Need time for coordination with the groups concerned | Mid-term<br>&<br>Long-term |
| Production Process Standards<br>Accuracy Standards | Shipyard<br>Shipowner<br>Regulatory Bodies | Production<br>Inspection | Will be enhanced if products/functional/design standards, etc.are established | Need time for coordination with the groups concerned | Mid-term<br>&<br>Long-term |

7. ORGANIZATIONAL FOR STANDARDIZATION.

OBJECTIVE: TO DEFINE RESPONSIBILITIES AT EACH LEVEL FOR STANDARDS PLANNING, DEVELOPMENT, IMPLEMENTATION AND FOLLOW-UP.

FUNCTIONS REQUIRED:

- PLANNING & DETERMINATION OF LONG-RANGE PLAN
- DEVELOPMENT OF STANDARDS
- APPROVAL AND ENACTMENT OF STANDARDS
- PUBLICATION OF STANDARDS
- FOLLOW-UP & MAINTENANCE OF STANDARDS

BASIC TASK GROUP STRUCTURE:

- STANDARDS COMMITTEE: DETERMINE LONG-RANGE AND ANNUAL DEVELOPMENT PLANS, APPROVE FINAL DRAFT STANDARDS.
- DIVISIONAL COMMITTEES: ORGANIZED UNDER STANDARDS COMMITTEE BY FUNCTIONS TO DRAFT LONG-RANGE & ANNUAL DEVELOPMENT PLANS, EVALUATE DRAFT STANDARDS DRAFTED BY WORKING COMMITTEES.
- WORKING COMMITTEES: ORGANIZED UNDER EACH DIVISIONAL COMMITTEE TO DRAFT STANDARDS.

## 8. RECOMMENDED U.S. SHIPBUILDING STANDARDS LONG-RANGE PLAN

### A. FINAL REPORT: FORMAT

VOLUME I: - EXECUTIVE SUMMARY

BACKGROUND CONSIDERATIONS & GUIDELINES FOR STANDARDIZATION.

APPENDICES: - BACKGROUND SURVEY RESULTS.
JAPANESE APPROACH TO STANDARDIZATION IN SHIPBUILDING.

VOLUME II: - RECOMMENDED U.S. SHIPBUILDING STANDARDS LONG-RANGE PLAN.

GUIDELINES FOR SELECTION AND ASSESSMENT OF STANDARDS.

GUIDELINES FOR CODING AND COMPUTER APPLICATION.

APPENDICES: - STANDARDS TREE STRUCTURE.
LIST OF STANDARDS ITEMS CATEGORIZED BY PRIORITY ORDERS.
STANDARDS PUBLICATION FORMAT
EXAMPLE OF SYSTEM CODES

VOLUME III: - CATALOGUE OF EXISTING SHIPBUILDING STANDARDS, COMMERCIAL & NAVY,

APPENDIX C

## EXPLANATIONS

### 1. RATIONALE

This column indicates the effects or benefits of standardization.

2 to 4 most effective rationales are selected for each standard.

01 - Improve communication, save labour
(e.g. smoother negotiations, minimize‘ conflicts)

02 - Improve approval work, save labour
(e.g. simplify plan approval, shorten approval time)

03 : Improve inspection work, save labour
(e.g. simplify/eliminate inspection, shorten inspection time, eliminate duplication)

04 - Improve design/engineering work, save labour
(e.g. reduce engineering manhours, minimize design changes, improve accuracy of drawings)

05 - Improve purchasing work, save labour
(e.g. simplify ordering, minimize estimation work)

06 - Improve production, save labour
(e.g. improve productivity, reduce manhours)

07 - Stabilize or improve technology level
(e.g. stabilize and improve engineering and production technology, eliminate inconsistency in design or specifications)

08 - Maintain or improve quality
(e.g. maintain quality, improve reliability)

09 - Reduce cost
(e.g. avoid over design, reduce tailor-made products) -

10 - Shorten delivery time
(e.g. reduce purchasing time, allow stocks)

2. STATUS

This column indicates the organization, rule or regulation, institute, etc., issuing and controlling the standard.

3. CATEGORY

This column indicates characteristics of the standard.

N - National standard

I - Industry-wide standard

H - Company in-house standard

4. F-25 COMMITTEE

This column indicates the code number of ASTM F-25 sub-committees.

| NO | ITEM | RATIO -NALE | STATUS | CATE -GORY | F-25 COMM |
|---|---|---|---|---|---|
| 1 | Manhole cover, Access hatch cover, etc. | 02 04 05 08 | MASS ABS ISO | I | 03 |
| 2 | Rigging, Lines, Blocks | 02 04 05 08 | MASS | I | 03 |
| 3 | Anchor | 02 04 05 08 | MASS ABS ISO | N | 03 |
| 4 | Anchor chain | 02 04 05 08 | MASS ABS ISO | N | 03 |
| 5 | Anchor chain controller | 02 04 05 08 | MASS ISO | N | 03 |
| 6 | Bitt, Bollard | 02 04 05 08 | PCC ISO | N | 03 |
| 7 | Chocks | 02 04 05 08 | PCC ISO | I | 03 |
| 8 | Eye plate, Ring plate | 04 05 08 10 | MASS DIN JIS | I | 03 |
| 9 | Handrail, Handrail stanchion | 04 05 08 10 | MASS ISO | I | 03 |
| 10 | Step, Vertical ladder | 04 05 08 10 | MASS ISO | I | 03 |
| 11 | Pilot ladder | 02 04 05 08 | ISO | N | 03 |
| 12 | Weather tight steel door | 02 04 05 08 | MASS ISO | I | 03 |
| 13 | Round scuttle, Window | 02 04 05 08 | MASS ABS ISO | I | 03 |
| 14 | Bottom plug | 04 05 08 10 | ISO | I | 03 |
| 15 | | | | | |
| 16 | | | | | |
| 17 | | | | | |

**Table - 1** Short-term Products Standards

| NO | ITEM | RATIO -NALE | STATUS | CATE -GORY | F-25 COMM |
|---|---|---|---|---|---|
| 1 | Bosun store equipment (bosun chair etc.) | 01 04 05 08 | MASS JIS | I | 03 |
| 2 | Derrick boom | 02 04 05 08 | MASS ISO | I | 03 |
| 3 | Goose neck bracket | 02 04 05 08 | MASS ISO | I | 03 |
| 4 | Topping bracket | 02 04 05 08 | MASS ISO | I | 03 |
| 5 | Boom rest | 04 05 08 09 | MASS JIS | I | 03 |
| 6 | Fittings of bitter end of anchor chain | 04 05 08 09 | JIS | I | 03 |
| 7 | Fairleader | 04 05 08 09 | DIN JIS | I/H | 03 |
| 8 | Ladder and platform | 04 05 08 09 | MASS | I | 03 |
| 9 | Ladder and platform (tank, hold) | 04 05 08 09 | MASS | I | 03 |
| 10 | Ladder and platform (engine room) | 04 05 08 09 | MASS | I | 03 |
| 11 | Ladder (in accommodation) | 04 05 08 09 | MASS | I | 03 |
| 12 | Ship's side ladder for pilot | 02 04 05 08 | PCC | I | 03 |
| 13 | Door for accommodation | 04 05 08 09 | MASS | I | 03 |
| 14 | Door for store (non-tight door) | 04 05 08 09 | JIS | I/H | 03 |
| 15 | Inventories | 04 05 08 10 | MASS FED MIL | I/H | 03 |
| 16 | Fittings for store and work space (shelf etc.) | 04 05 08 09 | MASS FED | I/H | 03 |
| 17 | Hydrant box, Hose box | 04 05 08 09 | MASS ABS | I/H | 03 |

**Table - 2** Mid-term Products Standards

| NO | ITEM | RATIO -NALE | STATUS | CATE -GORY | F-25 COMM |
|---|---|---|---|---|---|
| 1 | Side port | 02 04 05 08 | MASS | I/H | 03 |
| 2 | Water tight door | 02 04 05 08 | ABS JIS | I | 03 |
| 3 | Sequring device for cargo hatch cover | 04 05 08 09 | MASS ABS | I/H | 03 |
| 4 | Mast, Derrick post | 04 05 08 07 | MASS ABS | H | 03 |
| 5 | Ventriser (cargo/inert gas vent) | 04 05 08 09 | ABS | I | 03 |
| 6 | Pressure vacuum breaker | 04 05 08 09 | ABS | I | 03 |
| 7 | Rudder carrier | 04 05 08 09 | MASS ABS | I/H | 03 |
| 8 | Tanks (miscellaneous use) | 04 05 08 09 | - | I/H | 03 |
| 9 | Container lashing device | 04 05 08 09 | ABS | I/H | 03 |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |
| 16 | | | | | |
| 17 | | | | | |

**Table - 3** Long-term Products Standards

## RECOMMENDED ORGANIZATIONAL STRUCTURE FOR STANDARDS DEVELOPMENT

A) National Standards

| Work Process | Responsible Organization |
|---|---|
| - Planning, long-range plan goals | MarAd (commercial, actual planning assigned to SNAME SP-6) |
| - Development | ANSI (related to ISO)<br>ASTM, F-25 (others) |
| - Approval/Authorization | SNAME SP-6. |
| - Enactment | MarAd |
| - Publication/Distribution | ANSI or ASTM |
| - Follow-up | SNAME SP-6 (actual work assigned to ANSI or ASTM) |
| - Recognition, re compliance w/international, Federal laws, regulations | U.S.C.G. |

## 8 Industry Voluntary Standards

| Work Process | Responsible Organizations |
|---|---|
| - Planning, long-range plan goals | SNAME SP-6 |
| - Development | ASTM F-25 |
| - Approval/Authorization | SNAME SP-6 |
| - Enactment | ASTM |
| - Publication | ASTM |

| F-25 COMM | SWBS | TYPE OF STANDARD | POTENTL BENEFITS | ORG CODE | NO. OF STANDARD | RV YR | RF YR | SYNONYMS ORGCD STANDARD-1 YR | SYNONYMS ORGCD STANDARD-2 YR | SYNONYMS ORGCD STANDARD-3 YR | MOD REQD | SYSTEM UNITS | TSK NO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SUBJECT CATEGORY | | | | | | | | | | | |
| | | STANDARD TITLE | | | | | | | | | | | |
| 03 | 582 | 5 | 2 | DIN | 81921 | 69 | | | | | 3 | M | 3 |
| | BITT. BOLLARD AND CLEAT | | | | | | | | | | | | |
| | | | | | | | | | | BELAYING CLEATS FOR FIBRE ROPES | | | |
| 03 | 582 | 5 | 2 | HDW | 62034 | 72 | | | | | 3 | M | 3 |
| | BITT. BOLLARD AND CLEAT | | | | | | | | | | | | |
| | | | | | | | | | | BOLLARDS. SUMMARY | | | |
| 03 | 582 | 5 | 2 | JIS | F2001 | 75 | | | | | 3 | M | 3 |
| | BITT. BOLLARD AND CLEAT | | | | | | | | | | | | |
| | | | | | | | | | | BOLLARDS | | | |
| 03 | 582 | 5 | 2 | DIN | 81915 | 69 | | | | | 3 | M | 3 |
| | CHOCK | | | | | | | | | | | | |
| | | | | | | | | | | MULTI-PURPOSE CHOCKS | | | |
| 03 | 582 | 5 | 2 | HMN | 45002-1 | 2 | | | | | 3 | M | 3 |
| | CHOCK | | | | | | | | | | | | |
| | | | | | | | | | | ROLLER CHOCK. SUMMARY | | | |
| 03 | 582 | 5 | 2 | JIS | F2003 | 68 | | | | | 3 | M | 3 |
| | CHOCK | | | | | | | | | | | | |
| | | | | | | | | | | CAST IRON DECK END ROLLERS | | | |
| 03 | 582 | 5 | 2 | JIS | F2004 | 76 | | | | | 3 | M | 3 |
| | CHOCK | | | | | | | | | | | | |
| | | | | | | | | | | STEEL PLATE DECK END ROLLERS | | | |
| 03 | 582 | 5 | 2 | JIS | F2005 | 75 | | | | | 3 | M | 3 |
| | CHOCK | | | | | | | | | | | | |
| | | | | | | | | | | CLOSED CHOCKS | | | |
| 03 | 582 | 5 | 2 | JIS | F2017 | 75 | | | | | 3 | M | 3 |
| | CHOCK | | | | | | | | | | | | |
| | | | | | | | | | | PANAMA CHOCKS | | | |
| 03 | 582 | 5 | 2 | DIN | 81906 | 72 | | | | | 3 | M | 3 |
| | FAIRLEAD | | | | | | | | | | | | |
| | | | | | | | | | | PEDESTAL FAIRLEADS (OLD MAN FAIRLEADS) | | | |
| 03 | 582 | 5 | 2 | HMN | 46002-2 | 74 | | | | | 3 | M | 3 |
| | FAIRLEAD | | | | | | | | | | | | |
| | | | | | | | | | | GUIDE ROLLER. SUMMARY | | | |
| 03 | 582 | 5 | 2 | JIS | F2014 | 69 | 75 | | | | 3 | M | 3 |
| | FAIRLEAD | | | | | | | | | | | | |
| | | | | | | | | | | FAIR-LEADS | | | |

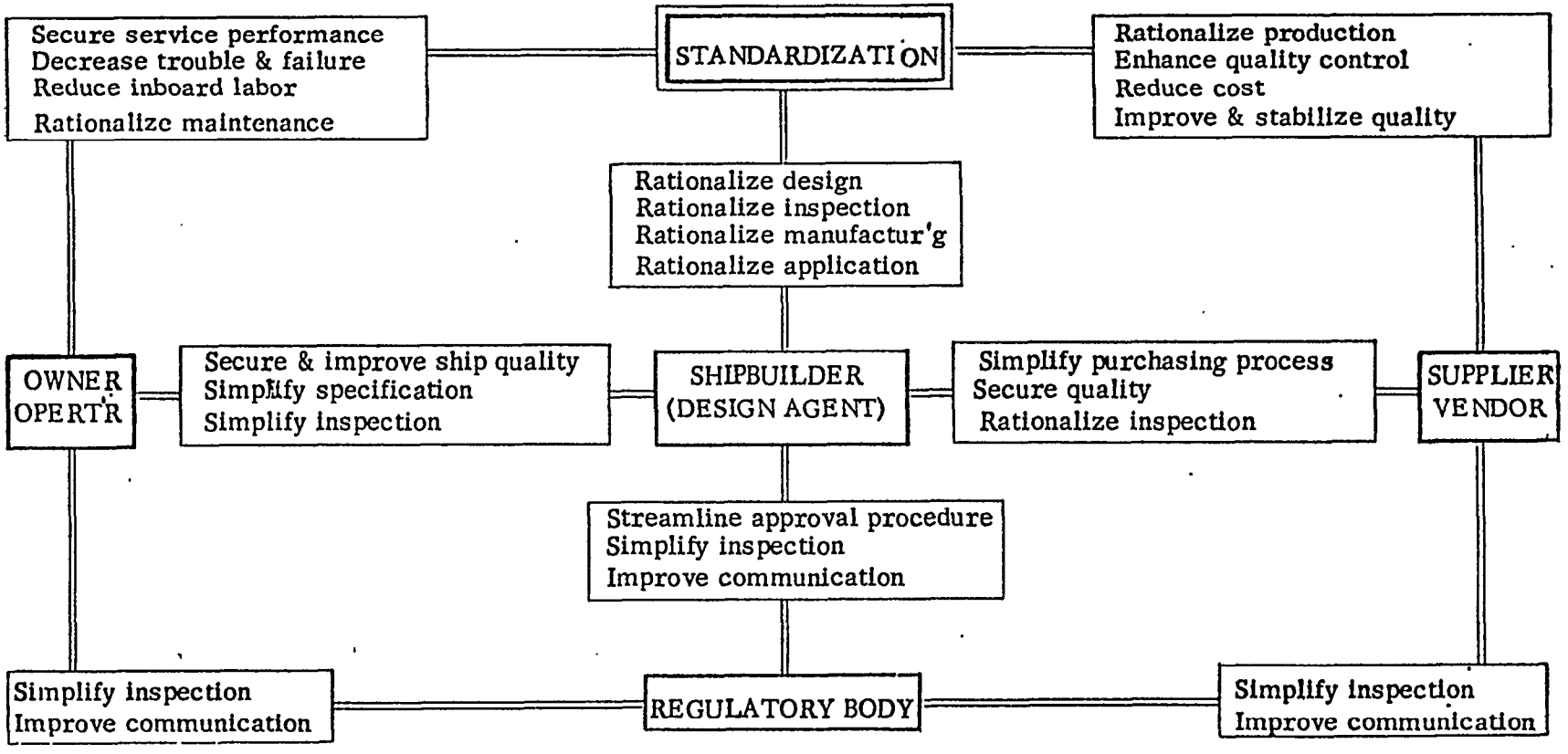



Figure 1-1 Effects of Standardization

# APPENDIX A: IREAPS TECHNICAL SYMPOSIUM AGENDA

## TUESDAY, SEPTEMBER 15

**8:00 - 3:30** REGISTRATION — GRAND FOYER

**9:15** GENERAL SESSION — FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER

SESSION CHAIRMAN: J.R. Vander Schaaf, Bath Iron Works

- WELCOME
  J.C. Estes, Bethlehem Steel Corp.
- SHIP PRODUCTION COMMITTEE OVERVIEW
  E.L. Peterson, Peterson Builders, Inc.

SHIP PRODUCTION COMMITTEE PANEL OVERVIEWS:

- SP-2 — Outfitting and Production Aids
  L.D. Chirillo, Todd Pacific Shipyards Corp.

**10:30** INFORMAL DISCUSSION PERIOD

**11:00** GENERAL SESSION — FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER

SESSION CHAIRMAN: E.L. Peterson, Peterson Builders

SPC PANEL OVERVIEWS (contd)

- SP-1 & 3 — Facilities and Environmental Effects
  R. Price, Avondale Shipyards, Inc.
- A PROGRESS REPORT ON THE IREAPS PROGRAM
  E.R. Bangs, IIT Research Institute

**12:00** LUNCH

**1:30** GENERAL SESSION — FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER

SESSION CHAIRMAN: L.D. Chirillo, Todd Pacific Shipyards

SPC PANEL OVERVIEWS (contd)

- SP-4 — Design/Production Integration
  T.J. O'Donohue, Newport News Shipbuilding
- Introduction-Ship Producibility Research Program
  J.C. Mason, Bath Iron Works Corp.
- SP-6 — The National Shipbuilding Standards Program
  S.Wolkow, Bath Iron Works Corp.
- SP-8 — The Shipbuilding Industrial Engineering Program
  J.R. Fortin, Bath Iron Works Corp.

**3:00** INFORMAL DISCUSSION PERIOD

**3:30** GENERAL SESSION — FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER

SESSION CHAIRMAN: E.R. Bangs, IIT Research Institute

SPC PANEL OVERVIEWS (contd)

- SP-7 — Shipyard Welding
  B.C. Howser, Newport News Shipbuilding
- 0-23-1 — Surface Preparation and Coatings
  J. Peart, Avondale Shipyards, Inc.
- SP-9 — Education
  H. Bunch, University of Michigan

**5:15 - 6:15** RECEPTION — GRAND FOYER
Sponsored by: IIT Research Institute

## WEDNESDAY, SEPTEMBER 16

**8:00 - 3:30** REGISTRATION — GRAND FOYER

**8:30** Concurrent Sessions

SESSION 1 — FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER

SESSION CHAIRMAN: P.M. Cofoni, General Dynamics

- THE AUTOFIT CAD/CAM SYSTEM FOR PIPING ENGINEERING: OPERATIONAL EXPERIENCE AND DEVELOPMENT STATUS
  F. Dahle, Shipping Research Services A/S
- AUTODRAW: AUTOKON'S INTERACTIVE GRAPHICS SYSTEM FOR VIEWING AND MANIPULATING STRUCTURAL MODEL DATA INTO COMPLETE DRAWING DOCUMENTATION
  F. van Cuilenborg, Shipping Research Services A/S
- USING AUTOKON FROM EARLY DESIGN: RECENT EXPERIENCE FROM ACTUAL SHIP DESIGNS
  H. Oigaarden, Shipping Research Services A/S

SESSION 2 — FRANCIS SCOTT KEY BALLROOM, SOUTH

SESSION CHAIRMAN: R. Price, Avondale Shipyards

- JAPANESE SURFACE PREPARATION AND COATING METHODOLOGY AND MATERIALS
  G. Soltz, Consultant
- IMPLEMENTATION OF PRODUCTION ENGINEERING TECHNIQUES
  M. Bell, A & P Appledore, Ltd.
  L. Flora, Norshipco
- A MANAGEMENT SIMULATOR FOR SHOP STORES IN THE U.S. NAVAL SHIPYARDS
  H.E. Warren, California State University — Los Angeles

**10:00** INFORMAL DISCUSSION PERIOD

**10:30** Concurrent Sessions

SESSION 1 — FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER

SESSION CHAIRMAN: J. Wasserboehr
National Steel
Shipbuildlng

. U.S. NAVY CAD/CAM PROGRAM HULL STRUCTURE (HULSTRX) DEVELOPMENT OVERVIEW
D. Helgerson. Advanced Marine Enterprises, Inc.
E. Byler. Advanced Marine Enterprises, Inc.

l BRITSHIPS - SHIPBUILDING CAD/CAM IN PRODUCTIVE APPLICATION
I.M. Tolmie, British Ship Research Association

. A NATIONAL COALITION FOR THE SHIPBUILDING TECHNOLOGY PROGRAM
F.W. Helming, SofTech, Inc.

SESSION 2 FRANCIS SCOTT KEY BALLROOM, SOUTH

SESSION CHAIRMAN: J. Peart
Avondale Shipyards

. ECONOMIC BENEFITS AND TECHNOLOGY OF CU/NI SHIP HULL SHEATHING
L.W. Sandor. The Franklin Research Center
L.M. Schetky, International Copper Research Association. Inc.
E.W. Thiele, Copper Development Association

. A CNC SHEETMETAL FABRICATION SYSTEM FOR PRODUCTION OF SHIPS VENTILATION COMPONENTS AND FLATWORK
T.R. Galie. Naval Ship Systems Engineering Station
D. Blais, Bath Iron Works Corp.

l SHIP STRUCTURAL COST PROGRAM
A. Furio. David W. Taylor Naval Ship Research and Development Center

12:00 LUNCH

1:30 GENERAL SESSION FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER

SESSION CHAIRMAN: R.C. Moore
Newport News
Shipbuilding

. IMPLEMENTATION OF INTERACTIVE GRAPHICS FOR STRUCTURAL DESIGN AND PART DEFINITION
G. Panciera, General Dynamics
D. Palmer, General Dynamics

. HUMAN PERFORMANCE ENGINEERING AS A GUARANTEED METHOD OF PRODUCTIVITY INCREASE
D.C. Anderson, University of Notre Dame

3:00 INFORMAL DISCUSSION PERIOD

3:30 GENERAL SESSION FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER

SESSION CHAIRMAN: T.J. O'Donohue
Newport News.
Shipbuilding

l PRODUCTIVITY, NAVY STYLE
J.W. Tweeddale, U.S. Navy

l QUALITY CIRCLES.. . DOING BUSINESS BETTER AT THE PHILADELPHIA NAVAL SHIPYARD
R. Bradley, Philadelphia Naval Shipyard

## THURSDAY, SEPTEMBER 17

8:00 - 10:30 REGISTRATION GRAND FOYER

8:30 Concurrent Sessions

SESSION 1 FRANCIS SCOTT KEY BALLROOM. NORTH & CENTER

SESSION CHAIRMAN: B.G. Bohi
Bethlehem Steel Corp.

. THE NEW INTERACTIVE GRAPHICS SYSTEM AT CALI AND ASSOCIATES
L. Lowery, Cali and Assoicates, Inc.

l THE MOST COMPUTER SYSTEMS - SHIPYARD APPLICATION
L. Kuh. H.B. Maynard & Co., Inc.

l INTERACTIVE PARTS DEFINITION PROJECT
R.C. Moore, Newport News Shipbuilding
A.F. Kaun. Newport News Shipbuilding

SESSION 2 FRANCIS SCOTT KEY BALLROOM, SOUTH

SESSION CHAIRMAN: H.M. Bunch
University of Michigan

. AN APPROACH TO SUCCESSFUL SHIPYARD PLANNING AND SCHEDULING
S. Knapp. SPAR Associates, Inc.

. PLANNING AND SCHEDULING SHIP CONSTRUCTION SUBJECT TO LIMITED RESOURCES
L.C. Deschamps. SPAR Associates, Inc.

l IMPLEMENTATION OF A PRACTICAL PLANNING AND PRODUCTION CONTROL SYSTEM IN SMALL AND MEDIUM SIZED SHIPYARDS
J.N. Spillane. Shipbuilding Consultants, Inc.

10:00 INFORMAL DISCUSSION PERIOD

10:30 GENERAL SESSION FRANCIS SCOTT KEY BALLROOM. NORTH & CENTER

SESSION CHAIRMAN: R. Lovdahl
Todd Pacific Shipyards

l INTERACTIVE STEEL STRUCTURE DEFINITION AND GENERATION: EFFECTS ON MANPOWER AND LEADING TIME
R. Di Luca, Italcantieri S.P.A.

l A PRACTICAL APPROACH TO USING STANDARD SOFTWARE PACKAGES IN SMALL SHIPYARDS
G. Hoffman, St. Louis Ship

• AN INTRODUCTION TO ENGINEERING MODELS (WITH A CASE STUDY IN THE SHIPBUILDING INDUSTRY) - A CHALLENGE
J.W. Rohrer, U.S.A. Models
G.L. Kraine, Sun Shipbuilding and Dry Dock Company

12:00 LUNCH

1:30 GENERAL SESSION FRANCIS SCOTT KEY BALLROOM. NORTH & CENTER
SESSION CHAIRMAN: D.J. Martin
National Steel & Shipbuilding

l PRODUCIBILITY FROM CONCEPTUAL DESIGN TO SHIP CONSTRUCTION
I.S. MacDougall A & P Appledore. Ltd.

. COMPUTER ASSISTED PROCESS MANUFACTURING AND ASSEMBLY - A FIRST STEP TOWARDS INTEGRATION
A. Houtzeel, Organization fox Industrial Research, Inc.

3:00 INFORMAL DISCUSSION PERIOD

3:30 GENERAL SESSION FRANCIS SCOTT KEY BALLROOM, NORTH & CENTER
SESSION CHAIRMAN: L.M. Thorell
Todd Pacific Shipyards

• PRODUCTIVITY -MANAGEMENT'S BONUS (!!) OR FAILURE (??)
F.H. Rack, Shipbuilding Consultants, Inc.

l THE U.S. SHIPBUILDING STANDARDS PROGRAM -LONG RANGE PLAN
Y. Ichinose. IHI Maxine Technology, Inc.

4:30 ADJOURNMENT

# APPENDIX B: IREAPS TECHNICAL SYMPOSIUM ATTENDANCE LIST

Baltimore, Maryland

SEPTEMBER 15-17, 1981

A&P APPLEDORE LIMITED
Northumbrian Way, Killingworth
Newcastle Upon Tyne, ENGLAND

Malcolm Bell
Ship Production Engineer

I. S. MacDougall
Director

ADVANCED MARINE ENTERPRISES
1725 Jefferson Davis Hwy - Suite 1300
Arlington, VA 22202

Barry L. Batchelor
System Analyst

Eric Byler
Systems Analyst

Dave Helgerson
Chief Hull Scientific Sect.

Ricky W. Lee
Sr. Designer

Otto P. Jons
V.P. Engineering

ADVANCED TECHNOLOGY, INC.
1725 Jefferson Davis Hwy - Suite 300
Arlington, VA 22202

Stephen T. Fisher
Senior Program Engineer

THE AMERICAN SHIP BUILDING COMPANY
AMSHIP Div.
400 Colorado
Lorain, OH 44052

Gordon Calvin
VP Planning & Production Control

Ray Francis
Manager-Engineering

Ed Wingenroth
Welding Engineer

ANDERSON ENGINEERS INC.
200 Thelma Drive
Carnegie, PA 15106

Gary L. Schnorrenberg
National Sales Manager

D. APPLETON CO., INC. (DACOM)
P.O. Box 838
Manhattan Beach, CA 90266

A. Wayne Snodgrass
Project Manager

AUTO-TROL TECHNOLOGY
12500 N. Washington
Denver, CO 80233

Walt Simpson
Manager of Applications Dev.

AVONDALE SHIPYARDS INC.
P.O. Box 50280
New Orleans, LA 70150

John Peart

Richard Price

AVONDALE SHIPYARDS INC.
76 Dunlcith Ct.
Marrero, LA 70072

Vincent H. Nuzzo
Supt. Mold Loft

BALTIMORE MARINE SERVICES
22 W. Padonia - Suite C252
Timonium, MD 21093

Robert Dennison

Gordon Kinkaid
President

Tom Kneeshaw
VP

BAND, LAVIS & ASSOCIATS INC.
670 Ritchie Highway
Severna Pk, MD 21146

Paul R. Van Mater, Jr
Senior Naval Architect

BATH IRON WORKS
700 Washington Street
Bath, Maine 04530

David Blais

J. R. Erikson
FFG Design Mgr.

J. R. Fortin

J. C. Mason

Richard B. Siek
NC Projedt Coordinator

D. H. Thompson
Producibility Project Engineer

James R. Vander Schaaf
Supvr. of Planning Systems Development

S. Wolkow

BAY SHIPBUILDING CORP.
605 N. Third Ave.
Sturgeon Bay, WI 54235

Robert H. Miller
VP, Director of Engineering

BETHLEHEM STEEL CORP.
CTD-Sparrows Point Shipyard
Sparrows Point, MD 21219

V. G. Adams
Hull Drafting Dept.

Bruce Bohl
Lead/Programmer/Analyst

Karl E. Briers
System Engineer

Martin Castle
Sr. Designer

Kevin D. Dyer
Sr. Engr.

Edwin Faus
Industrial Engineer

Isaac Gemmell
Chief Electrical Draftsman

Sudarshan K. Gupta
Senior Engineer

Joseph Haslbeck
Chief Machinery Draftsman

Nicholas V. Haynes
supt., Production Engineering

BETHLEHEM STEEL CORP. (continued)
CTD-Sparrows Point Shipyard
Sparrows Point, MD 21219

Art Huge
Shipyard Controller-Accounting Dept.

Henry Jones
Plant Engineer

James P. Kozo
Project Manager

Ed Marcavage
Computer Applications Sect..

William P. McCloskey
General Foreman-Electrical & Sheet Metal

Peter McNair
Planning

Alex Miller
Chief Planner

Mike Miller
Planning

T. L. Mullin
Chief Draftsman

Tahanh Minh Ngo
Computer Applications Sect.

Dan Romanchuk
General Supt.

Gerald Simmons
Pipe Foreman

Frank J. Slyker
Chief, Basic Ship Design

Norm Smith
Supt. Outfitting

John Spies
Computer Applications Sect.

David T. Vermette
Exempt. Supervisor

Dave Watson

BETHLEHEM STEEL CORP.
Shipbuilding
Martin Tower
Bethlehem, PA 18016

Henry A. Baierlein
Supt. Maint. Practices

John C. Estes
Assistant VP, Shipbuilding

Eugene Schorsch
Manager

BRITISH SHIP RESEARCH ASSOCIATION
Wallsend
Tyen & Wear NE28 6UY
ENGLAND

D. R. Patterson

BRITISH SHIPBUILDERS
Benton House, 136 Sandyford Road
Newcastle upon Tyne, NE1 1QE
ENGLAND

*George* R. Snaith
Director of Research

CADCOM DIV.
MANTECH INTL CORP.
107 Ridgely
Annapolis, MD

John C. Gebhardt
Chief Scientist

*CALCOMP*
3320 E. La Palma
Anaheim, CA 92706

Raymond T. Thexton
CAD/COM Manager

CALI & ASSOCIATES, INC.
3101 37th Street - Suite 130
Metairie, LA 70001

Filippo Cali
President

Lonnie Lowery
Consultant

CALIFORNIA STATE UNIVERSITY - L.A.
5151 State University Drive
Los Angeles, CA 90032

Hugh E. Warren
Professior of Accounting
School of Business and Economics

*CAMSCO*
2171 *N*. Lake Parkway - Suite 116
Tucker, GA 30084

Joseph W. Wade
Mgr. Eastern Regional Sales

CDI MARINE COMPANY
1725 Jefferson Davis Hwy - Suite 613
Arlington, VA 22202

Donald Atkins

William H. Hunley

Robert Van Buiten

COLLINGWOOD SHIPYARDS
Canadian Shipbuilding & Engineering Ltd.
Collingwood, ONT., Canada

Laurie Moore
Systems Analyst

CORPORATE-TECH PLANNING INC.
John Hart Mansion-The Hill
Portsmouth, NH 03801

Rodney A. Robinson
Executive Staff Member

DAVIE SHIPBUILDING LTD
P.O. 130 Lauzon Levis
Quebec, Canada

M. Donnison
Manager of Engineering

Marc-Guy Letourneau
Designer and Scientific Analysis

Charles Methot
Steel Work Planning Manager

DESIGNERS & PLANNERS
2341 Jefferson Davis Hwy
Arlington, VA 22202

Jon Gude
Computer Specialist

Steve Klomparens
Head, Computer Aided Ship Design

FMC
Marine & Rail Equipment
4700 N.W. Front Avenue
Portland, OR 97208

Walter MacDonald
Manager Marine Operations

THE FRANKLIN RESEARCH CENTER
Division of The Franklin Institute
20th & The Parkway
Philadelphia, PA 19103

L. W. Sandor

GALVESTON SHIPBUILDING CO.
P.O. Box 2660
Galveston, TX 77553

Bruce D. Johnson
Chief Engineer

GENERAL DYNAMICS
Electric Boat Div.
Eastern Point Rd.
Groton, CT 06340

Kenneth D. Brown
Operations Engineering Manager

Thomas F. McCarthy
Principal Engineer

Doug Palmer

David V. Pearson
Chief Engineer

GENERAL DYNAMICS
Electric Boat Div.
Quonset Point Facility
North Kingstown, RI 02852

Victor Sibilla
Chief Central Trade Planning

John M. Wallent
Chief of Automated Processes

GENERAL DYNAMICS
Data Systems Div.
Eastern Pt. Road
Groton, CT 06340

Paul M. Cofoni
Mgr., CAD/CAM

George Panciera
Sr Software Engineer

GENERAL DYNAMICS
Quincy Shipbuilding Div.
97 East Howard Street
Quincy, MA 02169

Russell G. Billard
Design Chief/Mold Loft

Lee A. Denney
IREAPS Representative

Robert B. Geary
Director of Engineering

GENERAL DYNAMICS CORP.
Data Systems Services
12101 Woodcrest Executive Drive
St. Louis, MO 63141

B. J. Breen
Director, CAD/CAM

GENERAL ELECTRIC COMPANY
Industrial Sales Div.
6060 Jefferson Ave.- Suite 8001
Newport News, VA 23605

Martin W. Steffens
Sales Manager

GIBBS & COX, INC.
40 Rector St.
New York, NY 10006

Malcolm Dick

GRUMMAN AEROSPACE
Advanced Marine Systems
Bethpage, NY 11714

Gordon Sammis
Naval Architect

Bob Skirkanich
Sr. Science Systems Analyst

HEMPEL'S MARINE
Ship Bldg. Div.
Foot of Carrie Ave.
Wallington, NJ

J. H. Shubrook
Natl. Sales Manager

J. J. HENRY CO., INC.
West Park Drive
Mt. Laurel Industrial Park
Moorestown, NJ 08057

Edward T. Barry

John H. Klose
Assistant VP

Gordon Plancich, Jr.

HYDRONAUTICS, INC.
7210 Pindell School Rd.
Laurel, MD

Stephen J. Daugard
Research Scientist

Thomas M. Sauer
Research Scientist

IHI MARINE TECHNOLOGY INC.
100 Church Street - Suite 1830
New York, New York 10007

Yoshinonu Ichinose
VP

IIT Research Institute
10 West 35th Street
Chicago, IL 60616

Edmund R. Bangs
IREAPS Manager

Lind M. Bender
General Chairman, IREAPS Technical Symposium

Victor Fischer
Staff

Margarita Hernandez
IREAPS Librarian

INDUSTRIAL CONSULTANTS, INC.
6726 Sulky Lane
Rockville, MD 20852

M. B. Miller
President

S. J. Miller
Assistant to President

INFORMATION/DOCUMENTATION
Box 17109 - Dulles International Airport
Washington, DC 20041

Michael S. Saboe
Director

INGALLS SHIPBUILDING
Division of Litton Systems, Inc.
P.O. Box 149
Pascagoula, MS 39567

Wesley Eugene Beech
M.S. 2018.07

G. A. Houstein
Design Specialist-M.S. 39567

Bill Hoven
Technical Applications

A. J. Morris
Manager, Interactive Graphics Dept.-M.S. 39567

F. M. Perry, Jr.
VP, Productivity & Operational Evaluation

R. H. Slaughter, Jr.
M.S. 1090-02

M. B. West
Section Manager-M.S. 1013-01

INTERCAN LOGISTICAL
c/o Collingwood Shipyards
Collingwood, ONT. Canada

John J. Dougherty
Vice President

INTERNATIONAL COPPER RESEARCH ASSOCIATION, INC.
708 Third Avenue
New York, NY 10017

L. McDonald Schetky
Tech. Dir. Metallurgy

INTERSHIPPING CONSULTANTS CO.
2507 Red Oak Circle
Springfield, PA 19064

Ralf Ohlin

ITALCANTIERI
Corso Cavour 1
Trieste, Italy

Renzo DiLuca

JACKSONVILLE SHIPYARDS INC.
P.O. Box 2347
Jacksonville, FL 32203

Richard Powell
Production Coordinator

LOCKHEED SHIPBUILDING AND CONSTRUCTION CO.
2929 16th Avenue S.W.
Seattle, WA 98134

O. G. (Otis) Edwards
Production Manager - Yard 1

Gerald A. Flynn
Craft Superintendent-Lofting

L. W. (Bill) Frank
Director of New Construction

Thomas Kuhlmeier
Design Engineer

David E. Todd
Sr. Systems Engineer

LOCKHEED MISSILES & SPACE CO.
P.O. Box 504
Sunnyvale, CA 94088

William Saunders
Staff Engineer

LONG BEACH NAVAL SHIPYARD
Long Beach, CA 90822

Jeffrey D. Arthursd
Naval Architect
Code 250.11 LBNS

Kenneth E. Knollenberg
Supervisory Naval Architect

MARINE INDUSTRIES LIMITED
B.P. 550
Sorel, Quebec, CANADA

Michel Cloutier
Industrial Engineer

Leon Gelinas
Chief Designer

MARINETTE MARINE CORP.
Ely Street
Marinette, WI 54143

William J. Keller
Chief, Steel Design

Gilbert Snyders
VP-Manufacturing

Michael Wade
Production Engineer

MARITIME ADMINISTRATION
Department of Commerce
Washington, DC 20230

Mary B. Arter
Computer Specialist
Office of Ship Construction-Engineering Computer Group

William P. Fannon
Shipbuilding Estsimator-Div. of Shipbuilding Costs

John J. Garvey
Acting Director, Office of Advance Ship Dev.

J. David Gessow
Naval Architect - Office of Shipbuilding Costs
Room 4868

Nancy C. Harris
Industrial Specialist (Shipbuilding)

Robert M. Henry
Engineer - Dept. of Transportation

John M. Hotaling
Mgr. Shipbuilding Analysis, Dept. of Transportation

Joyce Isaacs
Computer Programmer, Dept. of Transportation

Freddie T. Johnson
Chief, Engineering Computer Group
Office of Ship Construction

Joseph Kim
Naval Architect

Ronald K. Kiss
Acting Assistant Admin. for Shipbuilding

Alexander C. Landsburg
Mgr. Computer-Aided Cost Analysis
Room 4868

George H. Levine
Assistant Chief, Div. of Naval Arch.

Robert F. McGinn
Shipbuilding Analyst
Office Ship Construction

Robert McNaull
Computer Specialist
Office of Ship Construction-Engineering Group

Gary J. North
Naval Architect
Office of Ship Construction-Room 4059

Thomas R. Premski
Industrial Specialist
Office of Ship Construction

Robert Schaffran
R&D Program Manager
Advanced Ship Development

Michael W. Touma
Naval Architect

Mark Truffer
Contract Administrator
Div. of Domestic Costs

Thomas H. Vodicka
Mgr. Shipbuilding Ops.
Div. of Production

Robert H. Netzel
Industrial Specialist

MARITIME TRANSPORTATION RESEARCH BOARD
National Academy of Sciences
2101 Constitution Ave., N.W.
Washington, DC 20910

John J. Nachtsheim
Executive Director

MARYLAND SHIPBUILDING & DRY DOCK CO.
P.O. Box 537
Baltimore, MD 21203

Saul Levickas
Ship Supvr.

Ray Mills
Foreman-Sheetmetal Dept.

Roy T. Shiflet Jr.
Supv. Technical Computer Ctr.

H. B. MAYNARD
6 Woodmere
Stanford, CT 06905 Louis Kuh

McDERMOTT INCORPORATED
P.O. Box 588
Amelia, LA 70340 Sanjay Beshmukh
Project Engineer

Bill Coneybear
Project Engineer

Janet Granier
Technical Programming Group Leader

Francisco San Miguel

V.P. & Gen. Mgr.

Ken Tabor
NC Coordinator

McDERMOTT INCORPORATED
P.O. Box 128
New Iberia, LA 70560 Richard Adams
Chief Engineer

Tom Verret
Engineer's Aide

McDERMOTT INCORPORATED
1010 Common Street
New Orleans, LA Maurie B. Marcus
Section Leader

McDERMOTT INCORPORATED
P.O. Box 2249
Gulfport, MS 39503

Lowell Baudouin
Production Coordinator

Dennis Garrard
Supervisor of Project Engineers

JOHN J. McMULLEN ASSOCIATES
Rouse Tower - 6060 Jefferson Avenue
Newport News, VA 23605

Thomas F. Bridges
VP

B. L. Skeens
VP

UNIVERSITY OF MICHIGAN
Dept. of Naval Architecture and Marine Engineers
Ann Arbor, MI 48109

Howard M. Bunch
Associate Professor

Michael Parsons
Chairman, Dept. of Naval Architecture

MITSUI ENGINEERING & SHIPBUILDNG CO., LTD.
3050 S. Post Oak Road #590
Houston, TX 77056

M. Takizawa

NATIONAL STEEL & SHIPBUILDING CO.
Harbor Dr. and 28th St.
P.O. Box 80278
San Diego, CA 92010

Robert J. Derusha
Director Planning & Production Control

Jorge Krohn
Mgr. Production Engineering

John Lightbody
Director Estimating & Facilities

Douglas J. Martin
Mgr., Research & Development

Donald A. Spanninga
Director, Information Systems Dept.

Jack Wasserboehr
Supervisor-Technical Engineering

OFFICE OF NAVAL RESEARCH
(ONR)
Arlington, VA 22217

Nicholas Perrone

NAVAL MATERIAL COMMAND
Philadelpha, PA 19112

Eugene Zyblikewycz
Mech. Engr.

HQ NAVAL MATERIAL COMMAND
MAT 064
Washington, DC 203260

William F. Holden
General Engineer

U.S. NAVAL ACADEMY
Naval Systems Engineering
Annapolis, MD

Bruce Nehrling
Professor

NAVAL SEA SYSTEMS COMMAND
Dept. of the Navy
Washington, DC 20362

Philip Anklowitz
Technical Director (Acting) Computer
Suypport Design

Michael Aughey
Naval Architect

Craig Carlson
Naval Architect

James Claffey
Naval Architect

J. W. Cuthbert
Engineer, Manufacturing and Shipbuilding Tech.
SEA-9OM1

Jimmy W. Fuller
Industrial Specialist, Code 07K

Thomas Gallagher
Supv. Naval Architect

Page Glennie
Naval Architect

Thomas Gooding
Naval Architect

Wallin D. Holtgren
Naval Architect

Garly L. Jayne
Deputy Project Manager
PMS 383.B

Jospeh Lucie
Naval Architect

NAVAL SEA SYSTEMS COMMAND (continued)
Dept. of the Naval
Washington, DC 20362

Robert L. Milner
Industrial Engineer

Tosh Nomura
Naval Architect

John Rosborough
Naval Architect

Vincent Santomarino
Naval Architect

Lewis C. Smith
Naval Architect, Code 31241

Ronald Walz
Naval Architect

Richard Weiser
Naval Architect

NAVSEA METAL BR.
12111 Holly Knoll Cr.
Great Falls, VA

Charles L. Null
Welding Eng.

NAVAL SHIP SYSTEMS ENGINEERING STATION
Philadelphia Naval Base
Philadelphia, PA 19112

Thomas Galie
Project Manager

Walter Kollar
Mechanical Engineer, Code 035.1

U.S. NAVY
Office of the Assistant Secretary of the Navy
Reston, VA 22091

A. R. DiTrapani
Director of Ship Programs

Capt. Clyde C. Morris
Asst. Director Ship Programs

James W. Tweeddale
Dir. Productivity Management

U.S. NAVY
Industrial Resources Detachment
Philadelphia, PA 19112

David Fabry
Mech. Engr.
'Bldg. 75

NEWPORT NEWS SHIPBUILDING
4101 Washington Ave
Newport News, VA 23607

M. Brady
Contract Specialist

B. Bridges
Contract Manager

J. L. Camden
Production Control Supvr.

M. L. Garrison
Cost Engineer

J. G. Gemski
Production Control Mgr-X02C Steel Fabr.

B. C. Howser

A. F. Kaun

John A. Lina
Manager, CAD/CAM

Norman T. Monk
Section Manager

Richard C. Moore

Thomas O'Donohue

G. D. Shulenburg
Chief Design Engineer

D. W. Stewart
Manager, Fabrication

Mark I. Tanner
Special Assignment

B. C. Vinson, Jr.
Mold Loft Supv

NKK AMERICA INC
Shipbuilding
450 Park Ave
New York, NY 10022

Shusuke Maeda
Naval Architect

Michinosuke Unozawa
Technical Counselor

NORFOLK NAVAL SHIPYARD
Portsmouth, VA 23709

Gary B. Ettenger
Industrial Engineer

Craig M. Kuehn
Engineering/Comp. Spec.-Code 244-04

W. L. Sawyer, Jr.
Mechanical Engineering Technician

Herman B. Smith
(Engineering Technician-ll/lO

NORFOLK NAVAL SHIPYARD (continued)
Portsmouth, VA 23709

B. B. Seebo
Industrial Engineering Tech.

Herman B. Smith
Head, Test & Dev. Branch Welding Eng. Div.

Marvin F. Teachey, Jr.
Supervisor of Naval Architects

NORFOLK NAVAL SHIPYARD
3060 Blackstone CT
Virginia Beach, VA 23456

Jim Martin
Project Engineer-Code 3870

NORSHIPCO
P.O. Box 2100
Norfolk, VA 23501

William Blazer
Production Engineer

Les Flora

J. G. Price
Sr. VP of Special Projects

NORTH AMERICAN COMPUTER CONSULTANTS, LTD.
1516 North State Parkway
Chicago, IL 60610

Ernest Anderson
Director of Research & Development

UNIVERSITY OF NOTRE DAME
Haggar Hall
Notre Dame, IN 46556

Chris D. Anderson
Professor of Psychology

NUMERICAL CONTROL APPLICATIONS
A Div. of Upper Lakes Shipping Ltd.
c/o Port Weller Dry Docks
P.O. Box 3011
St. Catharines, Ontario, CANADA

Jesse Harkey
Manager

OFFSHORE POWER SYSTEMS
8000 Arlington Expressway
Jacksonville, FL 32211

Clifford M. Hammond
Mgr. Manufacturing Engineering & Control

Richard A. LaBelle
Manager, Engineering Adm.