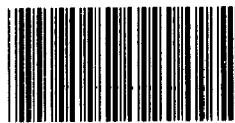




UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

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PROCUREMENT, LOGISTICS,
AND READINESS DIVISION



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MARCH 31, 1983

B-210247

The Honorable John F. Lehman
The Secretary of the Navy

Dear Mr. Secretary:

Subject: Improved Management of Sandblasting Operations
at Shipyards Will Enhance Productivity and
Lower Ship Repair Costs (GAO/PLRD-83-50)

On July 31, 1981, GAO reported to the Commander, Pearl Harbor Naval Shipyard, on weaknesses in the shipyard's reclamation, supply management, and storage of sandblasting materials. To determine if similar problems were wide spread, we made this follow-on review at the Navy shipyards in the continental United States.

The Naval Sea Systems Command is responsible for improving management programs at Navy shipyards. We found, however, that it has essentially assumed a passive role in the management of sandblasting operations. The Command depends on shipyard commanders to ensure effective sandblasting material management and on the Navy's surface preparation and painting committee to study preservation problems. The committee, made up of representatives from the Command and the shipyards, meets every 18 months and assigns problems to the shipyards for study and resolution. The solutions are reported to all shipyards for consideration, and they have the option to adopt or reject the ideas. By depending on the individual shipyard commanders to ensure an effective sandblasting operation and the resolution of problems, the Command has assumed a very limited role and provides limited direction on sandblasting matters. This has allowed large latitudes in the shipyards' management of sandblasting operations. As a result, sandblasting operations at the shipyards vary and the costs and productivity are sometimes adversely affected.

Some examples of the types of problems we encountered are as follows.

--Shipyards are independently responsible for selecting the sandblasting method needed to prepare a ship's surface for painting. As a result, some yards have

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not developed a variety of blasting methods to use on varying ship conditions. For example, the Long Beach Naval Shipyard's policy is to bare-metal blast all ships to remove all paint, whereas other shipyards have developed both bare-metal blasting and light blasting techniques. The latter is used in those cases where the base coats of paint on the ship are in good condition and do not need to be removed. The condition of the ship's surface should determine the sand-blasting method used. Without a variety of blasting methods available, work on some ships will cost considerably more.

- The Charleston Naval Shipyard uses a hydroblast method of cleaning a ship before painting. No other yard uses this light blasting technique and there is some concern among the yards as to the effectiveness of the hydroblast method. However, the Naval Sea Systems Command has provided no decision criteria to determine the best blasting material and method to be used on a particular task. Therefore, these decisions are left to the determination of each shipyard.
- The Navy Procurement Offices believe that consolidated purchases decrease material cost, eliminate duplicate effort, and standardize material used. However, the Navy has not coordinated shipyard needs for sandblasting materials and therefore is paying higher prices for small orders and incurring unnecessary administrative costs. For example, the same procurement office administers the Mare Island and Long Beach contracts for sandblasting materials used in dry docks. However, a consolidated purchase is not possible because the shipyards use different materials for doing the same work and vendors normally carry only one type material.
- Due to inadequate or lack of storage for bulk purchases of material at some shipyards and/or restrictive delivery methods and times, which can limit competitive bidding, additional opportunities for achieving savings and improving productivity through bulk purchases of sandblasting materials are being missed. We found that Long Beach and Charleston have facilities to accept carload deliveries whereas Puget Sound shipyard procured materials in paper sacks which cost more per ton and required an undetermined

amount in labor costs to move the material about the yard. The Norfolk shipyard uses small portable containers for holding materials which must be picked up by the vendor trucks, filled with the sandblasting material, and returned to the shipyard. The Norfolk shipyard allows only 2 to 3 days for delivery from date of order and various vendors stated that the delivery method and timing are too restrictive in contrast to other Navy shipyards.

--While sandblasting materials can be recycled, the merits of recycling materials used in unconfined areas such as dry docks have not been determined. The decision of whether to recycle has been left to each shipyard and has resulted in different policies. We found Pearl Harbor and Long Beach have constructed reclaimer facilities of which there has been minimum use due to maintenance, spare parts shortages, and dust problems. Norfolk and Mare Island Shipyards are not considering reclaimers because they believe the reprocessed materials are of a poor quality. The Puget Sound and Philadelphia yards are considering investments of over \$5 million in reclamation facilities similar to Pearl Harbor and Long Beach where the benefits are questionable under the manner in which the facilities are operated.

The enclosure presents our findings in more detail. We believe the Navy could enhance productivity and lower ship repair costs if the Naval Sea Systems Command, through greater involvement could identify the better sandblasting practices and make wider use of them at the Naval shipyards.

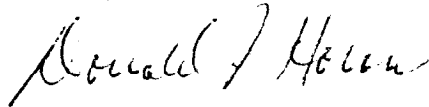
Accordingly, we recommend that you direct the Naval Sea Systems Command to (1) develop a method to evaluate the performance and economy of sandblasting materials and methods, (2) select the best blasting technique for preparing ships' surfaces before painting by considering such factors as the condition of the ship's surface and impact on the environment, (3) review sandblasting material procurement and storage practices to determine where consolidated and bulk purchases should be made, and upgrade sandblasting material storage where necessary, and (4) conduct surveys to determine the conditions that make sandblasting material reclamation programs feasible and to determine each shipyard's potential for recycling materials.

On December 3, 1982, we met with Department of Defense and Navy officials to discuss a draft of this report. The Department of Defense, in its January 3, 1983, response, generally agreed with the report and stated that the Navy will develop a plan for implementation of the report's recommendations within 180 days. The text of this report has been appropriately revised to reflect the detailed comments.

As you know, 31 U.S.C. § 720 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Secretary of Defense; the Director, Office of Management and Budget; the Chairmen of the above named committees; and the Chairmen, House and Senate Committees on Armed Services.

Sincerely yours,



Donald J. Horan
Director

Enclosure

NAVY NEEDS TO PROVIDE MORE DIRECTION
FOR MANAGING SANDBLASTING OPERATIONS

The Naval Sea Systems Command (NAVSEA) is responsible for improving the management of Navy shipyards, but it has essentially assumed a passive role in shipyard sandblasting operations. NAVSEA depends on shipyard commanders to ensure effective sandblasting material management and on the Navy's surface preparation and painting committee to study ship preservation problems. As a result, NAVSEA has provided only limited direction, allowing shipyards large latitudes in the management of sandblasting operations. This has caused disparities in management practices that, in some instances, have adversely affected sandblasting operations. Through greater involvement in the management of sandblasting operations, NAVSEA could identify the better shipyard practices that will lower repair costs and enhance productivity.

BACKGROUND

The Navy has approximately 500 ships. During 1981 it spent \$45 million at Navy shipyards for surface preparation and painting of 68 ships. According to NAVSEA, about 35 percent of the Navy's repair work is done by private industry. At this rate, the Navy spends an additional \$25 million annually at commercial shipyards.

Periodically, each Navy ship is put in dry dock for scheduled maintenance to ensure operational capability and structural integrity. During this time, a ship's metal surface is inspected for deterioration. At Navy shipyards, the inspection results, along with the Navy type commander's proposed work package for the ship and the shipyard's cost estimate, determine the extent of surface preparation and painting.

Using judgment based on past experiences, shipyards choose from a variety of surface preparation techniques for preparing metal surfaces before painting. These include

- hand tool cleaning,
- power tool cleaning,
- solvent/chemical wash,
- hydroblasting, and
- sandblasting.

During overhauls, shipyards usually sandblast ships' surfaces to remove nearly all of the paint. For maintenance between overhauls, shipyards normally sustain the material condition of ships by hydroblasting and/or sandblasting surfaces to remove layers of paint.

Hydroblasting is mostly used for cleaning good surfaces, removing light marine fouling, loose paint, and mild rusting. Sandblasting is the Navy's preferred method of preparing ship surfaces for painting. The type of abrasive material used determines the degree of sandblasting. For example:

- A fine mineral slag, garnet, or walnut shells will remove loose rust and about two out of five coatings of paint normally applied to a hull (light blasting).
- A coarse mineral slag will remove nearly all rust and paint (bare-metal blasting).

Bare-metal blasting removes approximately 95 percent of all paint and light blasting removes about 40 percent.

OBJECTIVE, SCOPE, AND METHODOLOGY

We made the review to identify opportunities for the Navy to manage sandblasting operations at Navy shipyards in a more economical and efficient manner. We concentrated on sandblasting of ships in dry docks because most of the shipyards' sandblasting materials are used to prepare ships' surfaces for painting. This review was performed in accordance with generally accepted government audit standards.

We obtained information regarding the Navy's management of sandblasting operations from NAVSEA, Washington, D.C., which is responsible for Navy shipyard management, and the following shipyards:

- Charleston Naval Shipyard, Charleston, South Carolina
- Long Beach Naval Shipyard, Long Beach, California
- Mare Island Naval Shipyard, Vallejo, California
- Norfolk Naval Shipyard, Portsmouth, Virginia

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--Philadelphia Naval Shipyard, Philadelphia,
Pennsylvania

--Portsmouth Naval Shipyard, Portsmouth,
New Hampshire

--Puget Sound Naval Shipyard, Bremerton, Washington.

We did limited work at the Pearl Harbor Naval Shipyard, Pearl Harbor, Hawaii, to supplement work done in mid-1981. At that time, we reported ¹ that the shipyard was experiencing problems in the reclamation, supply management, and storage of sandblasting materials.

At NAVSEA, we reviewed the Navy's policies and procedures for managing Navy shipyard sandblasting operations and discussed NAVSEA's involvement in researching, testing, and implementing industrial improvements at the shipyards. At the shipyards, we documented the various management practices for procuring, storing, using, and recycling sandblasting materials. As a part of our work, we obtained and reviewed audit reports and related studies.

For comparative purposes, we contacted some private shipyards and discussed their sandblasting operations. We obtained information on sandblasting materials from several commercial vendors and on recycling equipment from some manufacturers.

GUIDANCE IS NOT ADEQUATE
FOR MAKING DECISIONS

Some general guidance exists on the various surface preparation techniques before painting and on the procurement specifications for sandblasting materials, but NAVSEA has provided no decision criteria to determine the best sandblasting material and method for a particular task. There is also a lack of information on

--how to best acquire sandblasting materials,

--where to store materials, and

--when to recycle materials.

¹/Letter dated July 31, 1981, to the Commander, Pearl Harbor Naval Shipyard.

ENCLOSURE

ENCLOSURE

These decisions are determined by each shipyard. Some shipyards, however, have published no local procedures. According to NAVSEA, it has insufficient funds for researching and testing sandblasting materials to identify the best surface preparation techniques.

NAVSEA realizes there is a quality assurance problem among shipyards. This is evidenced by paint failures and other deficiencies that occur between scheduled maintenance. NAVSEA recognizes that sandblasting is not a precise science and that research and development is needed to better define sandblasting material specifications and to improve sandblasting management. For example, many types of sandblasting materials can blast clean a surface down to the bare metal, but all materials cannot produce the desired anchor pattern needed for good paint adhesion.

In addition to some existing guidance not being complete, some is not current. For example, the procurement specifications for sandblasting materials used on ship hulls was developed in 1959 and it has not been revised to reflect recent changes in environmental standards. According to NAVSEA, it is very difficult to revise Navy regulations in a timely manner. For example, NAVSEA has been attempting for the past 4 years to update its current regulation on sandblasting, which offers only general guidance on surface preparation techniques.

Shipyards rely on NAVSEA to provide adequate guidance. For example, Long Beach said that NAVSEA should publish more extensive guidance on how to best prepare metal surfaces for painting to ensure that the optimum use is obtained from painted surfaces. Without specific guidance, Long Beach does not know if current sandblasting practices are good or bad, and it and other shipyards continue to experiment with different sandblasting materials and methods.

Some shipyards also want guidance on the best method of procuring, storing, and recycling sandblasting materials. We believe that with adequate guidance opportunities exist for lowering repair costs and enhancing productivity.

MORE INFORMATION IS NEEDED
IN A TIMELY MANNER

NAVSEA needs to provide better information on solutions to problems and new technologies to shipyards for managing sandblasting operations. A major link between NAVSEA and the shipyards is the Navy's surface preparation and painting

committee. The committee includes representatives from NAVSEA and the shipyards and it meets about every 18 months. Its objective is to bring together shipyards to discuss ship preservation developments. Shipyards are assigned problem areas to study for solutions. The solutions are reported to all shipyards for considerations, and shipyards may implement new methods if they believe operations will be improved. NAVSEA neither validates the shipyards' solutions nor requires shipyards to implement them.

Some shipyards said more prompt interchange of information is needed to effectively manage sandblasting operations and to keep informed of new technologies. Norfolk said more frequent committee meetings will satisfy this need. Shipyards said that 18 months is too long to wait to discuss a costly operational problem. Charleston stated that issuance of technical bulletins will improve communications. Currently, shipyards informally contact other shipyards by telephone to keep abreast of sandblasting developments. They also talk with commercial vendors and equipment suppliers about new technologies. Generally, private industry brings information on new technologies to the shipyards' attention.

Because of the environmental impact that sandblasting creates, some shipyards believe NAVSEA should be informing them of developments. NAVSEA's lack of ongoing communications has caused some shipyards to individually seek improvements and possibly to make costly mistakes. For example, although NAVSEA has a project in process to develop blasting equipment that meets environmental requirements, Long Beach is planning to acquire similar, untested blasting units costing over \$1 million. Additionally, Philadelphia is exploring the feasibility of recycling, but is unaware that Long Beach has a reclaimer facility and is experiencing problems. Shipyards need to know promptly about sandblasting developments to prevent them from making costly mistakes and to assist them in improving operations.

NAVSEA has adopted a passive role in sandblasting matters, offering only limited guidance and no direction on the implementation of the Navy's surface preparation and painting committee's recommendations. This has caused disparities in the shipyards' sandblasting functions and missed opportunities to make wider use of the better shipyard sandblasting practices.

ECONOMICAL, PRODUCTIVE SURFACE
PREPARATION TECHNIQUES ARE
NOT ALWAYS SELECTED

Shipyards are not necessarily selecting the best surface preparation techniques for preparing a ship's surface before

painting. Most use various sandblasting materials and some use different sandblasting methods to achieve the same type work. Without agreement as to the best material and method, cost of similar sandblasting work at naval shipyards varies.

Various sandblasting materials are used

Shipyards are to select sandblasting materials that comply with military specifications and environmental requirements. Apparently, many materials meet these conditions. We found that the shipyards use various mineral slags (coal, copper, and nickel), garnet, or walnut shells to sandblast a ship in preparation for painting. The following table lists the materials used for each sandblasting method at the various shipyards.

<u>Shipyard</u>	<u>Bare-metal blasting</u>			<u>Light blasting</u>			
	<u>Coal</u>	<u>Copper</u>	<u>Nickel</u>	<u>Coal</u>	<u>Garnet</u>	<u>Nickel</u>	<u>Walnut shells</u>
Charleston (note a)	X						
Long Beach (note b)		X					
Mare Island			X				X
Norfolk	X						X
Pearl Harbor	X			X			
Philadelphia	X			X			
Portsmouth	X						X
Puget Sound (note c)		X			X		

a/Charleston uses hydroblast instead of light blasting.

b/Long Beach performs no light blasting.

c/Puget Sound plans to use a fine copper mineral slag in the near future.

The prices of the shipyards' sandblasting materials vary greatly ranging from \$29 a ton for coal mineral slag to \$385 a ton for walnut shells. In selecting sandblasting material,

price is not the only factor to be considered. For example, Portsmouth light blasted and painted the U.S.S. ARCHERFISH for about \$91,000. It used walnut shells costing \$385 a ton. According to Portsmouth, if it had used a fine coal mineral slag costing \$29 a ton, the cost would have been about \$136,000, almost 50 percent more. In addition to lower costs, the shipyard's productivity was greatly improved by using walnut shells. As shown in the following table, the shipyard saved 222 staff-days while accomplishing the same objective--sustaining the hull's condition until the next scheduled dry docking.

Costs of Surface Preparation and Painting
Using Different Sandblasting Materials

<u>Sandblasting material</u>	<u>Staff-days</u>		<u>Material cost</u>	<u>Total cost</u>
	<u>Used</u>	<u>Cost</u>		
Coal slag	490	\$114,072	\$21,696	\$135,768
Walnut shells	<u>268</u>	62,390	28,700	<u>91,090</u>
Difference	<u>222</u>			<u>\$ 44,678</u>

When using coal mineral slag, more time and materials are required. For instance, coal generates excessive dust requiring extensive protection of ship components and equipment. Walnut shells generate less dust; consequently, little protection is required. Furthermore, coal usage requires additional time to clean up used materials.

Shipyards have become accustomed to a particular type of sandblasting material for a specific task. Mare Island has a strong preference for nickel mineral slag to bare-metal blast a ship's surface; Long Beach prefers copper mineral slag. To light blast, Portsmouth likes walnut shells; Puget Sound uses garnet. Shipyards believe strongly in their particular sandblasting materials; they said their materials create less dust, are the best cutting abrasives, and provide the desirable surface profiles.

Navy shipyard and private industry tests show differences in these materials. For example, Long Beach has tested various sandblasting materials to determine the level of dust generated during sandblasting. It found that after blast cleaning with sand for only 1 minute, major dusting occurred which obscures a sandblaster's visibility by 30 percent; blasting with nickel mineral slag for 5 minutes creates dust which obscures visibility by 20 percent; blasting with copper mineral slag for 5 minutes creates only minor dust. The test shows that, in terms of dust created, copper mineral slag is superior to nickel mineral slag and far superior to sand.

A private industry test showed that using copper rather than nickel mineral slag produces a deeper etch on the surface to be painted and provides a better cleaning rate. Another private industry test showed that using copper rather than coal mineral slag is less of a health hazard. During laboratory tests of copper and coal mineral slags on animals, pulmonary fibrosis was discovered in the coal slag treated group--the material used by most shipyards.

According to some shipyards and commercial activities, additional differences exist. They said:

--Using walnut shells rather than mineral slags during light blasting reduces airborne contamination, limiting damage to shipboard machinery and equipment; increases operator visibility, resulting in better control of the surface profile and the extent of paint removal; provides a better anchor pattern for paint adhesion; permits reclamation; and allows energy recovery from the solid waste.

--Using freshwater during hydroblasting rather than an abrasive during sandblasting does not adversely affect nearby workers or the environment, nor does it create any disposal problems and it is faster.

--Using mineral slags rather than walnut shells during sandblasting is less costly for materials, and provides a better anchor pattern for paint adhesion than does water (hydroblasting).

The vast differences in sandblasting materials and the general lack of agreement as to the best material for a particular repair task can complicate a shipyard's decision in selecting a material. The extent to which shipyards are left to their own prerogative has led to personal preferences and decisions not always based on economical, productive considerations. NAVSEA's assistance in sorting out the differences in materials is needed to develop a maintenance strategy that clearly specifies the best material needed for a specific task.

Different sandblasting methods are used

The shipyards are responsible for selecting the best sandblasting method for correcting the material condition of a ship's surface. For maintenance programs between overhauls, there is no set scope of work. The condition of the ship's surface should determine the sandblasting method; however,

some shipyards have not developed a variety of sandblasting methods. This has resulted in the work on some ships costing considerably more than others and taking more time. For example, Long Beach uses the bare-metal blast method to remove all paint. At Long Beach, bare-metal blasting is the only blast cleaning method of preparing a ship for painting. In some instances, such as when a good base coat exists, shipyards should light blast before painting. In comparing both methods, Norfolk has documented savings of \$155,000 on one hull job. It light blasted the U.S.S. BLUEFISH and bare-metal blasted the U.S.S. HAMMERHEAD. Both were complete hull jobs with the same finished product--the five coat paint system was restored. In addition to lower costs, the shipyard's productivity was improved since light blasting saved 753 staff-days.

Specifying the sandblasting method also has resulted in questionable surface preparation. For example, Charleston uses hydroblast rather than light blasting before painting during interim maintenance. The shipyard believes this method achieves the same results as light blasting. However, Portsmouth has found that hydroblasting does not always adequately prepare a surface for painting. Portsmouth had experimented with hydroblasting as a surface preparation method. It hydroblasted and painted the U.S.S. BLUEFISH, but the paint did not adhere properly. The submarine had to be put back in dry dock for sandblasting and repainting.

The shipyards' actions have contributed to a less than optimal surface preparation and painting operation. The condition of the ship's surface when it comes in for repair should dictate the sandblasting method used. According to NAVSEA, the reasons that different surface preparation techniques seem best for one shipyard and not another are (1) type commanders are generally satisfied with shipyard surface preparation and painting and (2) shipyards prefer certain methods based on past experiences.

SANDBLASTING MATERIALS ARE
NOT PURCHASED AT LEAST COST

Navy shipyards are not purchasing sandblasting materials at least cost. Shipyards have not considered consolidating purchases of these materials to minimize cost. Because of inadequate storage, some shipyards have not taken advantage of bulk purchases at reduced costs and have limited competition.

Consolidated purchases
are not made

It is generally recognized that a consolidated purchase decreases material cost, eliminates duplicate efforts, and standardizes materials used. However, shipyards work independently to procure needed materials.

We believe that opportunities exist for achieving savings through consolidation of sandblasting material purchases. For example:

- In bare-metal blasting ships' hulls, east coast shipyards use coal mineral slag and two of the west coast shipyards use copper mineral slag providing the Navy with substantial opportunities to consolidate purchases. According to material vendors, standardization of sandblasting materials for all shipyards would provide even more opportunities for consolidation; however, storage and transportation costs must be considered.
- The same procurement office administers Mare Island and Long Beach contracts for sandblasting materials used in dry docks, an excellent opportunity for purchasing materials on a consolidated basis. According to the office, a consolidated purchase is not possible because the shipyards use different materials for doing the same repair work and vendors normally carry only one type of material. If Mare Island were to use copper mineral slag as the other west coast shipyards, then consolidation would be possible, saving Mare Island almost \$20,000 a year net of transportation costs.

Shipyards do not consolidate sandblasting material purchases even when they are with the same vendor. Charleston, Mare Island, and Portsmouth are under separate contracts with the same vendor, Lone Star Mineral, Incorporated. Two of the shipyards purchase the same material.

Industrial Mineral Products, Incorporated, said it would give volume discounts of 5 to 10 percent for consolidated purchases of sandblasting materials from several shipyards. The vendor told us that if west coast shipyard purchases were consolidated under one contract, it would locate a material processing plant near Puget Sound, saving the shipyard almost \$50,000 a year in transportation cost. Similar transportation savings would be available for Pearl Harbor.

ENCLOSURE

ENCLOSURE

Because the Navy has not coordinated shipyard needs for sandblasting materials, it is paying higher prices for small order quantities, and it is incurring unnecessary administrative costs.

Bulk purchases are
not always made

Additional opportunities exist for achieving savings and for improving productivity through bulk purchases of sandblasting materials. Navy shipyards are responsible for providing adequate storage of sandblasting materials considering storage costs. Most shipyards have constructed large bulk storage facilities enabling them to obtain discounts on material prices for large volume purchases. Three shipyards, however, have inadequate or no storage for bulk purchases.

Puget Sound's bulk storage facilities for sandblasting materials used in dry docks are antiquated and costly to operate. For the past several years, it has proposed a project to construct new facilities. Until the storage problem can be alleviated, the shipyard has stopped making bulk purchases and has begun to purchase materials packaged in paper sacks.

Packaged materials require more handling by shipyard people and are more expensive than materials purchased in bulk. Puget Sound's packaged materials cost \$13 a ton more than bulk materials. In 1981 the shipyard used about 6,600 tons in its dry dock operation. At this rate, the shipyard will pay over \$85,000 a year in increased material costs and an undetermined amount in labor costs until its storage facilities are upgraded.

Norfolk and Philadelphia have no bulk storage capability for sandblasting materials. The shipyards use small, portable containers for holding materials while sandblasting. In addition to preventing bulk purchases, this has caused unreasonable demands on potential vendors. The shipyards require vendors to pick up these containers by truck and use them for delivering materials to the shipyards. The shipyards limit the time for making deliveries. They allow only 2 to 3 days for delivery from date of order, while some other Navy shipyards allow 20 to 25 days. According to three vendors (Kaiser Chemicals; Lone Star Minerals, Inc.; and MDC Industries), these requirements prevented them from bidding on the shipyards' sandblasting material contracts. They said the delivery method is too restrictive and the delivery time is too short. For the shipyards' current contracts, only one vendor responded to each of their solicitations for bids.

The vendors have processing plants in close proximity of the shipyards. The shipyards' actions have limited competition and may have adversely affected the price of materials.

RECLAMATION PROGRAMS FOR DRY DOCKS
SANDBLASTING MATERIALS ARE UNSETTLED

Sandblasting materials can be recycled; however, the merits of recycling materials used in unconfined areas, such as dry docks, have not been resolved. Some shipyards are against reclamation of these materials while others are trying to reclaim them for reuse. Such decisions are left to each shipyard.

Reclamation is being opposed

Norfolk and Mare Island Naval Shipyards said they are not recycling sandblasting materials used in dry docks because new materials are a low-cost item (expendable) and reprocessed materials are a poor quality product. Mare Island told us that existing recycling equipment for a large scale operation does not adequately clean used sandblasting materials. The shipyard believes using reprocessed materials will lead to paint failure and other problems in preserving painted surfaces.

Reclamation is being attempted

In an effort to minimize the cost of sandblasting operations, Pearl Harbor and Long Beach have constructed reclaimer facilities for processing used sandblasting materials from dry dock operations. There has been minimum use of these facilities.

The Pearl Harbor project was completed in 1978 at a cost of \$400,000. Supposedly, reclamation would save \$300,000 a year. The savings was based on a yearly production rate of 2,000 tons. During the reclaimer's first year of operation, it processed only 20 tons of materials. Over the first 2-1/2 years of operation, the reclaimer was used only 10 percent of the time. According to Pearl Harbor, the low rate of production was caused by equipment malfunctions and spare parts shortages. In mid-1981 an engineer was assigned to keep the reclaimer operational. Currently, the reclaimer is working 50 percent of the time. It is experiencing dust problems during operation, requiring the facility to be shut down periodically for cleaning.

Long Beach's reclaimer facility was constructed in 1979 at a cost of \$260,000. Its justification was based on an annual savings of \$124,000. Supposedly, the reclaimer can process 10 tons of dry material an hour. Long Beach estimated that the reclaimer only processed 60 to 80 tons of used sandblasting materials before operations were discontinued. Long Beach experienced problems with excessive dust and poor quality reprocessed materials. Nearly 3 years later, Long Beach is still attempting to correct these problems.

Puget Sound and Philadelphia are considering similar reclamation programs. Puget Sound's proposed project is estimated to cost \$4.2 million and is included in NAVSEA's fiscal year 1985 military construction program. The project includes a sandblasting material processing facility and a bulk storage area. The preliminary estimate of equipment cost alone for Philadelphia is \$900,000. Currently, an equipment vendor is testing reprocessed materials from the proposed recycling equipment, at no cost to the Government, to determine if materials will meet sandblasting performance standards. If so, Philadelphia will request headquarters approval for the project.

The Navy has derived few benefits from its sandblasting reclamation facilities. Until existing problems are corrected, it is questionable whether any benefits will be realized from constructing similar facilities.