Identification of Producibility Inhibitors in Standard NAVSEA Ship Design Pracites

U.S. DEPARTMENT OF TRANSPORTATION
Maritime Administration and U.S. Navy

in cooperation with

Newport News Shipbuilding

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
AUG 1993	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Identification of Producibility Inhibitors in Standard NAVSEA Ship Design Pracites	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) **Naval Surface Warfare Center CD Code 2230-Design Integration Tools Bldg 192, Room 128 9500 MacArthur Blvd, Bethesda, MD 20817-5000**	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**	**108**	

Standard Form 298 (Rev. 8-98)
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NSRP 0388

PRODUCIBILITY INHIBITORS

IN

NAVSEA STANDARD SHIP DESIGN PRACTICES

Prepared by

WILKINS ENTERPRISE INC.

A Project of

THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

by

THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS
SHIP PRODUCTION COMMITTEE PANEL SP-4
DESIGN/PRODUCTION INTEGRATION

ACKNOWLEDGEMENTS

This report documents the results of a study performed for the National Shipbuilding Research Program, a cooperative effort of the Maritime Administration, the United States Navy, the Society of Naval Architects and Marine Engineers and the U.S. shipbuilding industry.

It was produced for Newport News Shipbuilding Co. by Wilkins Enterprise Inc. (WEI) under the sponsorship of panel SP-4, Design/ Production Integration, of the Society of Naval Architects and Marine Engineers. WEI was represented on the panel by Dr. James R. Wilkins Jr.

The content of this report was developed by a project team led by Dr. Wilkins. The other team members were Mr. Gilbert L. Kraine of Enterprise Assistance Inc. (EAI) , Mr. George M. LaChance and Mr. Victor R. Burnett of JJH Inc. Comments of members of SP-4 have been incorporated. The final content is the sole responsibility of the team leader.

Appreciation is expressed to the several individuals from SupShips Bath, Bath Iron Works, Gibbs and Cox, Ingalls Shipbuilding, Avondale Industries and NASSCO who provided input through responses to questionnaires and during direct discussions and interviews. Since their input was non-attributive, the individuals have not been identified, but the teams appreciation to each of the individuals who contributed so willingly is no less sincere. The team is equally appreciative to the management of each of the above organizations for their openness and for their contribution of the time of the individuals who participated.

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EXECUTIVE SUMMARY

This report provides the results of interviews with and questionnaires returned from various shipyards, ship design agents and supervisors of shipbuilding who were asked to identify producibility inhibitors in NavSea standard ship design practices. The responses addressed a broader spectrum, which included USN ship acquisition policies and practices and ship specification language in addition to the standard drawings, design data sheets and other documents which establish requirements which must be followed during the detailed design and ship construction processes.

Based upon the data collected, it is concluded that the major improvements in improving the producibility of USN ships will come from making changes in ship design and acquisition policies, including those which will facilitate the use of the most current requirement documentation when appropriate.

However, it is also clear that significant cost reductions are possible through many of the specific recommendations that are documented in this report.

Each of the recommendations in this report includes the specific wording or other changes that will accomplish the recommended change, so that implementation should be able to be accomplished with a minimum of extra effort. It is presumed that NavSea will convene a panel of design engineers to evaluate each of the recommendation and to initiate action to implement those with which there is agreement.

However, several of the recommendations will require changes of such magnitude that they may not be met with immediate agreement within NavSea. For these, it is recommended that a joint NavSea-industry team be established to further evaluate the proposed changes. If there is disagreement or misunderstanding about the reasons behind engineering requirements, a joint team should be able to address the rationale behind the requirements and come to agreement on how to accomplish the desired intent in the most productive manner.

BACKGROUND

NavSea has taken a number of steps-in recent years to identify those elements of the total ship acquisition process which contribute to unnecessarily high ship acquisition costs. Feedback received from many sources has indicating numerous possibilities for making changes to existing required design practices, but few of these recommendations have been implemented. A major reason for this is the lack of data to support the desirability of most of the recommendations that have been made. Recommendations made by one shipyard are not necessarily agreed to by other shipyards, leaving the NavSea design managers without confidence in the effectiveness of making the change that has been proposed. One of the purposes of this project was to identify recommendations with which numerous shipyards would concur.

Even if recommendations are accepted and implemented in one ship class, the improvements are not likely to be used in other ship classes unless the changes are made to standard drawings and other documentation which control the design process within NavSea and in the shipyards.

APPROACH

Authorization

Immediately following receipt of authorization to proceed on this project, the Project Manager met with officials in NavSea who have responsibility for the design requirements and for the application of these requirements to commercial shipyards which are building ships for the U.S. Navy. These officials gave authority to the team to contact personnel in NavSea, the Supervisors of Shipbuilding and the individual shipyards involved in ongoing shipbuilding programs to obtain the data necessary to accomplish this project.

Data Acquisition

An initial exploratory visit was made to one shipyard and Supervisor’s office, to evaluate the most effective way to carry out the data acquisition task. Based on these visits, a questionnaire was developed and distributed to shipyards, supervisors

and design agents, with primary emphasis on those who participate in SP-4. A copy of the questionnaire is shown in Figure 1. One of the organizations which participated in the study recommended some changes to the questionnaire. The revised questionnaire was used when contacting the few organizations that were not included in the original distribution. The revised questionnaire is shown in Figure 2.

About half of the organizations contacted responded to the questionnaires. Those that did respond provided many excellent recommendations. After collating the recommendations, two team members visited each of the activities that had responded, to talk directly with the individuals who had submitted suggestions and discuss their suggestions in detail and to review the comments of other organizations. At one shipyard the team members had the opportunity to meet with a number of design engineers at one time and brainstorm with them, using the suggestions of other shipyards as a catalyst. The team members also had the opportunity to meet with members of the cost estimating organization of one shipyard, from whom numerous suggestions for reducing the cost of naval ship acquisition programs were obtained.

Data Analysis

Each of the producibility inhibitors identified on a questionnaire or from meeting with the design engineers, cost estimators and production engineers of the organizations contacted was reviewed by team members. The documents referenced were obtained and reviewed. The suggestions received were modified as necessary to be more specific or to clarify their content. Each of the recommendations received was written up in a standard format. Each one was classified by content and uniquely identified through the use of an Item identifier. The Item identifier was an alpha-numeric combination; the alphabetic character relating to the subject matter and the number used to differentiate one Item from another. The Appendix contains all of the Items in the format in which they were written up.

QUESTIONNAIRE RELATING TO IDENTIFICATION OF PRODUCIBILITY INHIBITORS IN NAvsEA STANDARD DESIGN PRACTICES

PRACTICE TO BE MODIFIED

please be specific: giving number and title of a Standard drawing, page or paragraph of a document, etc., plus narrative description of the current requirement.

PROPOSED MODIFICATION

How should the standard practice be changed?

PROPOSED BENEFITS

In addition to a narrative description, please indicate the esttited magnitude of non-recurring cost to imPlement the change and the net savings in recurring cost on one ship:

NOn-Recurring COSt	Recurring Cost Saving on One ship
[] small	[] small
[] Moderate	[] Moderate
[] Large	[] Large

HISTORY

Has this modification been proposed before? Yes No (Circle one)
If Yes, what was the reason it was not implemented, or was implemented on only one program?

APPROVAL PROCESS

If the process for approving proposed producibility Changes has been too cumbersome to be effective, how can that process be improved?

Name_____ Tel_____ Company_____

Figure 1.

QUESTIONNAIRE RELATING To IDENTIFICATION OF PRODUCIBILITY INHIBITORS IN NAVSEA STANDARD DESIGN PRACTICES

PROBLEM IDENTIFICATION: (Optional. Use e as required to clarify problem)

PRACTICE TO BE MODIFIED

Please be specific; giving number and title of a standard drawing, page or paragraph of a document, etc., plus narrative description of the current requirement. Attach "Is-Was" samples if available. Check [] if sample(s) included.

PROPOSED MODIFICATION

How should the standard practice be changed?

PROPOSED BENEFITS

In addition to a narrative description, please indicate the estimated magnitude of non-recurring cost to implement the change and the net savings in recurring cost on ONE ship:

Non-Recurring Cost	Recurring Cost Saving	Savings Expected In
[] small (<10K)	[] small	[] Design NH/Costs
[] Moderate (10K - 100K)	[] Moderate	[] Material Costs
[] Large (>100K)	[] Large	[] Fabrication MH/Costs
		[] Rework Mtl/MH

HISTORY

Has this modification been proposed before? Yes No (Circle one)
If Yes, what was the reason it was not implemented, or was implemented on only one program?

APPROVAL PROCESS

If the process for approving proposed producibility changes has been too cumbersome to be effective, how can that process be improved?

Name_____ Tel_____ Company_____

Figure 2.

Cost Analysis

Since the original questionnaire asked only for costs to be defined as "Small", "Moderate" or "Large", and the vast majority of responses were submitted on those questionnaires, the team had to go back to the shipyards, either during the visits or by phone, to obtain more specific estimates of the costs. The results were not particularly satisfying, since most of the recommendations involved efforts which are below the level at which costs are estimated and actual costs are collected. Thus, most of the cost estimates given on the forms in the Appendix are in only the generic form. Where quantitative cost figures are given, they must be taken as order of magnitude values. Where specific details were provided for the cost estimates, they are described.

FINDINGS

The detailed findings from this project are given as individual items listed in the Appendix. All items received from the shipyards and Supships offices have been included. The items are labelled by subject matter and listed in alphabetic order as follows, to make it simpler to locate items in the Appendix:

A - Arrangements
AP - Acquisition Policy
E - Electrical/ Electronics
EP - Equipment Procurement
G - General
M - Mechanical
OF - Outfitting
P - Piping
S - Structure
T - Testing

The items range from being quite general to being extremely specific. The cost savings range from broad estimates with little more than rough opinions as substantiation to more specific estimates that are based upon internal data of some shipyards. The cost savings of some are relatively small, but others are very significant. A summary of the findings in each subject area follows.

Summary of Findings

Arrangements - Two items relating directly to Arrangement drawings were received. The more significant addresses the need for NavSea contract drawings to include the layout of distributive systems on arrangement drawings. It is not clear whether these systems are ignored or neglected during the contract design process or whether these details are considered unimportant. The shipyards find that there frequently is inadequate volume in a space when they lay out the equipment, making it appear that the distributed systems were not considered adequately, if at all, during the arrangement effort.

Acquisition Policy - Eight of the items identified by the shipyards addressed issues that were not directly related to NavSea ship design practices, which were the subject of this effort. However, the comments did relate directly to specifications and other requirements of the acquisition process that heavily impact the engineering efforts in shipyards, so they have been included under the heading of Acquisition Policy. NavSea design personnel have direct control or strong influence on each of the items included.

Electrical/Electronics - Twelve items concerning electrical and electronic issues were received, nine of which addressed specific requirements of DOD-STD-2003, "Electric Plant Standard Methods". The overall conclusion is that this document should be revised. A meeting of electrical designers and production supervisors with NavSea and SupShips personnel~ to consider the enclosed recommendations and others that would surely be included, is strongly recommended, in order that the document can be updated as soon as possible.

Equipment Procurement - Numerous suggestions which addressed the procurement of equipment were received. In many cases, the use of commercial marine equipment. was recommended in replacement of MIL-SPEC equipment, in those areas of the ship, such as shops, that are common to commercial ships. The recom-

mendations for related equipment were included on a single sheet, rather than as individual items. Two ILS items were included under this heading.

General - The comments under this heading address various aspects of the currency of standard documents, the processes by which changes to the documents are approved, the accuracy of design information provided, etc. The use of excessive numbers of Contract Drawings was cited by several sources as a major deterrent to efforts by the shipyards to make the design changes necessary to yield arrangements that could be constructed for fewer manhours with no decrease in functionality. It is well recognized within as well as outside the NavSea design community, that updating of standard and type drawings should be given high priority.

Recommendation: A system, by which the Navy can replace an existing NavSea standard drawing with a drawing that has been produced in a shipyard and proven to yield a satisfactory product with less productive effort, needs to be developed. This requires that NavSea design engineers know what is going on in the shipyards, are willing to accept changes when appropriate, are able to take steps to quickly and easily convert the shipyard drawing to a standard NavSea document and get it issued to the field for application to existing programs.

Mechanical - TWO items address areas where equipment or systems bought to commercial design requirements, rather than to NavSea or Military Standards, are considered suitable for military ships. A third relates to bolt hole clearance requirements and results from a case in which the recommended procedure was approved, but only for the instant case.

Outfitting - One of the two items under this heading relates to the standard design of watertight doors and the other to the standard design for lifelines and liferails. Stronger door frames and better mechanical fittings on doors will result in much less rework than is currently being experienced. Exist-

ing standards from other countries are recommended for consideration. Conversion of the USN lifeline dimensional standards to the international standards approved by the USCG is long overdue.

Piping - Four of the eleven piping related items refer to recommended changes to MIL-STD-1627 and three to MIL-STD-278. Three others recommend specific designs that could become NavSea standard drawings.

The requirements in MIL-STD-1627 that related to ovality of bent pipe and wall thinning were mentioned by each of the shipyards that were contacted. It is obvious that this is a real problem that needs to be addressed ASAP with an intent to make the changes that are necessary. Reference (1) addresses these problems among others, the solutions of which will lead to significant reductions in manhours for pipe manufacturing.

Structures - Twenty one items submitted on matters relating to structures are included in the report. These range from specific weld details to design methods. An item concerning Metal-spraying for corrosion control was included under this heading.

Testing - The final group of items, four in number, concern various issues relating to testing. Rather than include these with the types of systems to which the testing related, they have been included in a section of their own for emphasis. The manhours spent in quality assurance, of which testing is a part, can be minimized by proper selection of the tests to be made.

CONCLUSION

The overall conclusion from this project is that there are many steps which NavSea can take to improve the producibility, thus reduce the construction cost, of the U.S. Navy's ships. Most of them can be applied to combatants as well as auxiliaries. The cost savings from some of the individual recommendations are relatively small compared to the total cost of construction of a

ship. However, the combined savings from many small changes will add up to a very significant total saving.

The shipyards contacted responded very positively to this effort. The recommendations, made by various yards, to have a joint meeting of knowledgeable government personnel and shipyard personnel for the purpose of jointly reviewing the documents which most strongly influence some engineering specialty, are strongly endorsed by the authors.

As noted earlier, the shipyards also identified numerous areas of the Acquisition Process which, if changed, would result in significant reductions in acquisition costs. Although many of these recommendations are not directly related to specific NavSea Standard Design Practices, they have been included in the Appendix as "AP" (for Acquisition Policy) items. Addressing the problems identified in these items will have an additional significant reduction in the manhours expended by shipyards to build USN ships and will result in superior quality, as well.

REFERENCE

1. O'Keefe, Patrick G., "Time To Overhaul Marine Pipe Fabrication Technology"; DDG-51 Symposium, Bath; ME; 1992

APPENDIX

ITEM A-l

NAVSEA STANDARD DESIGN PRACTICE: Contract Drawings of Electronic Space Arrangements

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NAVSEA does not consistently use find numbers with a corresponding equipment list on Contract Arrangement Drawings. Instead, the noun name and equipment description is shown directly on the Contract Arrangement Drawing. The drawing becomes very cluttered and confusing to use. NAVSEA Drawing 802-6215139, Radio.Central, is an example.

PROPOSED SOLUTION: Label each equipment on an Arrangement drawing with a find number and level code. On a sheet of the same drawing, provide an equipment list in find number order, that gives the nomenclature and any other necessary description of the equipment.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: The savings in time for production planning and in using a less cluttered drawings are estimated to save a minimum of 20 manhours of production labor, about $700 a drawing. For 20 such drawings, a savings of $14000 would be achieved.

NON-RECURRING IMPLEMENTATION COST: Use of the recommended technique will reduce the cost of drawing development by about $1000 per applicable drawing. There will be no cost to the shipyard if the contract drawings are received in the recommended format.

ADDITIONAL COMMENT: The drawings which led to this item were for Electronics spaces. The recommended solution conforms with the practice usually followed for other arrangement drawings, such as general arrangements and machinery arrangements.

ITEM A-2

NAVSEA STANDARD DESIGN PRACTICE: Omission of Distributive Systems from Arrangement Drawings

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea contract drawings frequently do not show the distributive systems in sufficient detail. When the distributive systems are added during the detail design process, they have been found to crowd the space, making the specified equipment arrangement impossible to maintain. This may then require. redesigning the space and going through extensive approvals of the changes an expensive process. The crowded conditions also may raise the cost of installing the distributive systems and associated equipment, which represents an unanticipated expense to the shipyard.

PROPOSED SOLUTION: Require all NavSea contract drawings and contract guidance drawings to show, or otherwise make provision for, adequate space for the required distributive systems .

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: Designing the distributive systems is a major part of the shipyard's detail design work. The shipyard designers may not discover that insufficient space has been left in the contract arrangement drawings until they have expended considerable effort in trying to make the arrangement work. Failure to provide sufficient space for the distributive systems has resulted in extended disputes between the Navy and the shipyard, significantly increasing costs for both parties.

ITEM AP-1

NAVSEA STANDARD DESIGN PRACTICE: Excessive detail in Shipbuilding specifications

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea shipbuilding specifications have excessive directions on how work is to be performed, thus discouraging the use of improved, current techniques or more productive methods for accomplishing the intent of the specification requirement. In addition, differences and conflicts can exist between the various documents which are referenced in the specifications. Some of the referenced documents are seriously out of date. Resolution of these problems requires additional, wasteful, work and effort to clarify.

PROPOSED SOLUTION: Simplify and streamline shipbuilding specifications. Make greater use of performance specifications, giving the shipbuilder maximum flexibility to achieve the actual intent of the specifications in the most cost-effective manner.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: The specification package grows larger with every ship construction program. This is a direct result of trying to describe in detail all of the work that is to be accomplished, rather than adequately describe what functions must be provided. NavSea has to either carry a ship design through the detail design stage and specify every detail or rely on the shipbuilder to make some of the decisions, having given the shipbuilder the intent of the requirement. The present system, by which the Navy attempts to define how the work is to be done, as well as what is to be done, works against innovation and productivity improvement.

ITEM AP-2

NAVSEA STANDARD DESIGN PRACTICE: Currency of Ship Specifications

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Changes in ship specifications are very slow to be incorporated into new construction programs. In a multiship construction program, the ship specs may have been prepared years earlier and reflect the standards in effect at that time. Currently, new specs and standards are not incorporated into current programs. This may require a shipyard to applv different standards to the same task being Performed at the same time *on* the same class of ships being constructed under different ship specifications.

PROPOSED SOLUTION: Modify the policies relating to change approval to encourage, rather than discourage, the use of improved specification requirements.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: The adoption of new standards and specifications usually represents a lOng process of development and is done to gain some clear advantage. By not considering these changes for adoption into current ship construction contracts, the benefit of the changes are lost for ongoing programs. The usual argument against the change - increased costs of the current contract - may not apply in every case, since the change may even reduce costs.

ITEM AP-3

NAVSEA STANDARD DESIGN PRACTICE: NavSea and SupShip approvals for new techniques apply only to the individual ship construction program.

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Approvals received by shipyards from NavSea and SupShips for new techniques and procedures for one ship construction program are not routinely extended to other ship construction programs. As a result, each shipyard is required to go through the same costly approval process for every construction program on which they want to use the techniques/procedure.

PROPOSED SOLUTION: Policy and procedures should be established to require that when a change to some standard drawing, design data sheet, standard design manual, ship specification language, etc. is approved for one shipbuilding program, that change will be quickly disseminated to all other technical and program managers so that the change may be applied to all other programs which could benefit from the change. In particular, when a change, to a welding procedure, for instance, is approved in a shipyard for one shipbuilding program, It should not be necessary for the shipyard to go through the time-consuming and costly administrative process of obtaining a separate approval to use the approved procedure for another ship class being built in the same yard.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: Requiring repeated approvals for the same procedure or technique for each shipbuilding program in each shipyard raises the cost of building ships without any increase in value to the Navy. Whenever a NavSea or SupShip requirement increases a shipyard's costs without corresponding added value, it is needlessly increasing the cost of both the current and the next shipbuilding program while simultaneously undermining the shipyard's position in the international market.

ITEM AP-4

NAVSEA STANDARD DESIGN PRACTICE: Information flow among Supervisors of Shipbuilding.

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: There appears not to be an effective system by which technical personnel at Supervisors of Shipbuilding are kept advised of new techniques and procedures which have been approved for use in NavSea programs at other shipyards.

PROPOSED SOLUTION: NavSea 07, working closely with NavSea 05 and the Program Managers of shipbuilding programs, develop a system to collect and disseminate information to the SupShips about developments at both government and commercial shipyards on a regular routine basis.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: In order to achieve the most productive shipbuilding programs, each program should be kept aware of good ideas that have been invoked on other programs. A process by which the applicable ideas can be easily invoked on each program must be developed. The normal process for invoking a change to a shipbuilding contract absolutely precludes timely responses to good ideas.

ITEM AP-5

NAVSEA STANDARD DESIGN PRACTICE: Single Source Machinery Vendor

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Some recent contracts have required shipyards to employ a single source machinery vendor external to the ship builder. The single source vendor employs subcontractors to provide portions of the machinery plant, which the single source then assembles. Requiring an external source, however, effectively blocks the shipbuilder from dealing directly with the subcontractors. This keeps the shipbuilder from exerting any schedule or other pressure on the subcontractor even though the shipyard may be under considerable performance pressure.

PROPOSED SOLUTION: Require the shipyard to perform as the single source vendor and be totally responsible for the assembly and installation of the system.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: Taking control of the machinery plant vendors away from the shipbuilder by requiring a sole source vendor, while continuing to hold the shipbuilder responsible for contract performance, violates any rational management principle. If a sole source vendor of the machinery plant is desired, the shipbuilder should be relieved of any responsibility for the machinery plant and the sole source vendor should be under contract to NavSea.

ITEM AP-6

NAVSEA STANDARD DESIGN PRACTICE: Differences between New Construction and Repair Standards

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: There are major differences in the standards applied to new construction and repair work by NavSea. In some cases the repair specifications for older ships will require the repair work to be performed to the original construction specs. Techniques and procedures approved for similar work on new ship construction are routinely disapproved for ship repair work by the Supervisor of Shipbuilding. At times, this has resulted in the same shipyard being required to use one standard for new construction and an older, different, and occasionally more costly standard, for ship repair. This can lead to confusion and mistakes in the shipyard.

PROPOSED SOLUTION: Accept new construction standards for ship repair work unless there is a clearly established reason why the new standards should not be applied. Improve communication between Supervisors of Shipbuilding and NavSea.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: When a welding process, for example, is satisfactory for one type of material on a new construction ship, that same process should automatically be satisfactory to repair that same type of material on a repair job, regardless of what process was approved at the time of construction of the ship being repaired. Otherwise, the shipyard must maintain records for two different welding procedures for the same type of work - which is obviously wasteful. On the other hand, since most specification requirements tend to become more restrictive over time, there are many cases when the repair work is made excessively expensive by application of a requirement that was not invoked when the ship was built. If the ship has been operating successfully for many years with the older requirement having been used, it would be illogical to use a more expensive process for its repair. Of course, the more basic question is why a change was made to the original process if the ships to which it was applied have been operating successfully. Welding inspection requirements are an example.

ITEM AP-7

NAVSEA STANDARD DESIGN PRACTICE: NavSea Ship Specifications Change Process

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea ship construction contract specifications require an excessive number of changes, waivers and deviations starting immediately after contract award and continuing throughout the construction period of the ship. This reflects poorly on the quality of the design work and the inadequacy of the ship specifications preparation process.

PROPOSED SOLUTION: Major changes are required in the approach which NavSea uses to establish and manage ship design projects. NavSea's use of part time design teams even though "co-located" (meaning that an individual has a desk at the collocation site, but that the individual is only there part time because of other projects which he/she is working on), is excessively costly in terms of manpower expended, time required to perform the task and the quality of the specifications produced. As many of our industries have been relearning, the assignment of small dedicated design teams full time to a project provides better quality results in a shorter time and at lower costs.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: One clear demonstration of the inadequacy of the current NavSea design approach is the uneven level of detail in some of the drawings and specifications produced. For example, the contract arrangement drawing of a critical space may show vital machinery only in approximate locations and shapes while carefully establishing the location of non-vital items such as fire extinguishers and coat racks. Although this is presumably done because, by government procurement requirements, the exact equipment to be bought by the shipyard cannot be defined in advance, the actual result is that the location of miscellaneous equipment takes on more contractual significance than it should.

ITEM AP-8

NAVSEA STANDARD DESIGN PRACTICE: Maintenance of the General Specifications for Building Ships for the US Navy (GenSpecs)

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: To be effective for developing the most productive Ship Specifications, the GenSpecs must be continually updated to reflect the best and most productive shipbuilding practices, and to eliminate requirements that are excessive and costly to satisfy. It is well recognized that some sections of the General Specifications, as well as many of the references therein, are in need of revision and updating. During each construction project, numerous deviations and waivers from the Ship Specs are issued and approved. On many programs, "Program Specific" requirements are invoked *in* contracts to overcome deficiencies in General Specification requirements.

PROPOSED SOLUTION: Many of these items represent important changes which should be incorporated into the GenSpecs to ensure that the latest approved requirements are used in the next shipbuilding program. The process for updating General Specifications needs to automatically include evaluation of all ship specifications changes, waivers and deviations, rapid substitution of improved requirements and frequent notices describing the approved changes to all NavSea design and ship acquisition offices and to all Supervisors of Shipbuilding.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Moderate

ADDITIONAL COMMENT: When specifications are not maintained and updated in a continuing process, the specifications tend to be circumvented and eventually ignored completely. If the GenSpecs are not maintained as the most current source of requirements for the most productive shipbuilding techniques, there will be continuing erosion in the authority with which they are viewed throughout the Naval shipbuilding community. In time, regaining that level of authority may prove difficult if not impossible. Having the General Specs maintained as the most current source of good shipbuilding practices, would allow ship specification reading sessions to be much shorter and more effective.

ITEM E-1

NAVSEA STANDARD DESIGN PRACTICE: NAVSEA Drawing 803-5001027; DOD-STD-2003, Electric Plant Standard Methods.

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Various revisions of NAVSEA Drawing No. 803-5001027 are invoked in different shipbuilding contracts. This leads to different, non-standard production practices in a given yard, as well as between shipyards, as a function of the different shipbuilding contracts that are in place in the shipyard.

PROPOSED SOLUTION: DOD-STD-2003 should be invoked in shipbuilding contracts in lieu of the NAVSEA Drawing, to standardize electric plant installation methods.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $100,000 per ship

NON-RECURRING IMPLEMENTATION COST: None, for shipbuilding programs in which only an improved DOD-STD-2003 is implemented. It is estimated that the cost of revising existing documentation of ongoing programs, plus the administrative costs of changing contract requirements, would cost $10,000 - $20,000.

ADDITIONAL COMMENT: See the following item, which recommends a comprehensive review and update of DOD-STD-2003.

ITEM E-2

NAVSEA STANDARD DESIGN PRACTICE: DOD-STD-2003, Electric Plant Standard Methods.

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The installation methods in DOD-STD-2003 are not current with those which are used in industry today. There are requirements in the document which are in conflict with those of various drawings which the ship specifications require the shipyard to use.

PROPOSED SOLUTION: Establish a joint meeting between NAVSEA and industry design and production engineers to resolve conflicts between the various documents invoked upon the shipyards. Then, incorporate the resolved methods into 2003, invoke it in all shipbuilding contracts and delete the requirements to follow other drawings.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $100,000 per ship

NON-RECURRING IMPLEMENTATION COST: None, for shipbuilding programs in which only an improved DOD-STD-2003 is implemented. It is estimated that the cost of revising existing documentation of ongoing programs, plus the administrative costs of changing contract requirements, would cost $10,000 - $20,000.

ADDITIONAL COMMENT: The following few items are examples of changes that have been proposed for DOD-STD-2003.

ITEM E-3

NAVSEA STANDARD DESIGN PRACTICE: End Sealing of Water Blocked Cable

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: DOD-STD-2003, Section 1, requires cable end sealing on electrical cable in various systems and locations to prevent the flow of water along the cable in case of compartment flooding. NavSea also requires the use of more expensive water blocked cable in certain systems. Even though this cable is manufactured to prevent the flow of water along the cable, NavSea has not relaxed the requirement for cable end sealing.

PROPOSED SOLUTION: Add the following item to DOD-STD-2003, Paragraph 4.1.6.1, "Cable End-sealing exceptions":

(i) Where water blocked cable is utilized.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: The use of unnecessarily redundant specifications increases the costs of ship acquisition programs without any commensurate benefit in the performance or quality of the final product. The Supervisor of Shipbuilding should have authority to modify the specification requirements of such obvious inconsistencies without having to go through a major change process, with its attendant delays and administrative costs . The decision should then be fed back to NavSea Technical and Program Management personnel so that the change can be invoked in other contracts/programs.

ITEM E-4

NAVSEA STANDARD DESIGN PRACTICE: Locking Devices on Fasteners

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: DOD-STD-2003, Section 2, Para. 4.1.2, fourth sentence, requires the following: "Locking devices shall be used for bolts mounting electrical equipment."

PROPOSED SOLUTION: Delete the sentence as written and insert the following: "Unless otherwise specified, self locking nuts shall be used on bolts used for mounting electrical equipment, except that locking devices are not required for symbol material listed in NAVSEA S0300-AT-GTP-010/ESL."

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate.

NON-RECURRING IMPLEMENTATION COST: Small.

ADDITIONAL COMMENT: This change is required in order to stay within standard practices.

ITEM E-5

NAVSEA STANDARD DESIGN PRACTICE: Fume Tight Cable Penetrations

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: DOD-STD-2003, Section 3, Para. 4.1.4 (b) requires a 1 inch minimum annular area between the cable and the collar or nipple. This is not the configuration shown in Figures 4C17 and 4C18 of the document. Further, a 1 inch clearance for multiple cables before packing would be excessive, since the weight of the cables would compress the plastic sealer, which would, in essence, be supporting the cables.

PROPOSED SOLUTION: Change Para. 4.1.4 (b) to read "Fume tight chafing collars (for multiple cable penetrations) having a minimum collar length of 3 inches and nipples (for single cables) having a minimum length of 2 inches, shall have a minimum clearance space around cable(s) centered within the collar/nipple of 1/4 inch for single cable and 1 inch for multiple cables before packing. The entire void area within the collar (this includes the area between the collar and cable and the area between cables) shall be packed with plastic sealer. A minimum of 1/4" of clearance shall be maintained between the cables and the collar/nipple, filled with sealer.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Small.

NON-RECURRING IMPLEMENTATION COST: Small.

ADDITIONAL COMMENT: This modification is required to comply with the methods depicted and noted in Figures 4C17 and 4C18.

ITEM E-6

NAVSEA STANDARD DESIGN PRACTICE: Cable Penetration Fire Stops

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Fire Stops are required for cable penetrations through non-tight structure. New, fire resistant cable types make intermediary fire stops unnecessarily redundant.

PROPOSED SOLUTION: Eliminate unnecessary intermediary fire stops, by deleting Par 4.1.5 in Section 3 of DOD-STD-2003 and replacing it with the following:

4.1.5 Penetrations of nonstructural bulkheads, bents, web frames, transverse girders and longitudinal girders.

Unless otherwise specified, cables penetrating nonstructural bulkheads, bents, web frames, transverse girders and longitudinal girders shall be led through one of the following:

(a) Chaffing collars (for multiple cable penetrations) having a minimum collar length of 3 inches and nipples (for single cables) having *a minimum* length of two inches.

(b) Lightening holes or snipes, provided the structure is not used to support the cables. Single cable may be led through holes with rounded edges in bulkheads or beams whose thickness is 1/4 inch or greater. At least 1/4 inch clearance shall be left between cables and the edge of the structural penetrations described in this paragraph (4.1.5(b)).

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: The original practice was necessary because cables manufactured to Mil-C-915 or Mil-C-17 specifications supported combustion and intermediary fire stops were inserted to impede the spread of fire. The majority of the cable currently in use for new construction is Mil-C-24640 and Mil-C-24643, neither of which will support combustion.

ITEM E-7

NAVSEA STANDARD DESIGN PRACTICE: Use of Channel Rubber with Banding Straps

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Channel rubber is prescribed in many instances where it does not provide any benefit.

PROPOSED SOLUTION: Delete the current wording of DOD-STD-2003 Para. 5.3.7, "Channel Rubber" and replace it with the following:

5.3.7 Channel Rubber. Channel Rubber shall be used with bandstraps in cableways when the cables' outer jacket requires protection, for sound isolation, or to increase the friction coefficient between cables and banding material. Therefore, Channel Rubber is only required in the following instances:

(a) For each banding strap in a vertical wireway.
(b) For rubber jacketed cable. These cables, however, should be run in the middle of the cableway for increased mechanical protection.
(c) For submarine external cableways
(d) Around armored cables terminating at sound isolated equipment.
(e) For semi-solid dielectric coaxial cable supported by a contour type strap in a vertical run.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $100,000 per ship

NON-RECURRING IMPLEMENTATION COST: Small

ADDITIONAL CONMENT: Flexible coaxial cables are not included in the above list because they are deformed by excessive band tension, which is not obviated by the use of channel rubber.

Semi-solid coaxial cable because of its inherent mechanical stability cannot be readily crushed by a modest application of band tension.

Cableway bends and breakout bends will conform to radius requirements of the largest cable in the run. Consequently, sharp bends, which could cause chafing of the cable jacket by a band's relatively sharp edge during periods of structure vibration, are not encountered as long as bands' are tensioned properly .

ITEM E-8

NAVSEA STANDARD DESIGN PRACTICE: Crimped Conductor Pull Test

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: DOD-STD-2003, Section 5, requires 100% pull test of all crimped conductors during connector assembly.

PROPOSED SOLUTION: Delete the requirement. Revise the instructions in Fig. 5All to require that the applicable tool be calibrated, then checked for proper operation and crimp quality prior to each issue by the tool room.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Small

ADDITIONAL COMMENT: The current requirement is redundant, since crimp tools are selected, calibrated, checked for proper operation and crimp quality in accordance with eh requirements in Steps 1 through 3 of fig. 5A11, prior to the tool's use in the connector assembly process.

ITEM E-9

NAVSEA STANDARD DESIGN PRACTICE: Electrical Contact Push Test

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: DOD-STD-2003, Section 5, in step 9 of figure 5B7, step 9 of Fig. 5C6, step 8 in fig. 5D4, step 12 of fig. 5E3 and step 5.7 of Figure 5H3, requires a 100% pull test of pins/sockets during assembly, to ensure that they are locked in place. A visual inspection is made during the assembly process with a final inspection made upon completion.

PROPOSED SOLUTION: Delete the push test requirements or establish a random 5 to 10% test requirement in lieu of the 100% testing.

ESTIMATING COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Small

ADDITIONAL COMMENT: Contact push tests are required in order to evaluate the connectors' contact retention capability and not the installation process itself.

Connector reliability should be built in by the manufacturer by proper design and quality controls. Relying on the user to find defects is too late. If this test is still deemed necessary, it should be accomplished as a random sampling.

ITEM E-10

NAVSEA STANDARD DESIGN PRACTICE: Non-Standard Electrical Cables and Connectors

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Many cables in weapons systems, including the AEGIS system, are unique non MIL-Spec Navy cables. Cable types NAVORD Nos. 6322493, 6323056 and 6262065-1 are examples. The unique cables require a special order which means long lead times and the cables are often available only from a sole source vendor.

PROPOSED SOLUTION: Combat system designs should be required to use standard Navy cables. Revise MIL STD 1399, Section 304 to require the use of standard Navy cables. Then enforce the requirement.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: The additional cost to procure these unique cables is approximately three times the cost to procure standard cable. Using conventional techniques to shield standard cabling could increase the installation cost by about 10%. The net cost is estimated to equal about half of the cost to procure and install the unique cable.

However, maintaining an inventory of the non-standard cables and the additional configuration control efforts can cost millions of dollars extra during the entire service life of the ship. In a crisis these unique cables could put a ship out of commission for extended periods waiting for new cable.

NON-RECURRING IMPLEMENTATION COST: For ongoing programs the administrative cost of changing the contract requirements and the cost for producing new engineering drawings - estimate $50,000.00 maximum. For new programs, none.

ADDITIONAL COMMENT: The specified cables have an extra shield for AEGIS EMX protection. Electronic interference must be minimized, but it should be resolved with conventional methods such as separation conduit, trunks, etc. The extra cost of the conduit or trunks must be weighed against the time and cost to obtain unique non-standard cable.

ITEM E-11

NAVSEA STANDARD DESIGN PRACTICE: Use of Installation Control Drawing Lists (ICDLS) as Selected Records Data

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: ICDL'S for weapons systems, such as NavSea Drawing 5860501, are required to be maintained following ship delivery, to provide a record of all applicable drawings required for ship systems design.

PROPOSED SOLUTION: Make the ICDLS information only and drop the requirement to maintain them after the initial ship design is complete.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: ICDLS are another layer of GFI which are subject to errors. Fewer ECPS would be required to correct the errors if they were for information only.

NAVSEA STANDARD DESIGN PRACTICE: Maintenance of the Summary List of Installation Material (SLIM)

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The contract requires development and maintenance of a Summary List of Installation Material (SLIM), e.g., NavSea 53711-6262159.

PROPOSED SOLUTION: Make the SLIMS for information only.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: The SLIMS were developed specifically for the AEGIS Program. They are ship class specific while the Installation Control Drawings (ICDS) are generic.

SLIMS are another layer of GFI which are subject to additional errors. Fewer ECPS would be required to correct the errors if the SLIMS were for information only.

ITEM EP-1

NAVSEA STANDARD DESIGN PRACTICE: Schedule A

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: When GFE is received, it often is different than that described in the "Preliminary" GFI that is provided. It is all too common for the shipyard to receive no better information on the actual configuration until the hardware is received in the yard. The receipt inspection function in the yard is not set up to identify these type of discrepancies, so the problem is frequently not recognized until the equipment is in the process of being installed. This results in unnecessarily disruptive design and production planning changes while productive work is held up. It is not sufficient to forward accurate configuration data (drawings, spare parts lists, etc.) with the hardware.

PROPOSED SOLUTION: Acquisition Managers of GFE must identify the exact configuration of equipment that is to be sent to a shipyard as soon as the equipment manufacturer has completed the design of the configuration that will be sent. The GFI to support the design and production planning efforts must be made available to the shipyard as soon as possible, not sent with the hardware.

ESTIMATED COST IMPACT:

RECURRING COST SAVINGS: The lost time and wasted efforts consumed in overcoming this type of problem can be enormous. Based on current experience on various shipbuilding programs, it is estimated that as much as $1,000,000 can be saved by avoiding this type of problem on a lead ship.

NON-RECURRING IMPLEMENTATION COST: The administrative cost to the government of maintaining configuration monitoring during acquisition of GFE and providing accurate GFI to the shipyard as soon as the configuration to be provided to the shipyard is known. since adequate configuration monitoring and reporting systems are already available, it is merely necessary to invoke them in contract s to GFE suppliers.

ADDITIONAL COMMENT:

ITEM EP-2

NAVSEA STANDARD DESIGN PRACTICE: Use of "or equal" for equipment procurement; Ship Specification 042 and Contract Drawings

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The Navy attempts to circumvent the prohibition against sole source procurement of equipment by identifying the specific equipment desired and then appending "or equal" to its description, usually without providing an adequate definition of what characteristics of the equipment must be satisfied in order to be considered "equal". This leaves the Navy with authority to disapprove the shipyard's determination that an alternative equipment selection is "equal" to the equipment specified by the Navy, but without any responsibility to pay for the cost impact should they disapprove the shipyard's choice. The government is not required to make alternate proposals, respond in an expeditious manner *or* make allowance in cost and schedule for the impact of their decision making process. When the specified equipment is no longer manufactured (which happens), but the government can reject (and has rejected) the shipyard's proposed alternative without being responsible for identifying an alternative acceptable choice of equipment or for the additional equipment cost, the delay and the disruption caused by their unsatisfactory specification requirement.

PROPOSED SOLUTION: Modify the wording of Section 042a of the General Specifications and all Ship Specifications which reference it to the following:

""Or equal". - This term is used in connection with equipment that is to be ordered by the contractor, when the government is aware of a specific piece of hardware that has been successfully used in similar applications and/or in other ships of the fleet. Any alternative equipment proposed for procurement by the contractor must meet all of the requirements of the system in which it is to be installed at least as well as the specified equipment. All of the weight and volume constraints of the overall ship design must be satisfied. The reliability, maintainability and cost of operation of the alternative equipment must be equal to or superior to the specified equipment.

When the specified equipment is available from an approved manufacturer at the time the shipbuilder initiates procurement action, but the shipbuilder proposed\s to substitute an alternative equipment, the burden of proof of "equality" shall be on the shipbuilder and the procurement of the proposed substitute shall not be initiated by the shipbuilder without documented approval by the government. when a proposed substitute is submitted by the shipbuilder, the government must provide approval or disapproval within 60 days of the contractor'-s proposal. If no response is received by the shipbuilder within 60 days, the proposed substitute will be automatically approved for procurement by the shipbuilder.

If the equipment identified in the specification is found by the shipbuilder to be available no longer, the shipbuilder shall notify the government of that fact and provide a proposed substitute. The government shall have no more than 60 days in which to respond. If the response is negative, the government shall identify an alternative which is available. the contractor shall be reimbursed for any resulting delay in the delivery of the ultimate equipment choice past the required delivery date for the originally identified equipment."

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Little, if any.

NON-RECURRING IMPLEMENTATION COST: Variable, depending-upon the number of items involved, the length of time that the procurement process is delayed for each and the scheduled time of the stage of construction at which the equipment is to be installed. The administrative costs of dealing with a disapproval, the subsequent negotiations with the government for settling upon a suitable substitute, as well as the additional procurement effort, will likely be a minimum of 160 hours ($8000) an item. If drawings and/or work instructions require modification, the costs could well be in excess of $50,000 or more per item. If only five relatively minor equipments were involved, the cost to the shipyard easily could exceed $250,000.

ADDITIONAL COMMENT: More effort should be made by the government to properly justify sole source procurement when there is sufficient purpose in doing so. Otherwise, instead of identifying any specific hardware and using "or equal", the equipment's required performance parameters should be identified in the specification. Rewards should be provided for the use of equipment that is common to that used in other ships of the fleet. the use of equipment of superior quality or technical capability should be encouraged, as well, as long as the costs are appropriate to the gains being achieved.

ITEM EP-3

NAVSEA STANDARD DESIGN PRACTICE: Unnecessary Use of Military Specifications (MilSpecs)

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: In many instances, NavSea specifies equipment and machinery by MilSpec when commercial standards will suffice. MilSpecs are the first choice even though well established and satisfactory commercial standards exist and are used in the commercial marine industry for many items, such as laundry and galley equipment, shop machinery and tools, etc. Specifying MilSpec equipment raises the cost of the items due to the limited number of vendors and consequent lack of competition. A major portion of the increased cost of MilSpec versus commercial standards is due to the record keeping, packaging, marking and shipping requirements. Complying with these latter requirements in represents a considerable portion of the total cost of the item and sometimes is, in fact, the only difference between a MilSpec item compared to the commercial item.

In addition, some MilSpecs are out of date and specify obsolete technology and equipments. Attempting to comply with such MilSpecs results in higher costs. If the equipment can be obtained, its performance is likely to be not as good, its maintenance support is certain to be worse, etc. If the equipment can not be obtained, an expensive, time consuming process for substituting equipment is necessary.

PROPOSED SOLUTION: Limit the use of MilSpecs to items which are essential to the mission of the ship and where the commercial equivalent is inadequate. Change the design approach to require NavSea designers to justify specifying a MilSpec item in lieu of a commercial item rather than the current system where the reverse justification is more likely to be required.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: None, other than the initial efforts of NavSea engineers to obtain and evaluate information on commercial equipment when preparing the ship specification during contract design.

ADDITIONAL COMMENT: This approach will require the NavSea designers to become more familiar with commercial standards and equipments, including the relative costs of items procured under MilSpec versus commercial standards. When specifications are not maintained and updated in a continuing process, the inevitable result is unnecessary, wasteful administrative cost, delay and disruption due to the contract changes necessary for the shipbuilder to procure the equipment that meets the ship's needs.

ITEM EP-4

NAVSEA STANDARD DESIGN PRACTICE:

MIL-G-21296	Diesel Engine Generator Sets
MIL-R-16743	Refrigerating Plants and Systems, Mechanical

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Similar items are commercially available and can be specified with a performance type specification. Make more use of cost effective commercial equipment.

PROPOSED SOLUTION: Consider preparing an Industry Standard (i.e., ASTM) or a Commercial Item Description (CID) for these items and canceling the Military Specifications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $5,000 per ship per item

NON-RECURRING IMPLEMENTATION COST: $lO,OOO/Item

ADDITIONAL COMMENT: If not accepted for all ships, should be done for all ships not designed for grade A shock.

ITEM EP-5

NAVSEA STANDARD DESIGN PRACTICE:

MIL-D-23523	Dehydrators, Low Pressure Air
MIL-s-17849	Strainers, Sediment, Pipeline
MIL-F-3623	Filter Elements, Lube Oil, Engine
MIL-F-3690	Filter, Elements, Lube Oil, Engine
MIL-F-3541	Fittings, Lubrication General
MIL-F-15730	Coolers, Fluid, Lube Oil, Hydraulic Oil & Fresh Water
MIL-E-24127	Eductors, Gasoline, Oil or Water
MIL-H-17428	Heaters, Fluid, Industrial
MIL-C-17557	Cooler, Fluid, Industrial
MIL-c-17428	Heaters, Fuel System
MIL-T-15301	Tank, Pressure, 600 PSI WP

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Make more use of cost effective commercial equipment.

PROPOSED SOLUTION: Prepare an Industry Standard (i.e., ASTM) or a Commercial Item Description (CID) for these items and canceling the Military Specifications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $5,000 per ship per item

NON-RECURRING IMPLEMENTATION COST: $10,000/Item

ADDITIONAL COMMENT: If not accepted for all ships, should be done for all ships not designed for grade A shock.

ITEM EP-6

NAVSEA STANDARD DESIGN PRACTICE: MIL SPECS and S/T Drawings for Laundry, Drycleaning, Medical and Dental Spaces, Commissary, and Industrial Plant Equipment

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Most of this equipment has commercial equivalents or can be equivalent, for significant features, with a few changes.

PROPOSED SOLUTION: Develop a study of commercially available equipment to determine which items are suitable for procurement using a Commercial Item Description (CID). Develop CIDS for these equipments.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: Some of these types of items may be suitable only for non-combatant ships.

ITEM EP-7

NAVSEA STANDARD DESIGN PRACTICE: Pipe and Valve Procurement
MIL-V-22052
MIL-V-18110
MIL-P-1144
MIL-T-24107

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: More cost effective industry standards are available for these items.

PROPOSED SOLUTION:

MIL-V-22052	Use ANSI B16.34 - Valves 2-1/2" & Above Globe Angle and Stop Check
MIL-V-18110	Use ANSI B16.34 - Valves 2-1/2" to 16" Gate
MIL-P-1144	Use ASTM A312 - Pipe, Seamless or Welded, Stainless Steel
MIL-T-24107	Use ASTM B75 - Tube or Pipe, Seamless, Copper

ESTIMATED COST IMPACT

RECURRING COST SAVINGS:

NON-RECURRING IMPLEMENTATION COST:

ADDITIONAL COMMENT:

ITEM EP-8

NAVSEA STANDARD DESIGN PRACTICE: Specifying marine motors to MilSpec

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea specifies marine motors to MilSpec. The only difference between a MilSpec and a commercial marine motor is the documentation requirements and the cost.

PROPOSED SOLUTION : Accept commercial marine motor specifications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: The unnecessary use of MilSpecs increases the costs of ship acquisition programs without any commensurate benefit in the performance or quality of the final product.

ITEM EP-9

NAVSEA STANDARD DESIGN PRACTICE:

MIL-G-21032	Gasket, Spiral Wound (Metallic-Asbestos)
HH-P-46 Class I	Gasket-Compressed Sheet (Asbestos 700°F)

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: These gaskets contain asbestos.

PROPOSED SOLUTION: Develop CID or industry standard (ASTM) to cover non-asbestos standard commercial gaskets, such as Garlok-Blue-Guard for. compressed sheet gaskets, and cancel the above specifications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $5,000/ship

NON-RECURRING IMPLEMENTATION COST: $20,000

ADDITIONAL COMMENT:

ITEM EP-10

NAVSEA STANDARD DESIGN PRACTICE: Using MilSpecs in the procurement of Anchor Chain

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea specifies anchor chain by Milspec. MilSpec establishes tolerances for anchor chain which were based upon dielock anchor chain. Dielock anchor chain is no longer available. The current substitute in use in the marine industry, flat butt welded chain, doesn't meet the MilSpec tolerances. InSurv has been issuing trial cards for the failure of the anchor chain to meet tolerances. Responding to the trial cards causes both the shipyard and the Navy to expend unnecessary man-hours and incur increased costs.

PROPOSED SOLUTION: Adopt commercial marine specifications for specifying anchor chain.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Minor

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT : Although the cost impact may be minor, this is another instance where NavSea's use of MilSpecs increases the cost of ship acquisition programs without any commensurate benefit in the performance or quality of the final product.

ITEM EP-11

NAVSEA STANDARD DESIGN PRACTICE: Fastener Requirements; MIL-S-1222, GEN SPEC 075 and Various MIL SPECS and S/T Drawings

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Excessive use of MIL-S-1222. Fasteners acquired under MIL-S-1222 are designed and tested for use in critical applications where a high degree of reliability is required.

PROPOSED SOLUTION: Limit use of MIL-S-1222 to critical applications. Use ASTM A193, ASTM A194 or other specifications listed in ASTM Annual Book of Standards Section 15.08 Fasteners for all other applications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: Some yards have determined that it is cheaper to standardize on the use of MIL-SPEC fasteners, since it is possible to obtain lower costs per item for purchasing in greater quantities and since it eliminates the possibility of using lower quality fasteners in applications where the higher quality are required. The cost savings due to reduction in QA effort and rework have more than offset the additional cost of the fasteners. However,. if the government makes this practice a requirement, it is probable that the shipyards will consider it necessary to submit higher bids.

ITEM EP-12

NAVSEA STANDARD DESIGN PRACTICE: Integrated Logistic Support (ILS)

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea imposed ILS requirements increase the procurement costs of equipment and thereby increase ship acquisition costs. While ILS is important to enable a ship to meet its mission, not every piece of equipment aboard a ship is essential to the mission. The application of ILS standards to every item aboard is excessive and can be very costly. For example, vendors may be required to rewrite fully satisfactory commercial technical manuals to place them into an acceptable ILS format.

PROPOSED SOLUTION : Limit the application of ILS requirements to mission essential items.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: ILS requirements can be very costly and should not be applied indiscriminately for every item on even a combatant. NavSea engineering personnel need to be knowledgeable regarding the cost of invoking ILS standards and the Ship Acquisition Program Managers (SHAPMS) need to be both knowledgeable and vigilant to prevent ILS from needlessly increasing ship acquisition costs .

ITEM EP-13

NAVSEA STANDARD DESIGN PRACTICE: Vendor Drawings to Level 3

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea ship specs require Level 3 drawings for vendor equipment. This adds considerable expense even though the drawings for much of the equipment will never be used. Further Level 3 drawings for commercially available equipment with complete documentation is clearly overkill and expensive.

PROPOSED SOLUTION: Review Level 3 drawing requirements for each item and delete the requirement from all equipments where a considerable benefit is not anticipated.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: This is a case where ILS requirements can increase the cost of equipment without any corresponding increase in value.

ITEM G-1

NAVSEA STANDARD DESIGN PRACTICE: Invoking Obsolete NAVSEA Standard and Type Drawings

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Standard and Type Drawings invoked in Ship Specifications, for the most part, were issued in the 1940s and last updated in the 60s. Many of the materials and design criteria are obsolete and require contract mods to correct. Drawings do not reflect current industrial standards.

After revision it takes years for a modification to be put into production because the contract data for the first ship of the class remains in effect for the remaining follow ships of the class.

PROPOSED SOLUTION: Develop and implement a plan to cancel, replace, or update these drawings. Make use of drawings developed by the shipyards, converting them to NavSea standard drawings, if a standard drawing is truly necessary, by changing the label plates on the drawings. This can be done as soon as the drawings are developed, rather than waiting until the end of the shipbuilding contract when the drawings are officially delivered. The revised standards must be made available to all Supervisors as soon as possible and the Supervisors must be empowered to substitute the updated drawings into ongoing programs with minimum administrative effort (read cost).

As drawings are updated, insure their use by invoking in all ships under construction and all follow ships, the contents of the 1991 Gen. Specs. Section 042, paragraph 042c, subparagraph on “Use of other than effective issues”.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major, for every shipbuilding program.

NON-RECURRING IMPLEMENTATION COST: Major, for NavSea if done at Headquarters by local contract effort. However, minimal if done as part of an ongoing program using the shipyards’ products generated during detail design.

ADDITIONAL COMMENT: Shipyards should be encouraged, through the use of incentives rather than penalties (such as the need to go through all the hoops of the ECP or VE processes), to develop designs that accomplish the intent of the standard drawings but involve simplification, fewer parts, etc - anything that reduces the time, manhours and/or cost of building the design. The drawings for these improved designs should be converted to standard NavSea drawing format by modifying the label plates and distributed to all Supervisors and government shipyards for application to the ongoing programs under their cognizance.

ITEM G-2

NAVSEA STANDARD DESIGN PRACTICE: Use of Contract Drawings rather than Contract Guidance Drawings

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Too many contract drawings are invoked in USN shipbuilding contracts. For example, forty (40) were identified in DDG 51 follow ship specifications (Section 042). This results in excessive ECPS to make minor changes and also requires excessive maintenance of drawings.

PROPOSED SOLUTION: Minimize the number of contract drawings, to give shipbuilder leewav in design and provide greater motivation to improve the design from a producibility standpoint.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: There should be a reduction in cost.

ADDITIONAL COMMENT: The difficulty, ip terms of time and cost, of getting changes to contract drawings approved provides a negative incentive for the shipbuilder to make design changes that would reduce construction cost. Such changes frequently would result in improvements in operability and maintainability of the ship and/or its systems. The Navy must provide positive incentives for these types of changes, but making a drawing a Contract Drawing is going in the wrong direction. Design control can be achieved by more positive methods.

ITEM G-3

NAVSEA STANDARD DESIGN PRACTICE: Maintaining Contract Drawings for Configuration Control

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: In recent shipbuilding programs, Shipbuilders have been required to update and maintain the original contract drawings for configuration control purposes. The number of changes that are made during the construction period, even to follow ships and from ship to ship in a multi-ship program, makes this practice unnecessarily expensive and cumbersome.

PROPOSED SOLUTION: Use the shipbuilder's as-built drawings as the starting point for maintaining ship configuration. Use system drawings, such as piping schematic drawings, for this purpose - not module installation drawings.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $100,000 to $250,000 in engineering/design savings per ship.

NON-RECURRING IMPLEMENTATION COST: None.

ADDITIONAL COMMENT: It is not necessary to develop system arrangement drawings solely for configuration control when they are not otherwise required for the ship construction process. Piping system diagrams, electrical one-line drawings and similar documents, which actually establish all of the system design requirements, are the only drawings needed for configuration management.

ITEM G-4

NAVSEA STANDARD DESIGN PRACTICE: Inconsistent Contract Drawing Detail

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea contract drawings are not taken to the same level of detail in all technical areas. The drawings frequently show excessive detail in one area and an almost complete lack of detail in another.

PROPOSED SOLUTION:. When preparing-drawings to be used as part of a Contract Design package, take all elements of the design into consideration - such as .-the distributed systems in a compartment, rather than just the location of major equipments. Provide the shipyard with the benefit of all the thinking that has gone into the contract design effort, in a non-constraining way, rather than erase informatzon that was once on the drawing. NavSea should take greater responsibility for delivering a fully engineered design package, with adequate guidance to the detail designers concerning matters for which the details have not yet been determined.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: The uneven level of detail in the contract drawings is, in some cases obviously and in other cases presumably, due to the government's desire to restrict certain features of the design (the general arrangement of equipment, for instance) without constraining other features. In other cases, it appears to be due to the contract design effort not having adequately considered all aspects of the design, perhaps because of insufficient time to properly integrate the design of all the systems involved.

ITEM G-5

NAVSEA STANDARD DESIGN PRACTICE: Untimely responsiveness to Shipbuilders' Proposed Design Changes

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The lack of timely NavSea responses to proposed design changes and other technical problems, discourages shipyards from proposing changes. Each shipyard proposal requires extensive effort and represents considerable cost to the shipyard. Further, the delays in response to proposals have the potential to result in schedule impacts and other costs for which the shipyard may not be fully compensated even if the proposal is approved. As a result, only those producibility improvements which do not require NavSea approval are incorporated bY the shiPYard. Producibility improvements which require NavSea approval are frequently not initiated by the shipyard.

PROPOSED SOLUTION: Modify the change approval decision making process as necessary to motivate shipyards to make proposals that enhance producibility. Give SupShips greater authority to make decisions on-site with minimum administrative effort and delay, particularly when cost savings will clearly accrue to the Government. When the contract includes an incentive clause, use it. Don't try to convert every proposal into a reduced cost change so that the Government recoups all the savings instead of sharing them with the shipyard as the incentive clause intends. Define the required approval/disapproval turn-around time and meet it.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: Shipyards are much more likely to propose cost-saving producibility changes when the process for getting them approved is simple, quick and when the shipyard can share in the savings. The VE process is still too slow and the awards are too arbitrarily determined to generate much interest and involvement by the shipyards.

ITEM G-6

NAVSEA STANDARD DESIGN PRACTICE: Excessive/Inadequate Noise Criteria

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Meeting noise criteria is costly. It is excessively so when the shipyard must meet the criteria for a compartment which will contain new equipment with uncertain noise characteristics. The shipyard is required to estimate the cost of meeting the noise criteria when bidding on the contract. The shipbuilder is responsible for estimating the cost of meeting noise criteria even though it is impossible to know what quieting techniques will have to be used until the specific installed equipments for the ship are identified and are operating in their final configuration in the ship. The trend for noise criteria is ever more severe, exacerbating the problem.

PROPOSED SOLUTION: The government should identify the required sound controlling techniques for each equipment to be installed, so that the shipbuilder can bid on a clear requirement. If the specified techniques fail to provide the required sound levels, then the additional work by the shipyard should be an increased cost change to the contract.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: If NavSea cannot specify the level of noise sources nor noise control efforts which will be required, the shipbuilder should not be required to bid on the work on a fixed price basis. This same principle should also apply to other aspects of the design which are not completely defined.

ITEM M-1

NAVSEA STANDARD DESIGN PRACTICE: Compressed Gas Flask Design and Fabrication Methods; MIL-F-22606 "Flask,Compressed Gas and End Plugs for Air, Oxygen and Nitrogen"

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Compressed gas flasks should be designed and fabricated per commercial standards, allowing open bidding and reduced cost through competition.

PROPOSED SOLUTION: In Gen. Spec. Section 552, page 1, line 36, and in corresponding sections of Ship Specifications, delete Mil. Spec. MIL-F-22606 and substitute "ASME Section 8 Div. 1 *or* Department of Transportation Standard (DOT) 3AA.".

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $20,000 - $250,000/ship

NON-RECURRING IMPLEMENTATION COST: None, once the specifications are revised as described.

ADDITIONAL COMMENT: The DOT reference already has been included in T-Ship Gen Spec Section 552.

ITEM G-7

NAVSEA STANDARD DESIGN PRACTICE: Multiple Levels of Referenced Publications

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea has published numerous standards, instructions and manuals over the years. Some of these contain conflicting requirements while others are out of date but still in use in certain shipyards. This has the potential for resulting in different levels of performance and possibly serious mistakes in ship construction and repair practices. The larger problem is with documents that are referenced by other documents. The many levels and branches of the document reference tree all too frequently lead to documents whose contents are no longer current.

PROPOSED SOLUTION: Scrub all current instructions and manuals for references which should either be eliminated or the contents included in the instruction or manual without further reference. Formally advise all shipyards and SupShips of which instructions, manuals and other publications should be followed and which should be discarded. Revise GenSpecs to include the information or specifically identify the other approved publications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Moderate

ADDITIONAL COMMENT: This problem has been addressed in NavSea in the past to some extent, but remains a serious problem. A concerted, concentrated effort needs to be mounted to eliminate unnecessary and outdated references.

ITEM M-2

NAVSEA STANDARD DESIGN PRACTICE: Propulsion Shafting Design and Material Requirements; DDS 243-1, GEN SPEC and Ship Spec Section 243

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Design and material of propulsion shafting is not cost effective for non-shock hardened ships.

PROPOSED SOLUTION: For ships not designed for grade A shock, revise Gen Spec Section 243 and corresponding sections of Ship Specifications, to permit use of ABS material and ABS design formulas for propulsion shafting. Specifically, in Gen Specs:

Section 243, page 1, line 20, delete “Shaft” and substitute “For ships designed to Grade A shock shaft”

Line 21, delete “.” and substitute “for ships that do not have to meet Grade A shock requirements, shafting shall be in accordance with ABS rules.”

Page 3, line 8, delete “Materials” and substitute “For ships designed to Grade A shock, materials”

Line 10, delete “.” and substitute “for ships that do not have to meet Grade A shock requirements, material shall comply with ABS rules.”

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $20,000 - $100,000/ship

NON-RECURRING IMPLEMENTATION COST: None, other than a one time administrative cost to change the specification language.

ADDITIONAL COMMENT:

ITEM M-3

NAVSEA STANDARD DESIGN PRACTICE: Bolt Hole Clearance Requirements

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: General Specifications, Section 075, and the Ship specifications which follow, contain overly restrictive bolt hole clearance requirements. The requirements are the same regardless of whether for use in shock or non-shock applications. Numerous vendors provide equipment to the Contractor with pre-drilled mounting bolt holes. Although the equipment has undergone preliminary alignment check at the factory, it still is rechecked by the Contractor. Many times the equipment needs to be realigned, which means the existing bolt holes must be enlarged to allow adequate movement of the component for realignment. If the bolt holes then exceed the allowable limits they must then be plug welded, relocated, and re-drilled. Relaxation of the clearance requirements for non-shock related equipment would eliminate the expense of plug welding, relocating, and redrilling the bolt holes.

A similar problem exists for shock related items when they are properly located with dowels. If the dowels are adequately sized, the need to meet the stringent bolt hole requirements is not required.

PROPOSED SOLUTION: Modify Gen Specs Section 075 and the equivalent sections of Ship Specifications to allow up to double the current bolt hole clearance when used for non-shock related equipment. or when used for shock related equipment which has been adequately constrained by dowels.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $50,000 - $250,000 per ship

NON-RECURRING IMPLEMENTATION COST: None, once the specifications are revised as proposed.

ADDITIONAL COMMENT: NAVSEA has previously approved exceeding the bolt hole clearance on a case basis when the equipment was properly doweled for shock and plug welding could distort a critical component.

ITEM OF-1

NAVSEA STANDARD DESIGN PRACTICE: Watertight Door Design; Spec Section 624 and Associated Standard Drawings

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Ship Specs invoke standard door drawings from which no deviation is permitted. The doors that result from use of the standard drawings are unsatisfactory. The door frames are not strong enough to take bulkhead loads. Mechanisms are high wear, high maintenance. Poor lubrication causes doors to "freeze up". Doors are poor sealing, and operate poorly in the fleet. Tolerances are unrealistically tight for some items and too loose in others.

PROPOSED SOLUTION: Survey door designs throughout the world, design a new class of doors. Reform the watertight access closures working group from 1989, which involved shipyards, NAVSEA, NAVSSES, SUPSHIPS and Fleet HTC'S. Build prototypes and test to failure. Test in fleet applications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate. Primarily from reduction of wasted time and labor for rework to make doors tight and still workable. There are many doors on each ship. This is a potential high cost savings item when applied to all ongoing shipbuilding programs.

The savings would be multiplied manyfold if applied to conversion and repair efforts as well.

The service life costs for maintaining and replacing doors and their components will also be substantial.

NON-RECURRING IMPLEMENTATION COST: Moderate. The cost can be minimized by use of proven designs from other countries.

ADDITIONAL COMMENT: The NATO standard doors used on the SA'AR 5 are far superior to the US standard doors. Low maintenance, reliable, good working doors are critical to ship damage control and day-to-day operation.

ITEM OF-2

NAVSEA STANDARD DESIGN PRACTICE: Liferails, Lifelines, and Awning Stanchions; NAVSEA Type Drawings and GEN SPEC Section 612, paragraph 612c

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Too many choices of fittings and configurations are shown on the various drawings. These items should be standardized. The height and other details of lifelines and liferails -are not in accordance with the height of one meter, the height of the lower rail, etc., that are standard for USCG and international standards.

PROPOSED SOLUTION: Make a standard suitable for various conditions, e.g.:

- Height should be one meter.
- Configuration in compliance with ISO standard.
- Deck sockets and plugs should be identical for all portable stanchions.
- End stanchion staples should be round bar.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Small.

NON-RECURRING IMPLEMENTATION COST: None.

ADDITIONAL COMMENT: This proposal has been made for many years with no valid rationale for the resistance to making the changes proposed.

ITEM P-1

NAVSEA STANDARD DESIGN PRACTICE: Out of Roundness Requirements for bent pipe.

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The out of roundness requirements for bent pipe established in MIL-STD-1627 are too constrictive, resulting in much unnecessary material and labor wasteage.

PROPOSED SOLUTION: Allow 8% on all systems, rather than the present requirement of 5% for 600 psi and greater, but 8% for systems below 600 psi.

Change Para 7.5 to read "Out-of-roundness. Bent pipe shall be measured for out-of-roundness. The maximum out-of-roundness, as calculated by the formula provided in 7.5.1, shall be 8%.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: The inconsistencies between the requirements used for purchasing piping, tubing and fittings and the requirements in MIL-STD-1627 for fabricated piping, tubing and fittings demonstrate that the requirements of the MIL-STD are excessive. It is possible for the shipyards to buy and use fittings, for instance, which would be rejected if made in the shipyard. The paper "Time to Overhaul Marine Pipe Fabrication Technology" presented by Mr. P. G. O'Keefe at the recent Symposium at Bath, Maine identifies numerous issues that need to be addressed. Piping is a major cost driver in all shipbuilding programs and the steps necessary to minimize the manhours and time for fabricating and installing piping systems should be very high priority action items for effecting productivity improvements.

ITEM P-2

NAVSEA STANDARD DESIGN PRACTICE: Pipe Bend Thickness Requirement

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Paragraph 4.4.2 of MIL-STD-1627B limits pipe bend backwall thinning to 20% maximum. Based on experiments and experience, this is an excessive requirement.

PROPOSED SOLUTION: Change to allow 25% thinning for P-1 systems and 30% for P-2 systems.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: Approval has already been granted by NavSea for 25% thinning on all systems. The documentation has not reflected this change. The greater percentage of thinning for P-2 systems is considered justified based on design strength calculations.

ITEM P-3

NAVSEA STANDARD DESIGN PRACTICE: Post Bend Heat Treatment

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Table IV on page 16 of MIL-STD-1627B requires "various levels and methods" of post bend heat treatment.

PROPOSED SOLUTION: Change to be in accordance with ANSI B31.1.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: This is the current practice in the shipyard. The documentation needs to be brought into compliance with practice.

ITEM P-4

NAVSEA STANDARD DESIGN PRACTICE: Hot Bending of S-8 CRES Piping

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Table II on Page 13 of MIL-STD-1627B does not allow hot bending of Group S-8 CRES. HOwever, Then the shipyard buys such pipe from outside sources, which,use induction heating during their bending process, the use of this materia by the shipyard is approved by the government - because there are no other sources for the material.

PROPOSED SOLUTION: Allow hot bending by induction.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Minor

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: This item identifies an unrealistic requirement in a standard document which has not been removed despite the fact that it cannot be met in the real world. The ability to do the bending in the shipyard's facility would eliminate all of the procurement effort to buy small quantities of material outside the yard.

ITEM P-5

NAVSEA STANDARD DESIGN PRACTICE: P-1 Welding of Bleed Air System

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: MIL-STD-278 requires Class P-1 welding for piping systems exceeding 300 P.S.I. or 650°F. The bleed-air system exceeds 650°F only for very short periods of time. Requiring this system to be classified as a P-1 piping system leads to excessive time and cost for welding of the system components.

PROPOSED SOLUTION: Revise MIL-STD 278F, page 14, paragraph 3.3.2(b)(1) line 10. Allow N.D.T. of bleed-air system by use of dye penetrant.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $7,000/ship

NON-RECURRING IMPLEMENTATION COST: $5,000

ADDITIONAL COMMENT: Dye penetrant has been used for NDT of bleed air systems on many ships in service built by the shipyard and there is no know record of failures of any bleed air systems .that were so tested

ITEM P-6

NAVSEA STANDARD DESIGN PRACTICE: Sil-Braze Pipe Welding

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Paragraph 6.2.6 of MIL-STD-278E requires two passes on all weld joints. There are systems and conditions for which this requirement is excessive.

PROPOSED SOLUTION: For systems whose operating pressure is less than 400 psi, such as 90/10 CuNi Salt water fittings, where the welding surface is too small to accommodate two passes, but the joint integrity is satisfactory, allow single pass welding.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Small

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: In many applications of the type described above, the welding surface is too small to accommodate two weld passes and maintain a decent appearance, and the required strength of the joint can be obtained with a single pass. To require more than one pass is wasteful and non-productive.

ITEM P-7

NAVSEA STANDARD DESIGN PRACTICE: NavSea 0348-LP-078-1000

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Hydraulic Control Boards are not standardized.

PROPOSED SOLUTION: Develop a Manifold that will encompass all the hydraulic control valves excluding the PRP Valve.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Cost savings should accrue.

ADDITIONAL COMMENT: This would save on design and installation cost .

ITEM P-8

NAVSEA STANDARD DESIGN PRACTICE: Vent and drain fitting design

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The use of globe valves for high pressure and low pressure vent and drain systems is more expensive than the alternative discussed below.

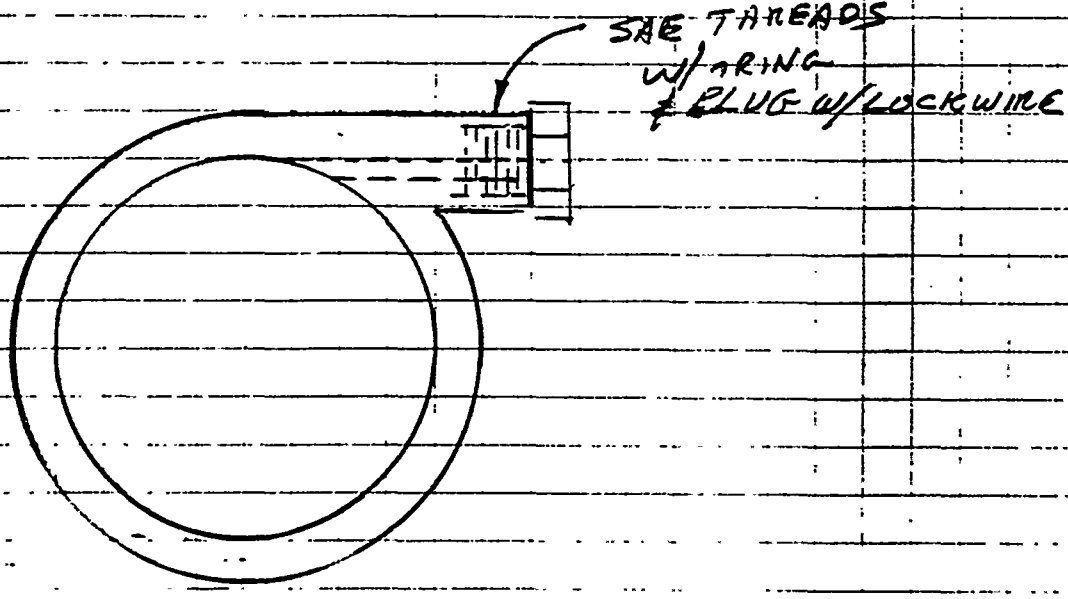
PROPOSED SOLUTION: Develop a low pressure tangential vent and drain fitting similar to the high pressure vent and drain fittings used on submarine hydraulic systems, and use these type fittings in all fluid systems..

ESTIMATED COST IMPACT

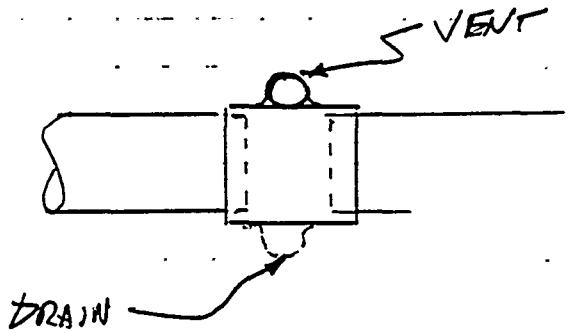
RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Nominal

ADDITIONAL COMMENT: The simple fitting shown in the accompanying sketch would be much less expensive to manufacture and install than globe valves.



TANGENTIAL VENT FTG SILBRZ, SWD OR BTWLD
VENT SHOWN ROTATE 180° FOR DRN



ITEM P-9

NAVSEA STANDARD DESIGN PRACTICE: NavSea 803-1385789

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The drains designed to the standard drawing referenced above are leaking around the steel rings.

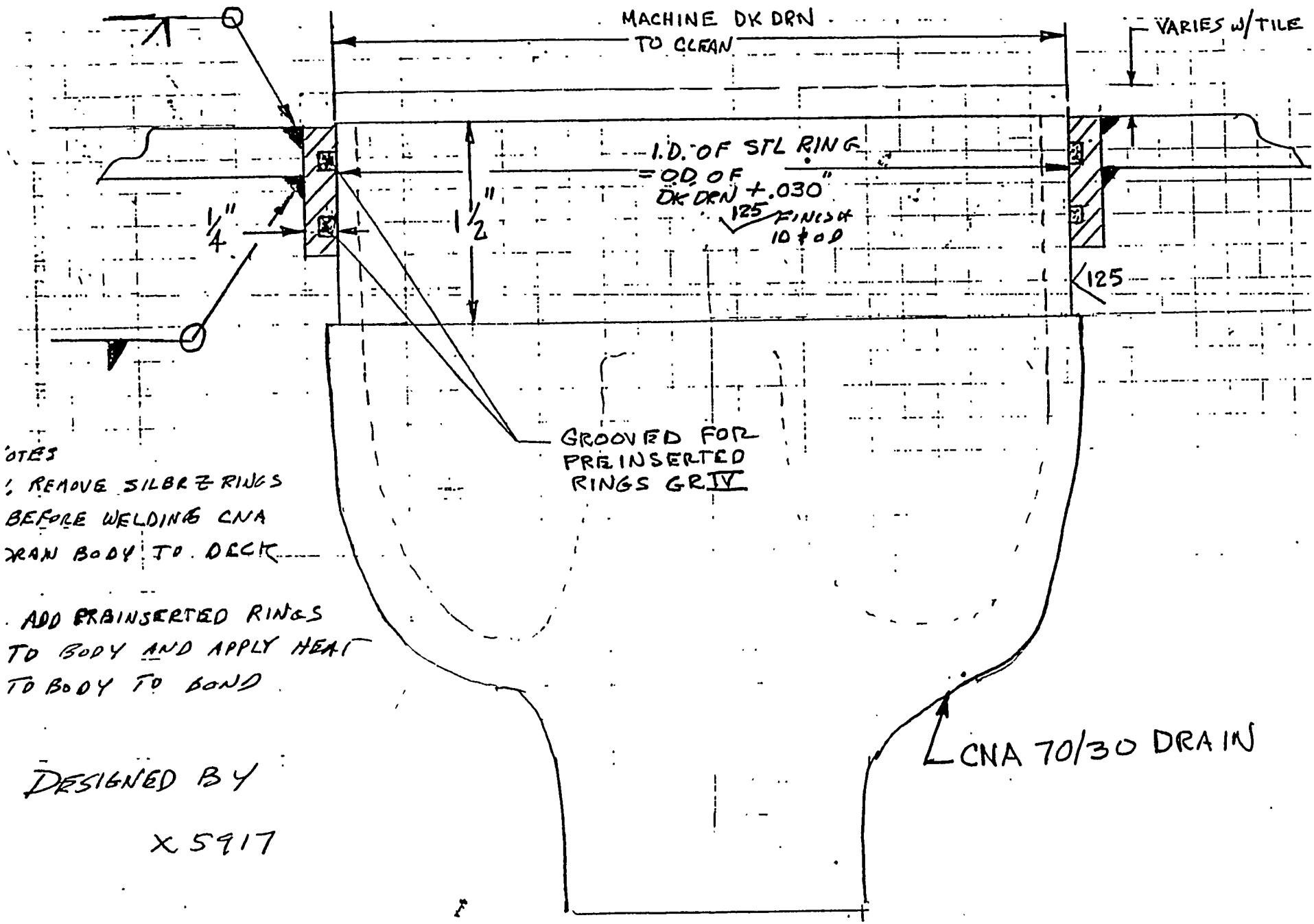
PROPOSED SOLUTION: Develop CNA drains with 4“ seals and steel ring for welding into the deck for strength and silbraze the deck drain into the ring with grade IV solder.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Moderate, to design and test.

ADDITIONAL COMMENT: See attached sketch.



OTES

; REMOVE SILBRZ RINGS
BEFORE WELDING CNA
RAN BODY TO DECK

. ADD PRBINSERTED RINGS
TO BODY AND APPLY HEAT
TO BODY TO BOND

DESIGNED BY

X5917

ITEM P-10

NAVSEA STANDARD DESIGN PRACTICE: Deck Drains for CPS System

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: "P" traps now have to be added in drain rings for CPS systems. These have to be oriented fore and aft, which affects design and installation.

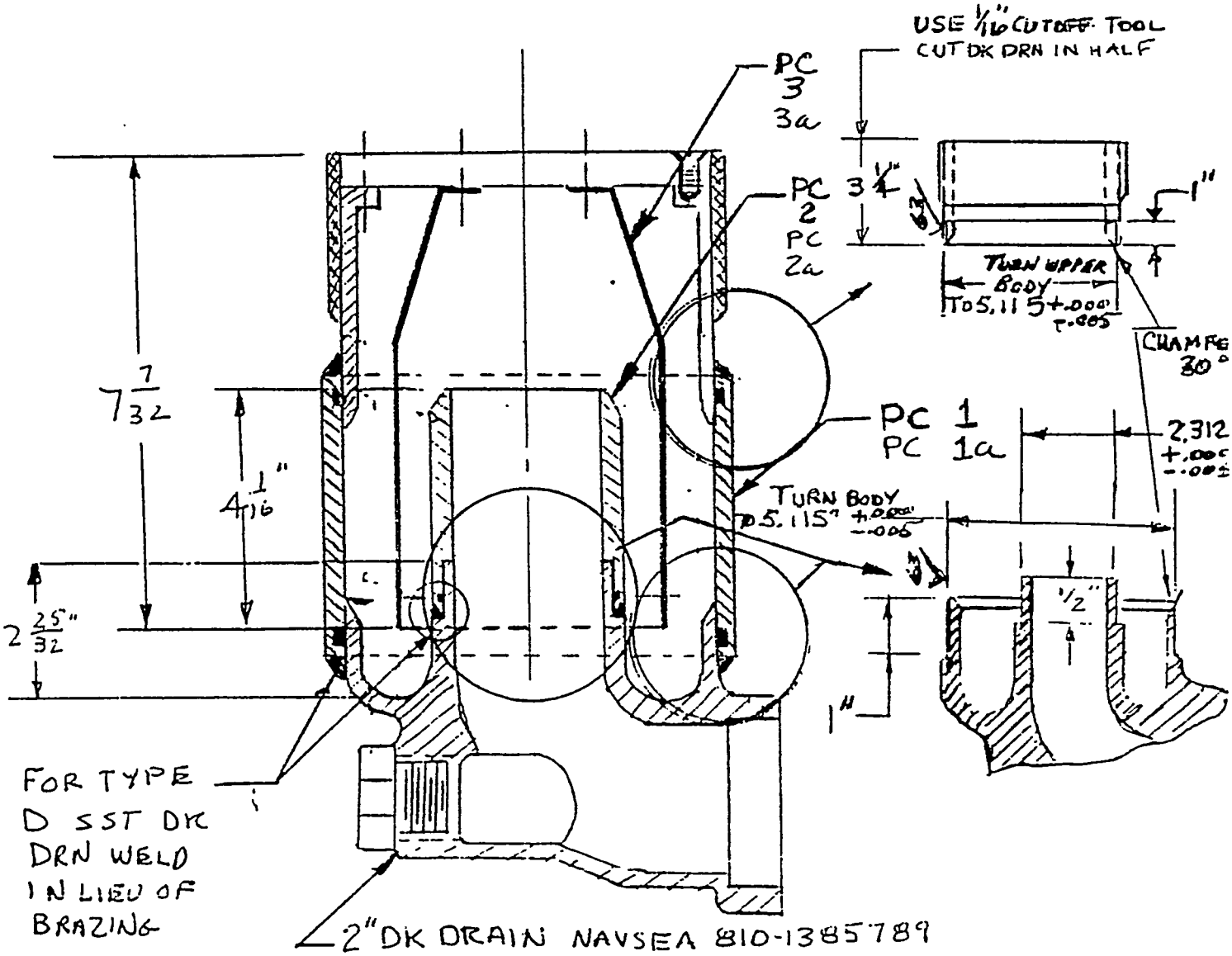
PROPOSED SOLUTION: Modify existing deck drains or manufacture new ones to suit 4" seals.

ESTIMATED COST IMPACT

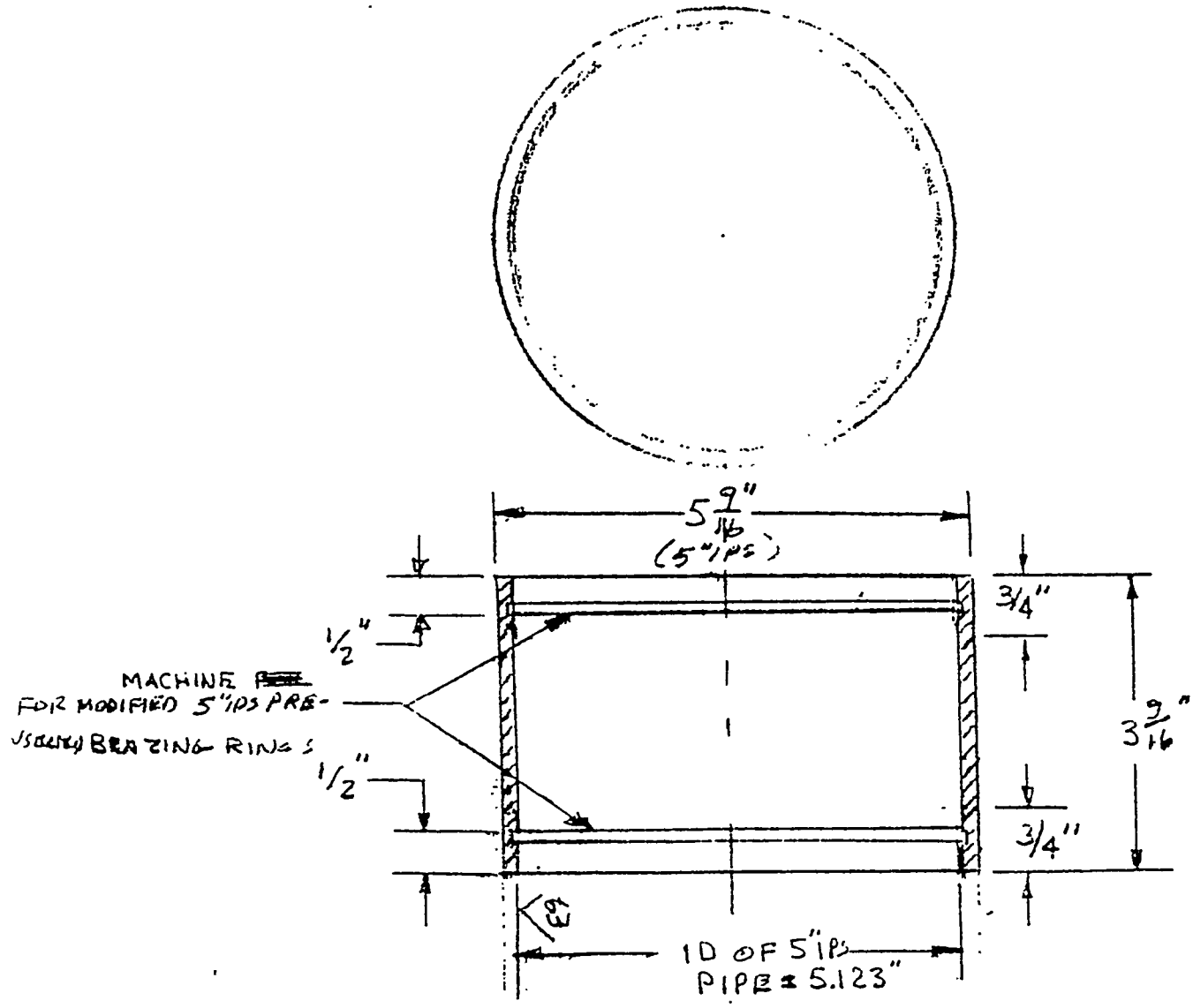
RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: Design time and installation time will be reduced. See attached sketch for proposed changes.

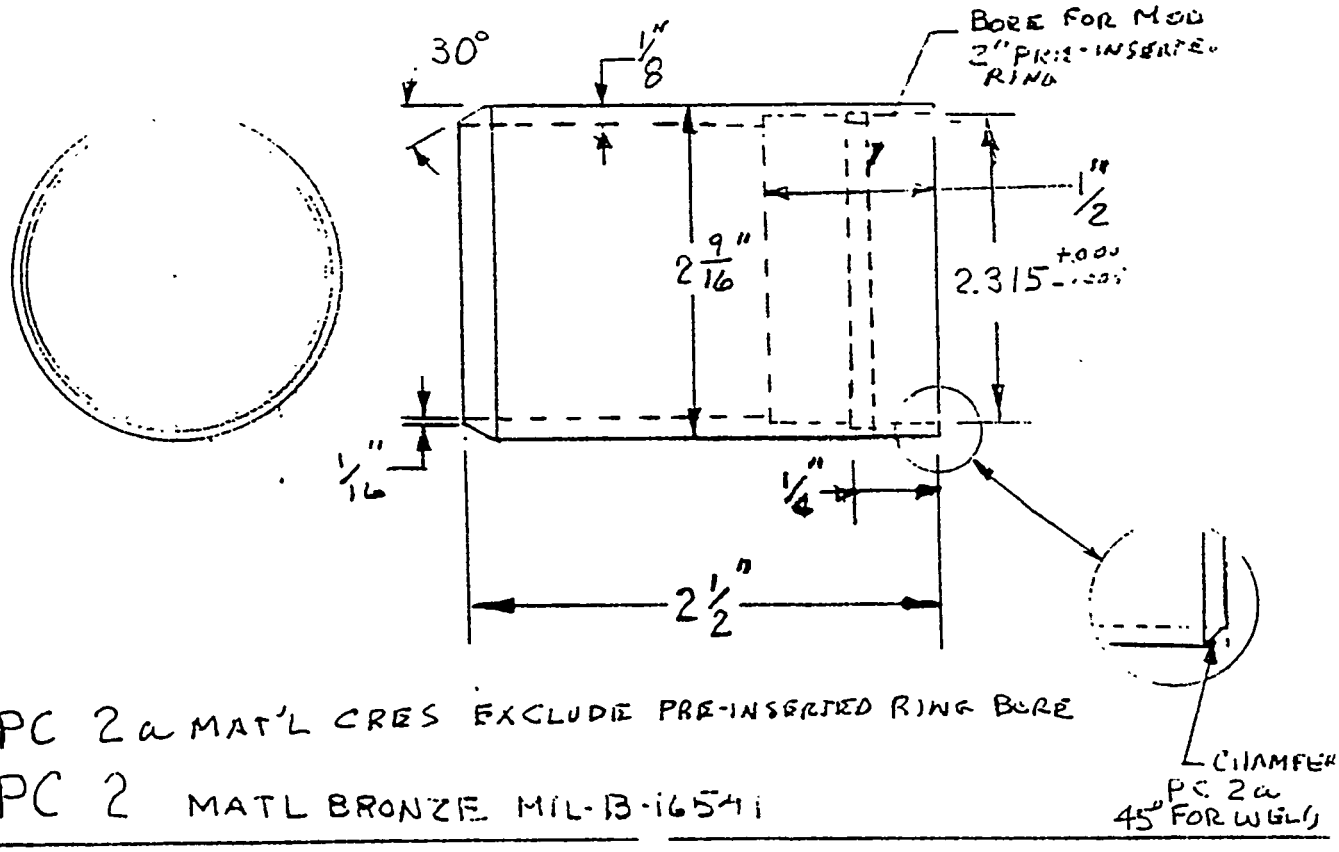


MODIFIED 2" DK DRAIN W/4" SEAL



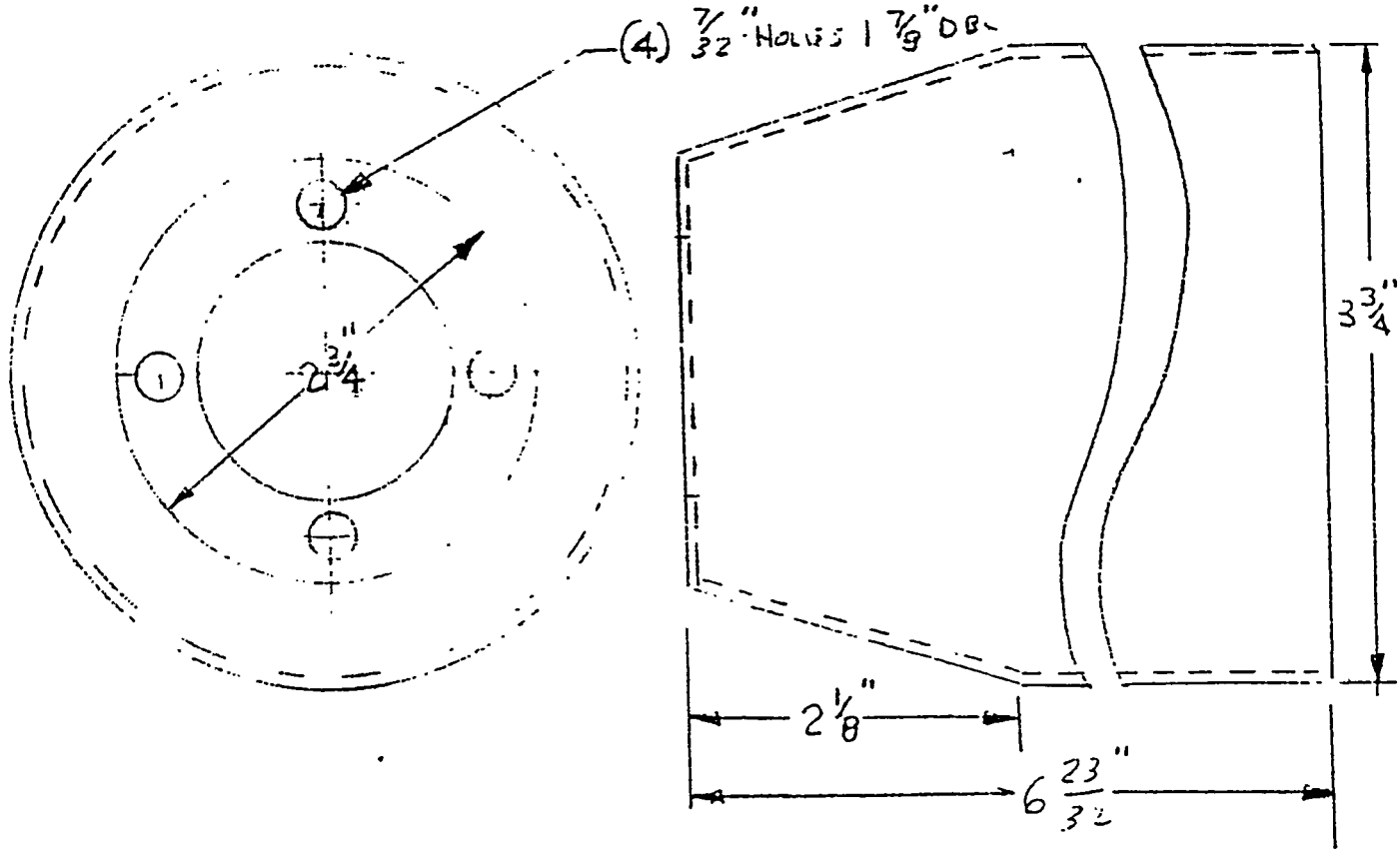
PC 1a MAKE FROM 5"IPS CRES SCH 40 BORE TO 5.123 EXCLUDE MACH. OF PRE-INSERT RING BORE

PC 1 MAKE FROM 5"IPS CNA TBG CLASS 700 LB .220" WALL



PC 2a MAT'L CRES EXCLUDE PRE-INSERTED RING BORE

PC 2 MATL BRONZE MIL-B-16541



PC 3 BRASS SHEET 1/16" THICK QQ-N-B613

PC 3a CRES

ITEM P-11

NAVSEA STANDARD DESIGN PRACTICE: P-1 piping joint design

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Table VII of MIL-STD 278F does not permit use of P-2 Mod 1 joint design for P-1 piping systems. The Navy previously permitted this design at shipyard, but withdrew approval when QA records did not indicate visual inspection of the root on a number of P2 Model joints.

PROPOSED SOLUTION: Revise MIL-STD 278F, table VII to add "P-2 Mod 1" to third column-for "Piping Classes P-1, P-2, P-LT service classification".

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Depends on extent of P-1 piping on the ship. Would save 1/3 of the manhours used for fit-up. Would eliminate X-Ray and add Dye Penetrant, saving 4 manhours per inspection. Would save at least 1/2 of the welding manhours. Estimate cost savings in excess of $100,000 per DD type ship.

NON-RECURRING IMPLEMENTATION COST: $5,000, to recertify personnel and change paperwork on existing ship programs. None for new starts.

ADDITIONAL COMMENT:

ITEM S-1

NAVSEA STANDARD DESIGN PRACTICE: Hull Girder Bending Stress

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Hull girder bending stresses for USN ships are based upon techniques that have not been improved for years.

PROPOSED SOLUTION: Make use of the more rational techniques for these calculations which have been developed by ABS.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None. There should be cost savings due to reductions in required engineering calculation time.

ADDITIONAL COMMENT: The use of ABS rules frequently results in structure that is lighter and more producible, while still meeting the design loads satisfactorily. Ship designs should be based on meeting the ship's required performance, using the best techniques currently available - not on rigid adherence to some historical technique.

ITEM ***S-2***

NAVSEA STANDARD DESIGN PRACTICE: Excessively conservative, outdated Structural Buckling Design Criteria

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea hull structural buckling criteria were established by DDS-11OO-3 and its successors. The DDS is based upon tests conducted in the Brooklyn Navy Yard in 1930. The DDS limits the width of effective plate material which can be included in the calculations from 40t to 60t, which is much less than currently allowed in commercial practice. With the available US profiles, the web frame spacing in Navy designs is limited to about 8 feet. ABS allows the inclusion of 33% of the span, which allows for much greater web frame spacing. A larger web frame spacing results in a much more producible hull due to the reduced number of web frames, the decreased welding, and the improved worker access to the work.

PROPOSED SOLUTION: Accept the ABS buckling design criteria for NavSea designs, except when specific load requirements dictate otherwise.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: NavSea structural ship design standards are not up to date in various areas. Developments in the commercial and international shipbuilding industry since the 1930/40s are being ignored. The rigid limitations on the effective plate width which can be included in the current buckling criteria keeps NavSea hull structural design mired in the standards of the 1930s despite the demonstrated success of the AM and other standards.

ITEM S-3

NAVSEA STANDARD DESIGN PRACTICE: Design of Non-tight Bulkheads

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Structural non-tight bulkheads with flat plate and attached stiffeners are not cost effective and reduce producibility.

PROPOSED SOLUTION: Permit use of corrugated steel bulkheads for structural non-tight bulkheads. Develop a Commercial Item Description for this product.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $15,000/ship

NON-RECURRING IMPLEMENTATION COST: $25,000 to develop CID, specification, or drawing

ADDITIONAL COMMENT: Approximately 400 lineal feet of bulkhead per Destroyer/Cruiser type ship could be constructed from this type material. Estimated savings of about 25% in fabrication and installation, also savings in painting. Spaces selected have little or no insulation and low quantity of bulkhead mounted items. Penetrations could be simple for distributive systems. Some cost in door fit-up.

Has been done to a limited extent on CG'S as a weight savings.

ITEM S-4

NAVSEA STANDARD DESIGN PRACTICE: DDS method for combined sections

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The DDS method for determining the properties of combined sections frequently yields structure which is heavier than necessary and more labor intensive to build.

PROPOSED SOLUTION: Use ABS ules for developing the properties of combined sections.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate.

NON-RECURRING IMPLEMENTATION COST: None.

ADDITIONAL COMMENT: Use of more than one set of rules in the structural design of ships is unnecessary and wasteful. The Navy should work more closely with ABS or other rule making and standards organizations to ensure that their needs are met by the techniques used in those organizations, and cease making Up a separate set of unique requirements unless there is a demonstrated need for them. Even then, it is probable that the other organization's rules can be modified to allow for alternate techniques to be used under the unique conditions which call for them.

ITEM S-5

NAVSEA STANDARD DESIGN PRACTICE: Foundation Design Practices - Foundation Design Data Sheet; Spec Section 180

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATENENT: The present method for designing foundations, described in the DDS, is excessively conservative in the alignment requirements for backup structure. It also does not apply well to the use of skid-mounted foundations - the type of foundations which enhance equipment packaging, pre-outfitting and moving work from the ship to the shop environment.

PROPOSED SOLUTION: Develop a new DDS and change the content of Spec Section 180 to include requirements for skid-mounted foundations.

ESTIMATED 'COST IMPACT

RECURRING COST SAVINGS: Major.

NON-RECURRING IMPLEMENTATION COST: Moderate.

ADDITIONAL COMMENT: Major savings will be made on each ship constructed when equipment packaging is enhanced. Maintenance and operation of equipment are also improved by the use of this technique. Application of skid-mounting systems greatly facilitate the use of machinery package units.

A project to develop a new manual for the design of foundations has been initiated in the National Ship Research Program's Ship Construction Program's Panel SP-4 on Ship Design/Production Integration.

ITEM S-6

NAVSEA STANDARD DESIGN PRACTICE: Chain Locker Grating **Design -** Spec Section 622c

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMNT: Chain locker gratings are defined in the specifications to be constructed in a grid of bars of rectangular cross section. The bars' cross sections range between 1" x 3/8" and 2" x 3/4"r depending upon the chain size. The distance between the bars must be not greater than 1 1/2". This grid structure is extremely expensive to build, since it requires cutting out notches in each piece so that they can be fitted together into a grid, after which,each..intersection must be manually - an extremely labor intensive process.

PROPOSED SOLUTION: The function of this grating, obviously, is to support the weight of the chain and to allow drainage of water from the chain when the anchor is raised. An alternative design that achieves this same function equally well would be a flat plate with holes of up to 1 1/2" diameter, stiffened on one side as necessary. The proposed wording of the revised specification is as follows:

Chain locker gratings.- Galvanized steel gratings shall be fitted in chain lockers, arranged in sections of suitable size for passing through the access hatchways or manholes. Gratings may be of a flat bar type or plating with similar drainage holes. Flat bar type gratings shall be made of (2" by 3/4") flat bar. The bars shall be spaced so that the distance between the bars is about one-half the diameter of the wire of the chain, but not greater than 1 1/2 inches. Plate type grating shall be of at least equal load carrying capacity to the flat bar grid. Drainage holes in plate type gratings shall be no larger than one half the width of the chain links. (New language in italics)

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: The plate solution would cost much less than half the cost of the grillage structure solution, per ship.

NON-RECURRING IMPLEMENTATION COST: The cost of modifying the specification. The design of the plate solution would be less than half the cost of the design of the grating approach.

ADDITIONAL COMMENT: A proposal by the shipyard to implement the proposed solution above was denied by the Supervisor because it did not meet the requirements of the ship specification. This appears to be a case where the emphasis in the government's management of the shipbuilding process is on insistence that a specification be satisfied precisely, rather than on working with the shipyard to find the most cost effective way to achieve the functionality of the design and then share this idea with other shipbuilding programs.

ITEM S-9

NAVSEA STANDARD DESIGN PRACTICE: Seachest Protection Sleeve Fit-Up Tolerances - NAVSEA Drawing 803-1749026

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The fit-up tolerances specified on the drawing cited above are too restrictive and expensive to achieve, particularly for the larger diameter installations such as Main Sea Chest Scoop Injection and Overboard discharge Sea Chests. The drawing requires 1/16 ± 1/64″ fit-up gap between waster Piece and seachest. This tight requirement. does not improve functionality, operability or maintainability of the system, nor does it improve the quality of the resulting welds.

PROPOSED SOLUTION: Modify the fit-up gap clearances on the above drawing to 1/8 ± 1/32″ (5/32″ maximum clearance) for all installations greater than 4“ nominal OD pipe sizes and 1/16 ± 1/32″ for (3/32″ maximum clearance) for nominal pipe sizes less than or equal to 4“ OD.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Approximately 24 manhours per seachest. Estimate $20,000 per hull on destroyer type hulls and proportionately more on larger ship types.

NON-RECURRING IMPLEMENTATION COST: Minor costs, not exceeding 4 hours per revised drawing. Maximum of $ 5000 for existing programs. No cost for new programs.

ADDITIONAL COMMENT: **None.**

ITEM- S-10

NAVSEA STANDARD DESIGN PRACTICE: Specifying MilSpec steel

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea specifies hull structural steel to MilSpec even when ABS grades of steel are available and acceptable for the specified service.

PROPOSED SOLUTION: Use ABS steel grades for NavSea ship designs except where it can be demonstrated that only a MilSpec steel can meet the requirements.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: The commercial marine-industry has been using ABS steel for many years without problems. ABS steel is less costly. NavSea's use of MilSpecs for steels that are not significantly different than those which meet commercial standards increases the costs of ship acquisition programs without any commensurate benefit in the performance or quality of the final product.

ITEM S-11

NAVSEA STANDARD DESIGN PRACTICE: Limited Use of HSLA Steel

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The application of this type of steel as a replacement for HY steels should be increased.

PROPOSED SOLUTION: Permit the shipyards to utilize HSLA in all applications where this steel could be used.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT:

ITEM S-12

NAVSEA STANDARD DESIGN PRACTICE: NavSea design standards for hull structural profiles: specifying shipbuilding profiles from I's cut to T's and channels cut to L's.

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: NavSea structural design standards for shipbuilding profiles are based on I's cut to T's or channels cut to L's. Specifying these profiles for the hull structure in the midship section drawing, normally a contract drawing, forces the shipbuilder to use these shapes. However, this practice is a high cost driver in the construction of a ship's hull. First, cutting the shapes requires additional work while wasting the removed steel. Further, burning the member results in distortion in the member. The distortion then requires that the member be straightened before it can be used, a costly process. Finally, the practice limits the size and shape of the structural members which can be used to design the hull structure, which in turn may results in a less weight efficient hull structure. Other marine profiles which are less costly to purchase and install, are available in the international market.

Section 100b of the General Specifications contains the following statement: " Where an I-T is specified, a tee or fabricated tee having substantially equal weight and section modulus may be used." As long as the structural sections are shown in a drawing that is a Contract Drawing, this provision is overridden by the drawing, which apparently violates the whole intent of this statement.

Furthermore, the requirement for *"substantially* equal weight and section modulus" inevitably involves the subjective determination by two parties of what is acceptable. The determination of the structural details should be left to the shipbuilder, given that the structural design must meet all of the functional requirements specified in the contract.

PROPOSED SOLUTION: Make the Midship Section, and other structural drawings provided in the Contract package,contract guidance drawings rater than contract drawings.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: This item is vital, from a structural standpoint, in enhancing the producibility of USN ships.

ITEM S-13

NAVSEA STANDARD DESIGN PRACTICE: NavSea design standards for hull structural profiles: not specifying marine bulb shapes.

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The US steel industry does not offer marine bulb structural members in the variety of sizes which are available to the international shipbuilding industry. The steel industry claims that there is insufficient demand for the item but simultaneously blocks the importation of foreign steel. The use of marine bulbs in hull structures gives foreign shipyards a competitive advantage while penalizing US shipyards. This situation can at least partially be attributed to NavSea (currently the only large customer for US built ships) not using the marine bulb in the design of hull structures, despite the appreciable production cost savings which would result.

PROPOSED SOLUTION: Adopt marine bulb profiles in the design of Navy hull structures. If the US Navy were to specify marine bulb profiles, the demand would justify the US steel industry making the capital investments necessary to produce the shapes. The resultant savings in production manhours would assist the US shipyard industry in becoming competitive internationally.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Major, since the cut-out and welding costs of each intersection of a bulb section with a bulkhead or frame would be reduced by one-third to one-half. Maintenance costs would be reduced throughout the life of the ship, since bulb shapes have significantly less area for coating, etc. compared with L- and T-shapes.

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: This item is one of the most cost effective changes NavSea can make in the hull structural area to improve producibility and maintainability.

ITEM S-14

NAVSEA STANDARD DESIGN PRACTICE: Hardness Requirements for Anchor Handling Hardware - GEN SPEC Section 581, page 3, lines 49-54

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: The bearing surface hardness requirements for anchor handling hardware are based on the use of the obsolete Dilock chain, which is much harder than the MIL-C-24633 Butt Welded Chain which is currently being procured (Brinell hardness of 305 vs 210 for butt welded). These requirements lead to the use of materials which are more expensive to buy and more expensive to process.

PROPOSED SOLUTION: Reduce the bearing surface hardness requirements for bolsters and hawsepipes. In Gen. Spec. Section 581, page 3, line 50 change “300-350” to “200-300”. Initiate change orders for ships under construction.

Specify high ultimate strength (hardness) casting material for bolsters, and HSLA-1OO plate (Brinell hardness about 220) for hawsepipe.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: About 400 manhours per shiP would be saved. $25,000 construction/ship plus service life cost savings.

NON-RECURRING IMPLEMENTATION COST: One time administrative costs for changing paperwork.

ADDITIONAL COMMENT: Partially implemented on DDG program.

ITEM .S-16

NAVSEA STANDARD DESIGN PRACTICE: Imprecise Metal - Sprayed Aluminum Requirement - Ship Specs and Gen Spec Section 632, Table I.

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: Lines 14 and 15 in Table I on page 4 of Gen Spec Section 632, and the ship specifications that result therefrom, specify that metal-sprayed aluminum is required for all foundations in main and auxiliary machinery rooms and pump rooms. This exotic treatment should only be required for foundations expected to normally or frequently be subject to standing, splashed, or sprayed water. Foundations in overhead and other locations not exposed to such an environment should not require this treatment.

PROPOSED SOLUTION: Revise Gen. Spec section 632, Table I, page 4 lines 14 and 15, to exempt foundations not exposed to standing, splashed or sprayed water.

Initiate change requests for ships under construction with this requirement.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $1/2 to 1 million per ship

NON-RECURRING IMPLEMENTATION COST: $50,000 per class

ADDITIONAL COMMENT: This is an example of a specification requirement being applied in entirely unrealistic manner by a field activity because the wording of the requirement is too general. It should be possible for a Supervisor to determine that metal spraying of foundations in the overhead of a space is not necessary, (and any similar determination) without having to get approval of NavSea or to go through an expensive change order process. The purpose of having on-site field inspectors should be to get the best value for the government - not to mindlessly invoke whatever specification requirements exist.

ITEM S-15

NAVSEA STANDARD DESIGN PRACTICE: Inconsistent authorization for use of Hull Fairing Compounds

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The hull fairing requirements are specified in Spec Section 074 and MIL-STD-1689. The use of fairing compounds to correct for lack of fairness in hull plating is permitted on some shipbuilding contracts, but not on others.

PROPOSED SOLUTION: Modify the language of MIL-STD-1689 to permit use of fairing compounds.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Minor

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: The use of fairing compound is allowed on one ship class and not on another, larger, ship class being built in the same shipyard. This appears to be a requirement that is imposed by or relaxed by individual ship program management staffs, rather than by a standard technical or productivity policy consideration.

ITEM S-17

NAVSEA STANDARD DESIGN PRACTICE: Unique Welding Procedures

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Ship Specifications and Standard and Type drawings generally require that welding procedures comply with unique USN requirements.

PROPOSED SOLUTION: Modify existing USN documentation to require the use of ABS and/or AWS welding procedures which are applicable to materials used in shipbuilding. Eliminate those portions of USN documents which describe and prescribe the replaced procedures. Develop a document which provides a matrix or other description of what USN procedures have been superseded and by what other procedure each has been superseded. The information should be sorted or provided in such a way that one could enter with either the USN procedure, to find which procedure(s) supersede it, or the commercial practice, to find what USN procedure(s) it supersedes.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate savings to each ship.

NON-RECURRING IMPLEMENTATION COST: Moderate cost to the government to document the changes.

ADDITIONAL COMMENT :

ITEM S-18

NAVSEA STANDARD DESIGN PRACTICE: Fillet Weld Strength and Efficiency Calculation Method, Use of PT weld joints; MIL-STD-1689, MIL-STD-22, Spec Section 074

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The calculation method for PT joints required in MIL-STD-1689 is cumbersome and excessively conservative.

At least one Supships office has proposed limiting the allowable locations at which PT. joints may be used to fewer locations than MIL-STD-1689 specifically allows.

PROPOSED SOLUTION: Authorize the alternative calculation method proposed in a technical paper "Designing Partial Penetration T-Joints for Naval Ships" presented in August 1988 at the National Shipbuilding Research Symposium in Seattle, WA. It is believed that some shipyards have already implemented this method.

Encourage SupShips personnel to approve the use of productive techniques rather than insisting on overly conservative misinterpretations of specifications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST : Minor

ADDITIONAL COMMENT: The use of PT joints eliminates the need for backgouging - a substantial saving in time and manhours. The alternative calculation method has been proposed officially to NavSea. If approved, all shipyards building USN ships should be notified. This calculation method has been proposed for over 4 years. The NavSea technical community must be required to act faster in making decisions that enhance producibility.

Steps also need to be taken to ensure that government inspectors do not unnecessarily interpret technical documents more stringently than the documents require.

ITEM S-19

NAVSEA STANDARD DESIGN PRACTICE: Prohibition against flux core welding - SPEC Section 074 and MIL-STD-1689

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Flux Core welding is forbidden for welding bilge, sheet and stringer strakes.

PROPOSED SOLUTION: Allow flux core approved procedures.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: None

ADDITIONAL COMMENT: Flux core is a high productivity welding process. It yields excellent results with ceramic backing tape. Fusion and wetting is better than with other Grounded Metal Arc Welded (GMAW) processes.

ITEM S-20

NAVSEA STANDARD DESIGN PRACTICE: Prohibition against intermittent welding - MIL-STD-1689, Para. 11

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Intermittent welds for primary hull structure are prohibited by MIL-sTD-1689, Paragraph 11.3.3.1. Primary hull structure is so broadly defined as to essentially preclude the use of intermittent welds.

PROPOSED SOLUTION: Since paragraph 11.2.3.1 of MIL-STD-1689A, recently issued, permits intermittent fillet welds to be used in the "joints of stiffeners attached to surface ship primary support structure which is not a part of the primary hull girder", this authorization should be incorporated into existing ship construction contracts, as well as future shipbuilding specifications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $100,000 - $200,000 per ship

NON-RECURRING IMPLEMENTATION COST: Cost of modifying contracts to permit use of the latest version of the MIL-STD.

ADDITIONAL COMMENT: Intermittent welds are less costly to install and result in much less distortion than continuous welds. Intermittent welding is utilized for both foreign military vessels and commercial ships.

ITEM T-1

NAVSEA STANDARD DESIGN PRACTICE: Excessive Non-Destructive Testing Requirements; Specs, MIL STD 1689

DESCRIPTION OF IMPROVEMENT REQUIRED

PROBLEM STATEMENT: For years the Navy has been increasing the requirements for random Ultrasonic Testing (UT) and other Non-Destructive Testing (NDT) in ship specifications invoking MIL STD 1689 requirements. This is a bandaid that does not improve the fitness for service. Porosity is the largest cause of rejects, yet does not significantly degrade ship performance until well above the level that meets the minimum criterion for rejection. For example, on one recent program 5 times the Visual Tests (VT) of butt welds were required compared to prior VT inspection requirements, at great cost. However, there was no decrease in the UT reject rates. Dye-Penetrant Testing (PT) was originally added, but did not detect subsurface defects, which is the most prevalent real problem.

PROPOSED SOLUTION: Require a major rethink of the approach for NDT, with NAVSEA working in partnership with shipyards. Ensure UT rejects only welds which would fail in service. Financially reward lower reject rates. Minimize NDT which does not result in improving fitness for service.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $100,000 to $200,000 per ship

NON-RECURRING IMPLEMENTATION COST: None.

ADDITIONAL COMMENT: Field activities, in general, consider that the NDT requirements imposed by Ship Specifications are excessively conservative. There is a strong feeling that standards have been made more severe largely because the inspection methods are more effective in showing smaller discontinuities - not because those smaller discontinuities are necessarily detrimental to the performance of the welds in service. During repairs of ships that have many years of service, including battle damage, welds that have performed perfectly satisfactorily since the construction of the ship, when subjected to current weld inspection criteria, failed and had to be chipped and/or ground out and rewelded.

ITEM S-21

NAVSEA STANDARD DESIGN PRACTICE: Sonar Dome Fairing Methods

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Fairing of Sonar domes to the hull is accomplished using canning (closure) plates. These require expensive welding, bending, fitting, and grinding to fair the dome to the hull.

PROPOSED SOLUTION: Use polyurethane fill, which is cheap to apply and fair, and easy to repair.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Small

NON-RECURRING IMPLEMENTATION COST: Small

ADDITIONAL COMMENT: This proposal has been studied by NavSea in cooperation with a shipyard. The study was successful, but approval has not been received. The approval process is taking so long that the opportunity to achieve this productivity saving has been lost on several ships.

ITEM T-2

NAVSEA STANDARD DESIGN PRACTICE: Helicopter Facility Inspections

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The helicopter facilities of ships that are to be homeported on the West Coast are currently being inspected and certified by West Coast inspectors while those going to DesLant must be inspected and certified by an East Coast inspection team. The requirements established by the two different teams are not the same. furthermore, the requirements of the inspection team from either coast vary frequently from ship to ship.

PROPOSED SOLUTION: a single, definitive set of requirements that are not open to different interpretation by different teams or by the same team at different times should be established and made part of the ship's specifications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: By eliminating rework and changes made necessary by having a moving target for the design requirements for helo facilities, it is estimated that $200,000 or more could be saved at the shipyard. The cost savings to the government could be of the same order of magnitude, since the inspections and certifications could become a normal part of the work of the Supervisor, eliminating travel and subsistence cost s of the traveling teams as well as all of the administrative costs due to changes in work scope, etc.

NON-RECURRING IMPLEMENTATION COST: None, once the requirements were agreed upon and implemented into the contract.

ADDITIONAL COMMENT: Implementation of this recommendation should eliminate the need for government inspection teams from the opposite coast of the country to travel to the shipbuilder's site. One team, at most, would be needed to ensure that the requirements of the Helo community were satisfied.

If the operators of the two fleets have significantly different ideas of what helicopter facilities are required, it seems apparent that there is a problem greater than the shipbuilder should be expected to have to resolve or be subjected to. The Project Manager should make sure that the requirements for his program are defined before entering into a contract to build the ship.

ITEM T-3

NAVSEA STANDARD DESIGN PRACTICE: Watertightness Testing

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Ship Specifications require that watertight and airtight doors, hatches and scuttles located in structure not required to be pressure tested be given a water hose test for Completion Tests.

PROPOSED SOLUTION: Revise ship specifications by deleting "water hose test''and substituting ''air hose test".

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: $8,000 per ship

NON-RECURRING IMPLEMENTATION COST: One time administrative cost to change existing documentation.

ADDITIONAL COMMENT: High Pressure water hose testing is expensive, messy and not as good as other methods of detecting leaks. Air hose testing is much preferred from a producibility standpoint.

A check of the 1991 General Specifications, Section 095-192 shows that this latest version allows air hose testing as an equivalent of water hose testing in all cases. Section 095-624 refers only to "hose test". Therefore, it appears that this recommendation could and should be implemented virtually automatically for all ongoing shipbuilding programs.

ITEM T-4

NAVSEA STANDARD DESIGN PRACTICE: Hydro Test of Tanks

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Currently, based on Ship Spec Sections 192 and 095-192, all watertight tanks are being hydrotested.

PROPOSED SOLUTION: Use air pressure test for a percentage of tanks.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Small

NON-RECURRING IMPLEMENTATION COST: Small

ADDITIONAL COMMENT: The 1992 General Specifications, Section 095-192, allows tightness testing of tanks, cofferdams and voids to be done on a sampling basis.

ITEM T-5

NAVSEA STANDARD DESIGN PRACTICE: Variations in Inspection Standards

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: The various SupShip inspectors apply varying standards in the construction and repair of ships. This has resulted in some major differences in the way requirements are applied between shipyards.

PROPOSED SOLUTION: More emphasis on overseeing the technical standards being applied in the various SupShip offices.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Moderate

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: Maintaining equivalent levels of inspection standards is essential to insuring a level playing field in the competition for Navy contracts but even more important, for insuring that the Navy receives the same level of quality between contractors.

ITEM S-8

NAVSEA STANDARD DESIGN PRACTICE: Welding requirements for False Deck and Grating Support Structure- Hull Type Drawing 804-1340709

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: Note 4 of the referenced drawing requires that false deck and grating support structure be welded to the same requirements as the ship's structure. This is over-kill and is not required to ensure that the structure is adequate for the intended service. Note 4 and the Ship Specifications invoke MIL-STD-1689, but that document is not applicable to this "Non-structure".

PROPOSED SOLUTION: Revise the drawing to allow single-sided butt welds without backing for such "non-structure" applications.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Minor

NON-RECURRING IMPLEMENTATION COST: Minor

ADDITIONAL COMMENT: This will reduce production time and costs, while still providing installations which are fully fit for the service intended. The proposed solution has been standard procedure in at least one shipyard until a recent decision was made that this did not meet the specification requirements.

ITEM S-7

NAVSEA STANDARD DESIGN PRACTICE: Aluminum-Steel Transition Joint Design; MIL-J-24445, Spec Sections 074 and 100

DESCRIPTION OF IMPROVEMENT REQUIRED:

PROBLEM STATEMENT: MIL-J-24445 is inadequate to ensure that satisfactory aluminum-steel structural transition joint material is installed. Material that was in total compliance with the standard has failed several times.

PROPOSED SOLUTION: Increase the temperature resistance weldability requirement. Add dynamic tear notch toughness test requirements. Improve strength, to cut costs. Change sampling locations to ensure that the worst material is scrapped. Require chisel testing of every plate, since it is the cheapest test and the best indicator of poor bond.

ESTIMATED COST IMPACT

RECURRING COST SAVINGS: Small

NON-RECURRING IMPLEMENTATION COST: Small

ADDITIONAL COMMENT: One shipyard, at least, is conducting considerable research on finding a more successful and economical solution to the aluminum-steel bonding problem. The USN appears to be reacting very slowly to these efforts.

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