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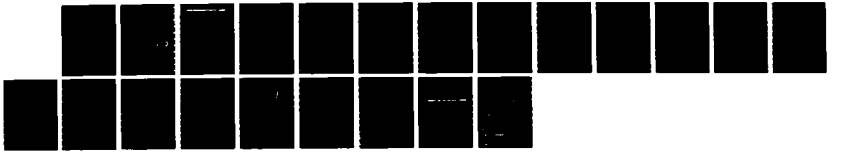

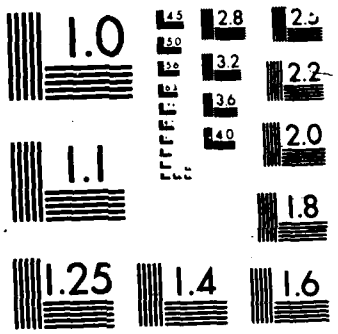
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David W. Taylor Naval Ship Research and Development Center

Bethesda, MD 20084-5000

AD-A172 577

DTNSRDC-86/45 August 1986

Ship Materials Engineering Department

Research and Development

DOK-BLOK HULL COATING SYSTEM GENERAL SHIPYARD APPLICATION INSTRUCTIONS

by

N.A. Smith
H.S. Preiser

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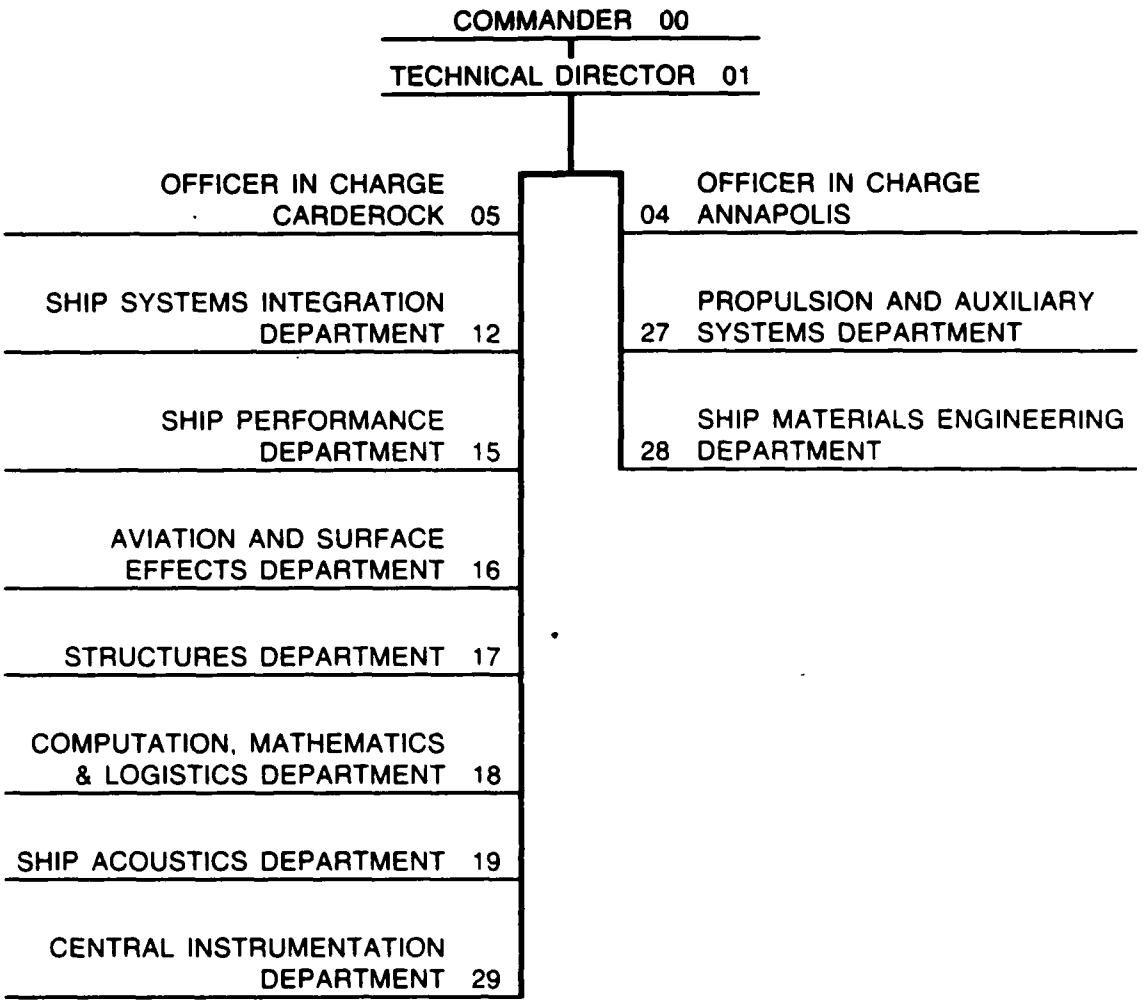

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AD-A172 577

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.
2b DECLASSIFICATION/DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S) DTNSRDC SME-86/45	5 MONITORING ORGANIZATION REPORT NUMBER(S)
6a NAME OF PERFORMING ORGANIZATION David Taylor Naval Ship R&D Center 6b OFFICE SYMBOL (If applicable) 2841	7a. NAME OF MONITORING ORGANIZATION
6c ADDRESS (City, State, and ZIP Code) Bethesda, Maryland 20084-5000	7b. ADDRESS (City, State, and ZIP Code)
8a NAME OF FUNDING/SPONSORING ORGANIZATION Chief of Naval Research 8b OFFICE SYMBOL (If applicable) 216	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c ADDRESS (City, State, and ZIP Code) Washington, DC 20362	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO: 64710N PROJECT NO: DN678022 / DN506568 TASK NO: Z0371 WORK UNIT ACCESSION NO: 12759447

11 TITLE (Include Security Classification)
DOK-BLOK Hull Coating System General Shipyard Application Instructions

12 PERSONAL AUTHOR(S)
N.A. Smith and H.S. Preiser

13a TYPE OF REPORT	13b TIME COVERED FROM ____ TO ____	14 DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
		August 1986	

16 SUPPLEMENTARY NOTATION

17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Hull Fouling, Antifouling/Anticorrosion Coatings, Ablative, Hull Block Area Protection, Marine Fouling, Non-Military Application.

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

As a result of the evaluation of the DOK-BLOK hull coating system* on the USS NASSAU (LHA-4) and the USS MCILERNEY (FFG-8), a shipyard procedure has been developed to install the system economically and efficiently on a naval ship. The illustrated instructions contained herein, provide a step by step procedure for proper installation which can be carried out by the average shipyard worker involved in drydocking and hull painting operations. Input and suggestions from installers are invited to upgrade and simplify installation techniques.

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ABSTRACT

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ADMINISTRATIVE INFORMATION

This project was authorized by W.H. Stoffel of the Energy R&D Office at DTNSRDC, under the direction of Mr. G. Duvall. This program is under sponsorship of the Office of Chief of Naval Research (Code 126) funded through program element DN64710N, task area R0371-12, work unit 1-2759-447. Additional funds were furnished by SURFLANT via Norfolk Naval Shipyard under Document No. N00181-36-WR-H0079 for application directly to the USS NASSAU (LHA-4). Other SURFLANT support via SUPSHIPS Boston was provided for installation on the USS MCINERNEY (FFG-8). The work was accomplished in the Paints and Processes Branch, Code 2841. Special acknowledgement is made to Edwin R. Wilkinson, Jr. of Code 5212 for the execution of the exceptional artwork.

INTRODUCTION

This report is the result of the evaluation of the DOK-BLOK hull coating system on the USS NASSAU (LHA-4) and the USS MCINERNEY (FFG-8). The format was purposely put into an instruction specification form to enable cognizant technical personnel to use the information immediately. The format will serve as the basis for issuing a revised NAVSEA instruction once full fleet deployment is approved.

1.0 SCOPE

This document describes a shipyard application procedure for the DOK-BLOK Hull Coating System to precleaned sections of ship's hulls normally obscured by the docking blocks supporting the ship in the drydock.

2.0 MATERIALS

The DOK-BLOK Hull Coating System consists of two multilayered tape components, combined to form an integral, flexible sandwich structure. See Fig. 1.

2.1 Hull AF Tape

The Hull Tape component consists of an epoxy impregnated glass cloth, 10 to 12 mils thick, with a special pressure sensitive adhesive on one side

*Protected under U.S. Patents 4,321,101; 4,202,533 and 4,522,882 for which U.S. Government has royalty-free license.

protected by an easy release waterproof liner, and an antifouling (AF) surface on the other side. The AF surface of the Hull Tape is protected by a thin, water-soluble film.

2.2 Block Cushion Tape

The Block Cushion Tape component is composed of a combination 1/4-in.-thick polyethylene foam, laminated to a 1/8-in. polyurethane foam pad with a special adhesive on one side, suitable for application on rough, dirty or moist wood. In later designs, 1/4-in. polyurethane foam pad will replace the above laminated pad for simplication. The other side of this foam pad combination has several strips of a weak adhesive whose function is to hold the two tape components together prior to and during shipboard application and to serve as a weak plane of separation during undocking of the ship.

2.3 DOK-BLOK Tape Sandwich

The two tapes are assembled so that the adhesive strips on the Block Cushion Tape are in contact with the water soluble film on the Hull Tape to form the DOK-BLOK Tape sandwich which is applied to the docking block as a single unit. There are easy release protective liners completely covering and overlapping each adhesive surface. Each liner will be clearly marked either "Hull Side, Top" or "Block Side, Bottom," to indicate the proper positioning of the sandwich unit on the docking block. The blue plastic liner faces up and the split paper liner faces down. Other elements of the system include a special fairing compound for edge treatment of the applied hull tape. These items will be furnished as part of the complete system. Substitute materials will not be acceptable.

3.0 PACKAGING

The DOK-BLOK Hull Coating System is supplied in sheet form. Sheets as normally supplied are 54-in. wide and 60 to 72-in. long. Other lengths are available on special order. Each DOK-BLOK sandwich unit will be packaged in a separate, heat-sealed polyethylene bag. Sandwich units will be suitably boxed in lots of 5 bags. Longer lengths will be bundled on a pallet.

4.0 PRETREATMENT OF SHIP'S HULL

Shortly before the ship enters the drydock (about 3 days prior) services of a diving team should be utilized to clean and scrub the bottom of the ship in the general hull areas where the DOK-BLOK system will be applied. To accomplish this task, divers may use conventional underwater cleaning tools and procedures.

Pneumatically operated scrubbers and stiff, flat rotating wire brushes, as well as high pressure cavitating water jets have been found effective in removing all loose debris and for properly preparing the hull surface to receive the DOK-BLOK system. Hydroblasting with sand slurry is particularly effective. The purpose of this operation is to provide a stable substrate surface for the DOK-BLOK system by removing accumulated slimes, fouling growths, loose paint or corrosion products. Hogging lines may be tied around the ship to guide the diver while underwater. For large underwater areas a Scamp® machine may be used. See Fig. 2.

5.0 DRYDOCK PREPARATION

The following steps shall be performed on each docking block in the sequence listed.

5.1 All soft wood facing should be closely butted together with no seam gap over 1/8 in. The wood facing should be brushed clean of loose debris and be substantiall, dry before installing the DOK-BLOK system.

5.2 Remove DOK-BLOK assembly (one integral tape sandwich) from polyethylene bag.

5.3 Unfold any hull tape edges that are tucked under, during packing.

5.4 The larger and thinner hull tape component is deployed face up (blue protective liner in place). This face is labelled "Hull Side-Up."

5.5 The smaller, thicker block cushion component is deployed face down (white protective paper in place). This face is labelled "Block Side-Down." See Fig. 1.

5.6 Remove the protective paper on cushion tape which is usually 42-in. wide. Align edge of cushion tape with side edge of block parallel to long dimension. Center cushion so that a 12-in. overhang (approximately) occurs at each opposite end edge. The hull tape attached to cushion tape will be larger than the width of the block to allow an overhang of 6 in. from each side edge. See Fig. 1. Slowly press cushion tape on block starting at one side and work across the block face. See Fig. 3.

5.7 Where block cushion tie downs are furnished, two men stationed at opposite sides of the block pull the ties tightly down and secure them with roofing nails. Start with the center ties so that the cushion tape conforms to the curvature of the block. Finish tensioning the ties at each end to complete the job. See Fig. 3.

5.8 If no ties are furnished, use a mallet and striking board to pound DOK-BLOK assembly over entire block surface to adhere the cushion tape to the block bearing face.

5.9 At the 12-in. overhang at each end, bend entire DOK-BLOK tape assembly over the block edge. Using roofing nails, securely attach DOK-BLOK assembly to the block ends avoiding obstructions such as metal straps and dogs. Use about 10 nails in each end, keeping nails at least 3 in. below the top edge of the blocks.

5.10 At this point, the hull tape overlap will hang free on the two side edges of the docking block and be bent 90° at the two opposite end edges.

5.11 The overlap tape edges on the secured ends of the block are now folded around the sides and nailed along the reinforced edge (nailer strip). Next the overlap tape edges are pulled tightly down over the sides of the block making hospital corners and nailed securely with roofing nails along the reinforced nailer edge. See Figs. 3 and 4.

5.12 If the drydock is to remain exposed to weather for over 24 hours or is to be reflooded more than once prior to drydocking the ship under consideration, then the plastic protective liner is left in place until actual drydocking operations begin. Otherwise remove protective plastic liner as in 5.14 below.

5.13 CAUTION: The DOK-BLOK system cannot be used in dirty graving docks where large amounts of suspended mud, silt and grit are present during flooding operations. When these conditions prevail special precautions must be taken by divers, to remove all debris settling on the block faces prior to removal of the protective liner and just before ship settles on the blocks. Removal of settled debris may require wiping with gloved hands while hosing down block bearing surfaces, while submerged.

5.14 Where clean water conditions prevail (no settling out of particulates) or when using floating drydocks (blocks washed clean during unflooding operations) the protective plastic liner may be removed in drydock just prior to flooding. Diver operations described in 5.13 would not normally be required.

5.15 In removing the protective plastic liner, the rip strip on the transverse perforated ends are pulled to separate the liner. See Fig. 3. The protective liner ends remain on the overlapped ends of the DOK-BLOK assembly which is already nailed in place. The protective liner on the bearing face of the hull tape adhesive is removed exposing the pressure sensitive white adhesive.

5.16 Proceed with drydocking and try to avoid bouncing the ship, unless absolutely required. See Fig. 4.

5.17 After 48 to 72 hours in drydock, proceed with edge preparation and complete the DOK-BLOK installation.

6.0 COMPLETION OF APPLICATION AND EDGE TREATMENT SEQUENCE

The hull tape subassembly, where feasible will be manufactured with suitable masking on its painted surface to allow for trimming and proper edge treatment. See Fig. 5. Completion of the application and edge treatment procedure will require the following steps to be performed on each docking block in the sequence listed:

6.1 Clean hull in a 4 to 6-in. band around block perimeter with a power abrader or a vacuum abrasive blaster. See Fig. 6.

6.2 Wipe abraded area with solvent soaked clean rags (toulene) or paint thinner. See Fig. 6.

6.3 Trowel black fairing compound (properly mixed) on hull at prepared surfaces (3 to 4-in. band) all around block perimeter. See Fig. 7.

6.4 Trim hull tape overlap in place on block to 3-in. width on all sides. This operation will free the hull tape from its fastenings to the sides and ends of the blocks. The hull tape overlap at the ends will have to be gently separated from its low-tack adhesive on the block cushion tape at this point.

6.5 Remove masking paper from painted overlap hull tape surfaces, coat tape surface with fairing compound and press tape edges into fairing compound already on hull.

6.6 With flat flexible trowel, squeeze excess fairing compound under tape. Working trowel from block edges outward to tape edges. Leave little or no excess compound on hull. See Fig. 7.

6.7 Move on to next block to allow tape embedded in fairing compound to cure overnight.

6.8 After curing in 6.7, return to each block and solvent wipe all cemented edges with clean rags soaked in toulene or paint thinner. Apply additional black fairing compound (properly mixed) over the cleaned exposed cemented tape surface and on the cleaned perimeter for a band of about 6-in. wide. See Fig. 7.

6.9 With trowel, smooth compound and draw down to thin layer. Feather compound to hull so that tape edges are no longer visible. Allow to cure. See Fig. 8.

6.10 After curing, mask areas using Herculite (a vinyl-coated cloth) if abrasive blasting of hull is necessary near feathered edges.

6.11 Remove masking material after surface preparation, clean surface of abrasive dust by air pressure blow, followed by wiping with clean solvent soaked rags (paint thinner). Brush one coat of Devoe 201 or other suitable AC paint on all feathered edges of hull tape up to edge of blocks. Also coat all bare metal abraded areas. Finished edge is shown in an enlarged view in Fig. 8.

6.12 During final hull painting, blend hull AC/AF paint system over all feathered edges of the hull tape system up to edges of blocks.

7.0 FINAL INSPECTION AND DOCUMENTATION

Before the ship is undocked, a final inspection should be conducted to ascertain that the system has been properly applied to all docking block areas. Any abnormalities should be noted, located, described and if possible, corrected. Any blocks bearing surfaces not in full contact with hull must be wedged so that reasonable pressure is applied to all inaccessible bearing areas under the hull tape. The appearance of each DOK-BLOK patch shall be such that it blends into the ship's paint system without discernible edge ridges. When the ship is refloated, the hull tapes should be wrinkle-free and blended completely into the hull paint system. The water soluble protective film will dissolve away exposing the AF paint on the Hull Tape for normal operation. See Fig. 9. The Block Cushion Tape remaining on the blocks may be discarded. Removal of cushion tapes remaining on block faces by high pressure hydroblasting may be desirable.

8.0 FURTHER INFORMATION

Corrections, comments and other input to this document as shipyard experience is gained should be sent to Paints and Processes Branch, Code 2841, David Taylor Naval Ship Research and Development Center, Annapolis, MD 21402.

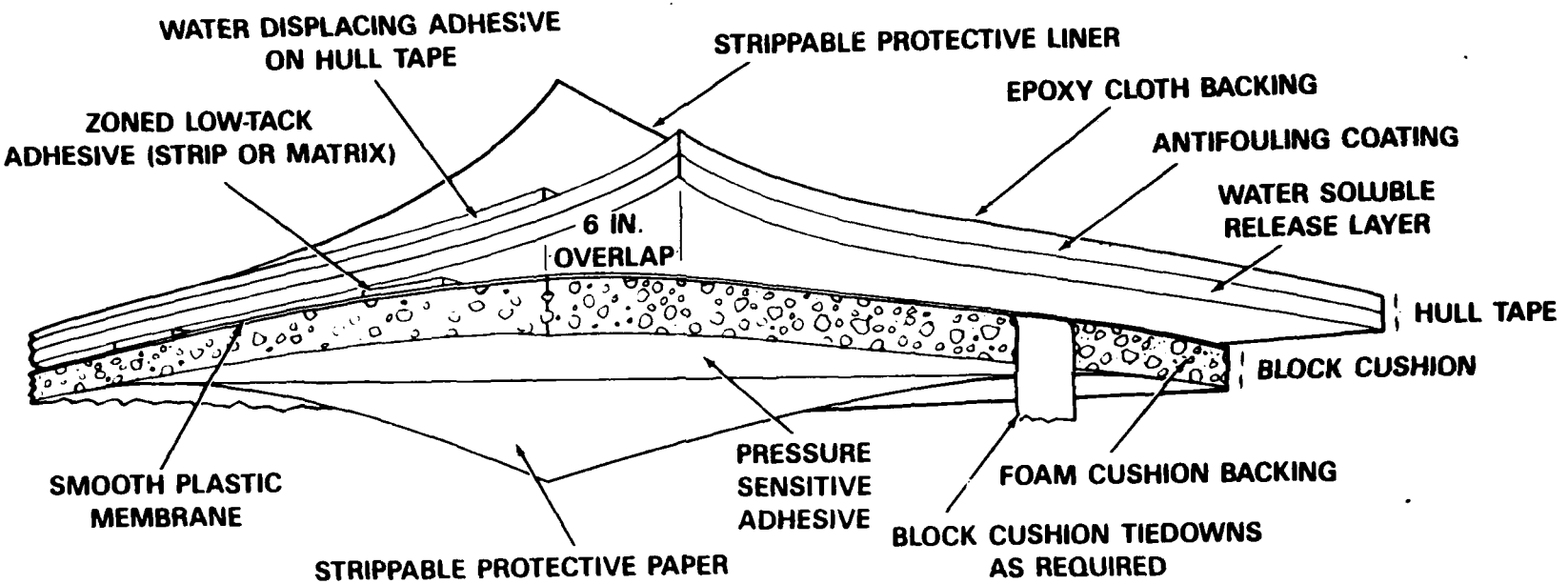

Fig. 1. Tape sandwich structure (thickness exaggerated for detail)

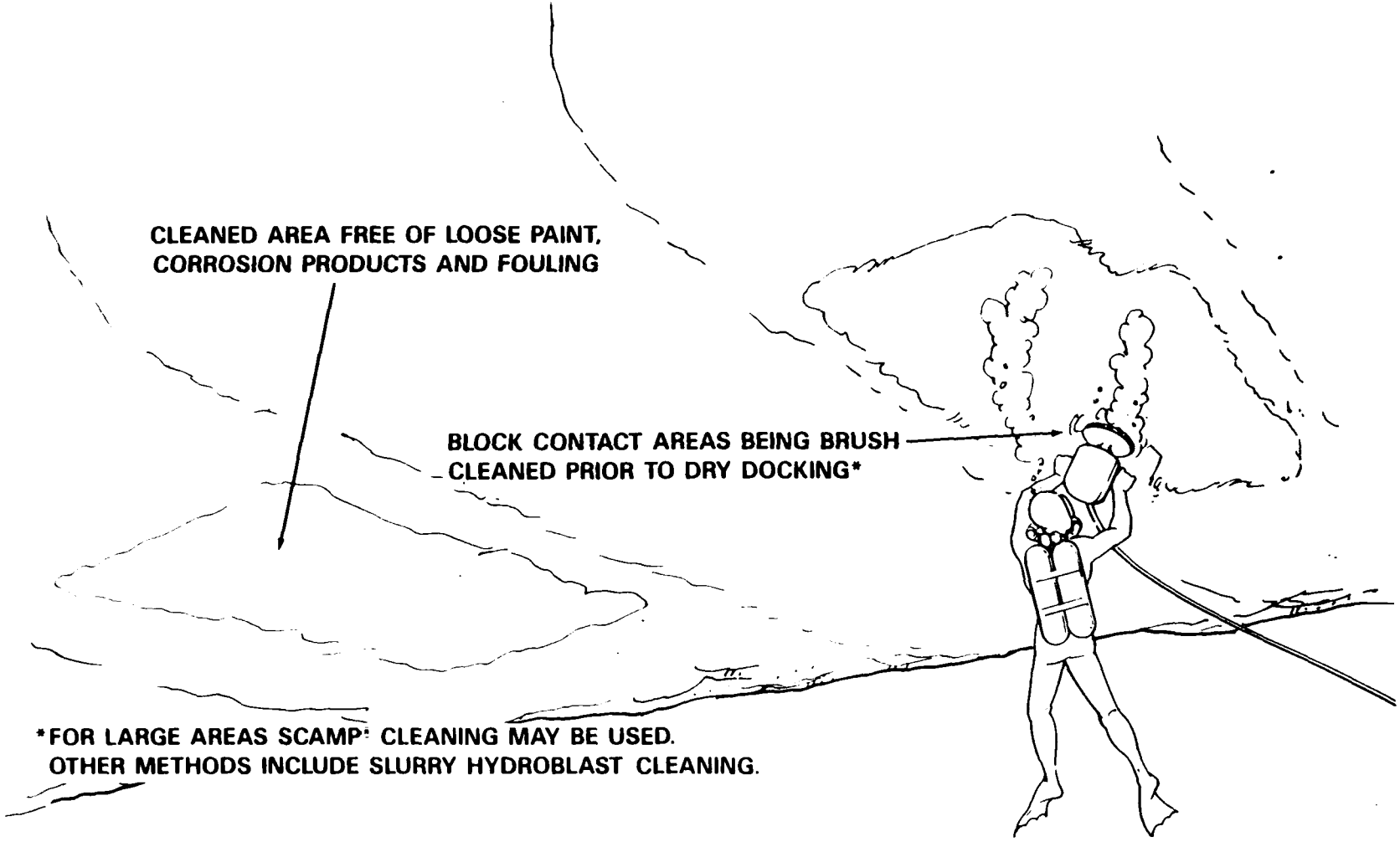

Fig. 2. Diver cleaning operations.

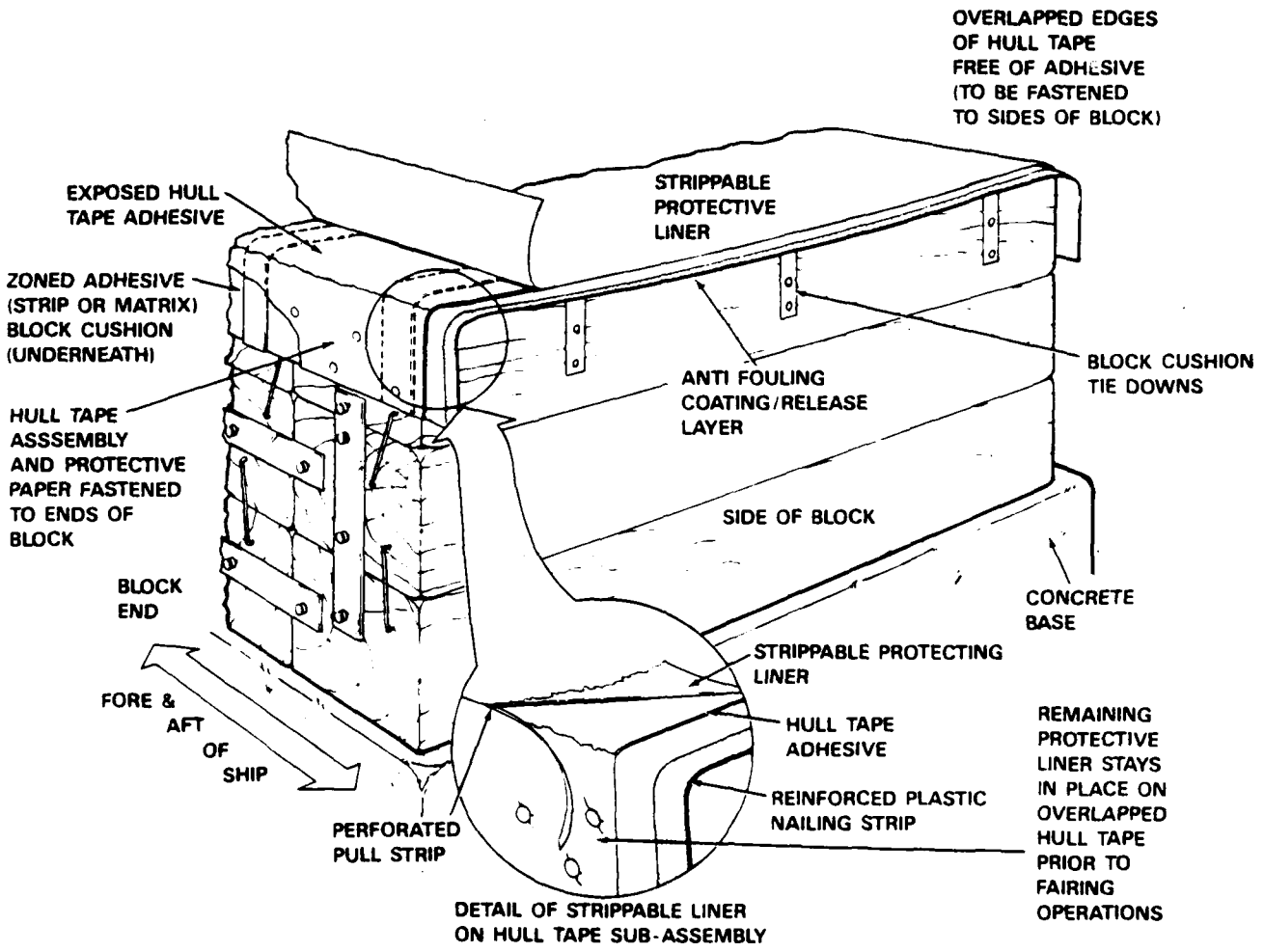

Fig. 3. DOK-BLOK prepositioned on block.

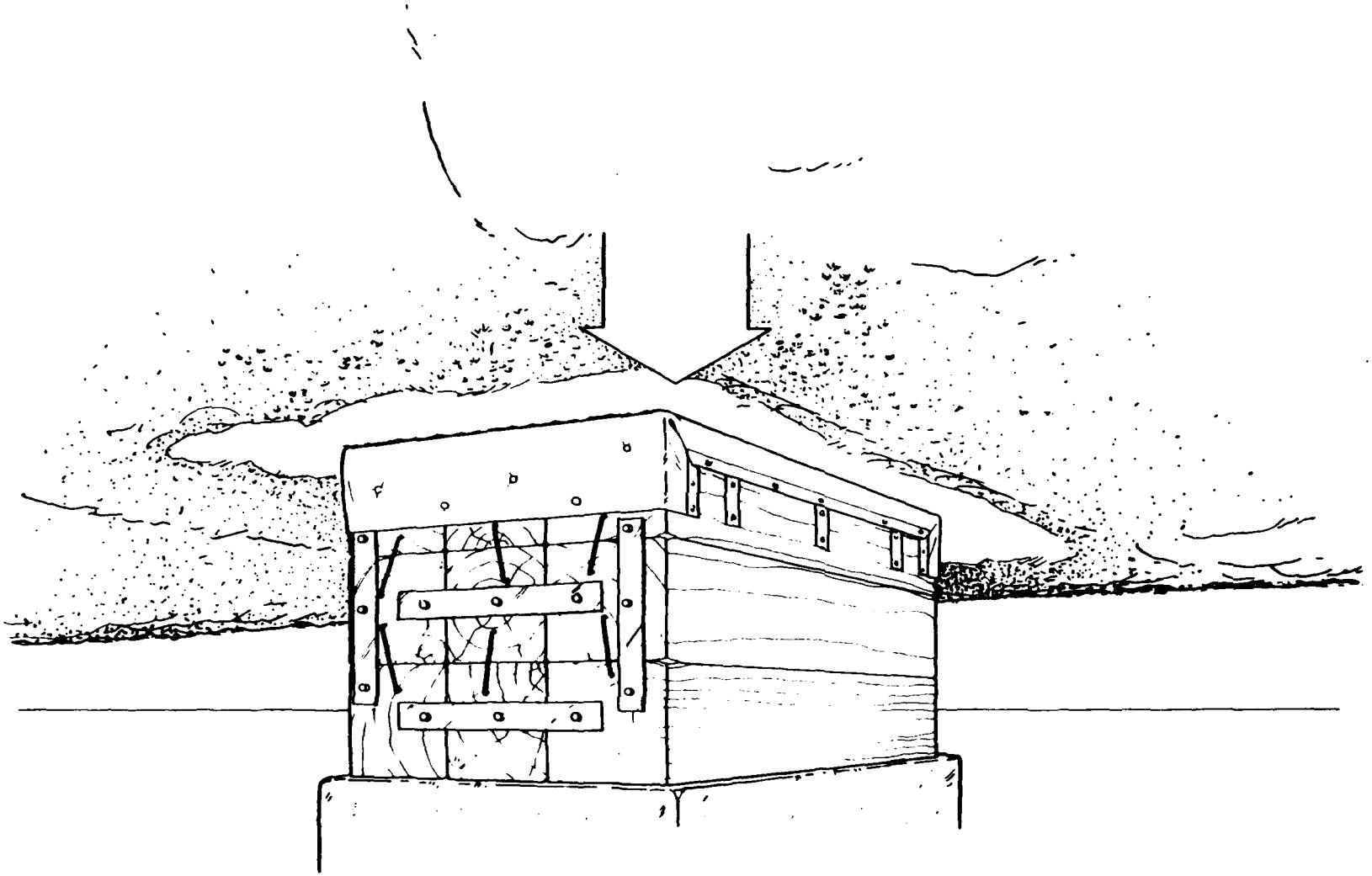

Fig. 4. Ship settles on exposed adhesive of hull tape affixed to block.

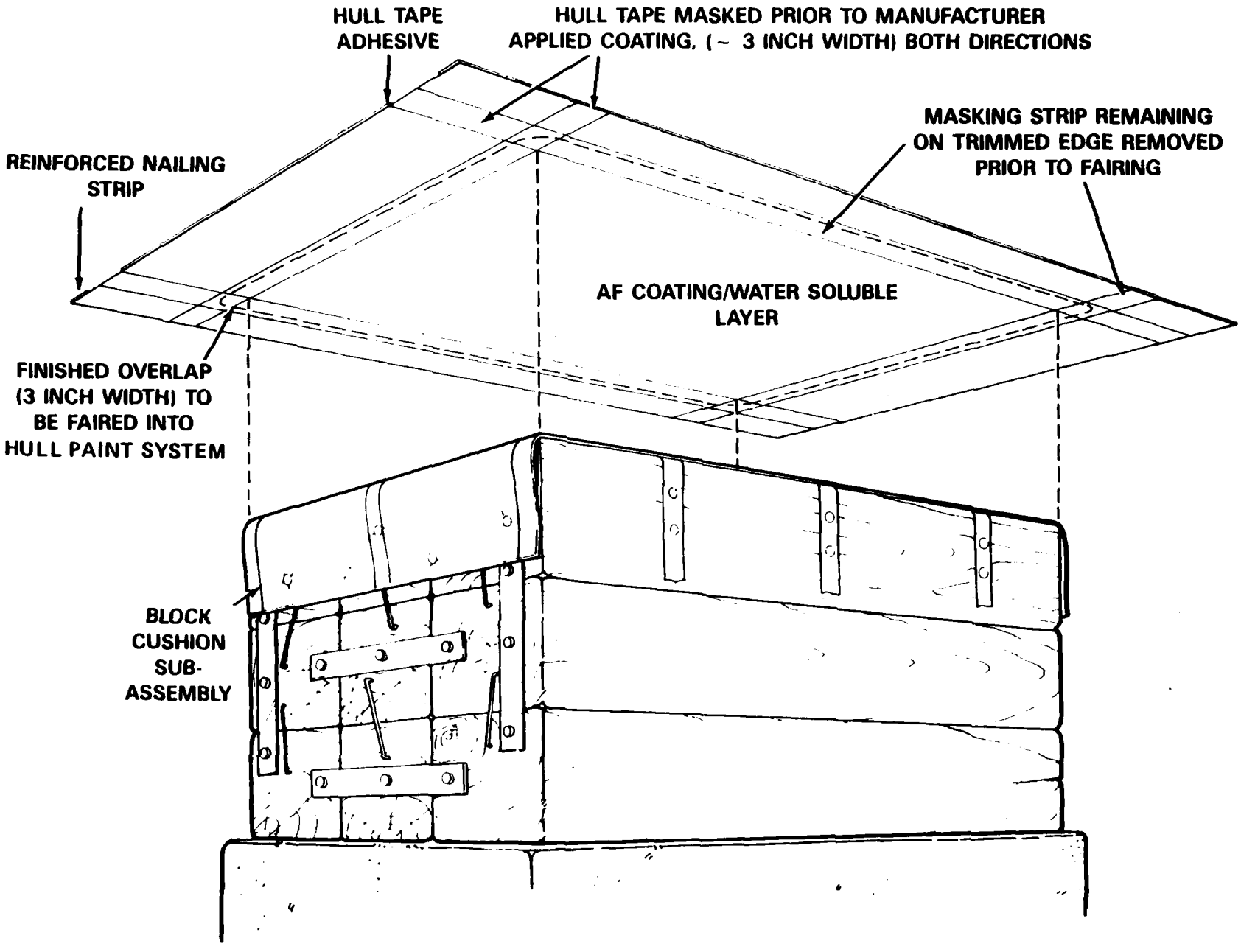

Fig. 5. Hull tape sub-assembly showing detail of masking and trimming.

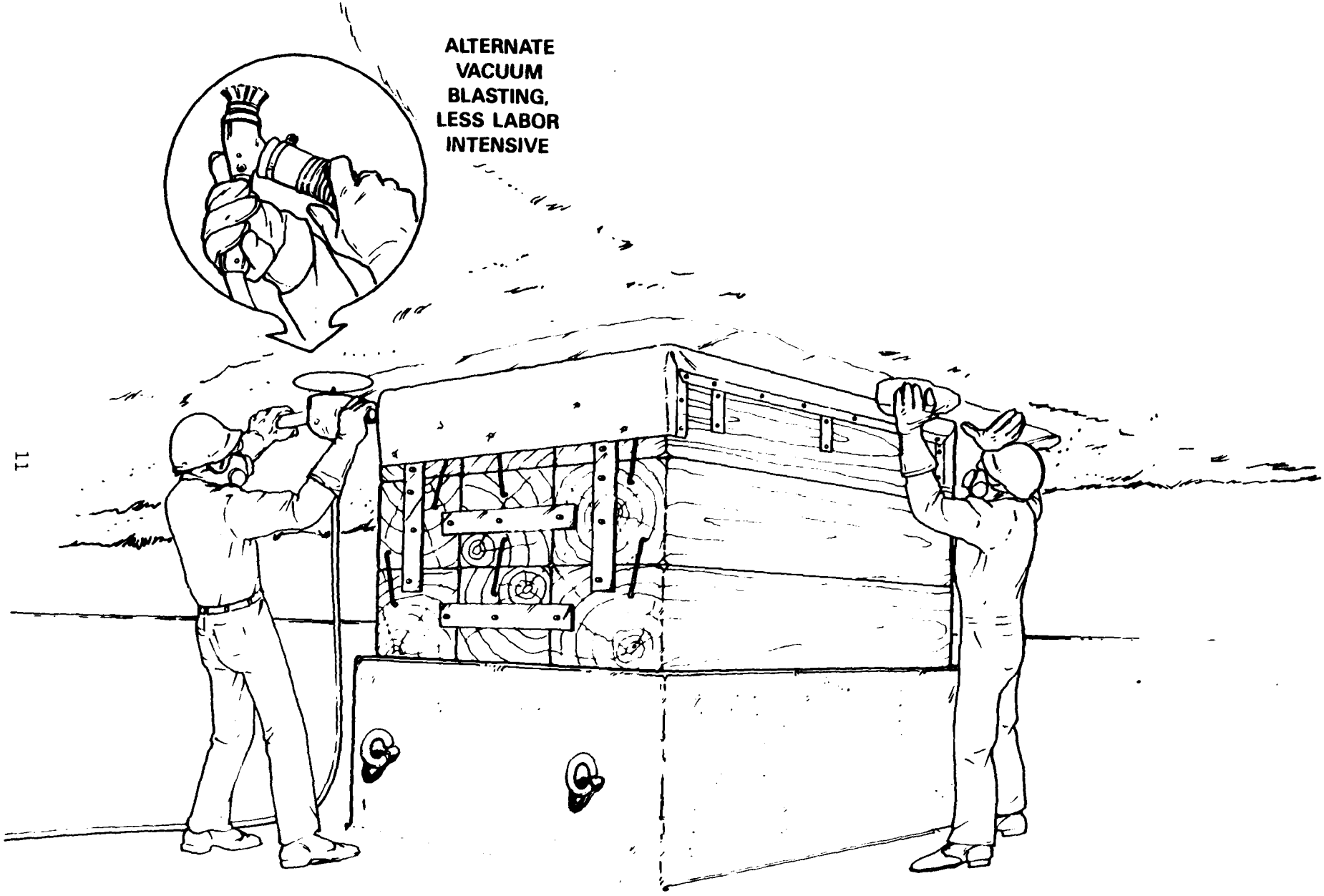

Fig. 6. Hull carefully cleaned and solvent wiped for 4 to 6-in. around perimeter of block.

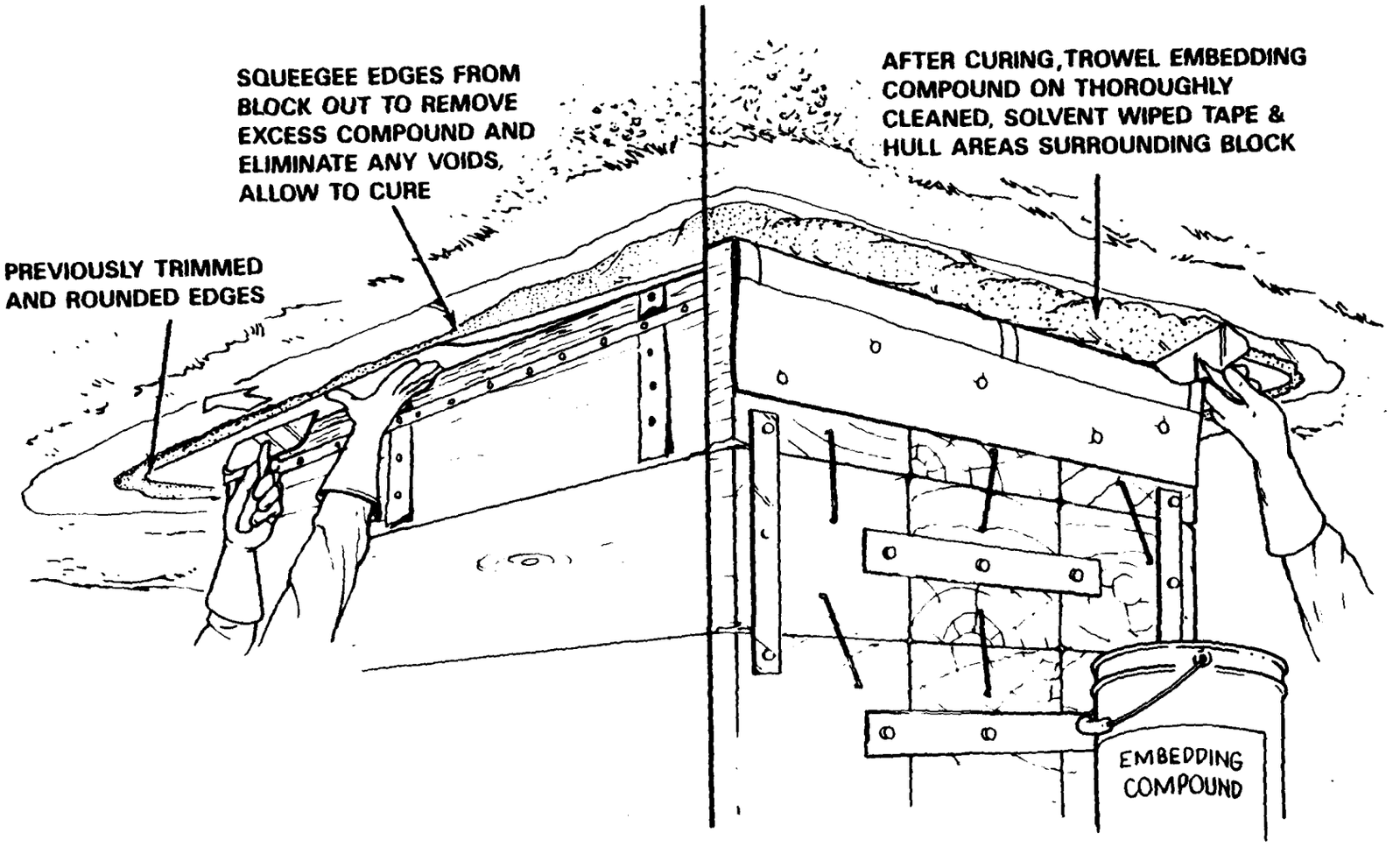

Fig. 7. Embedding of hull tape edges.

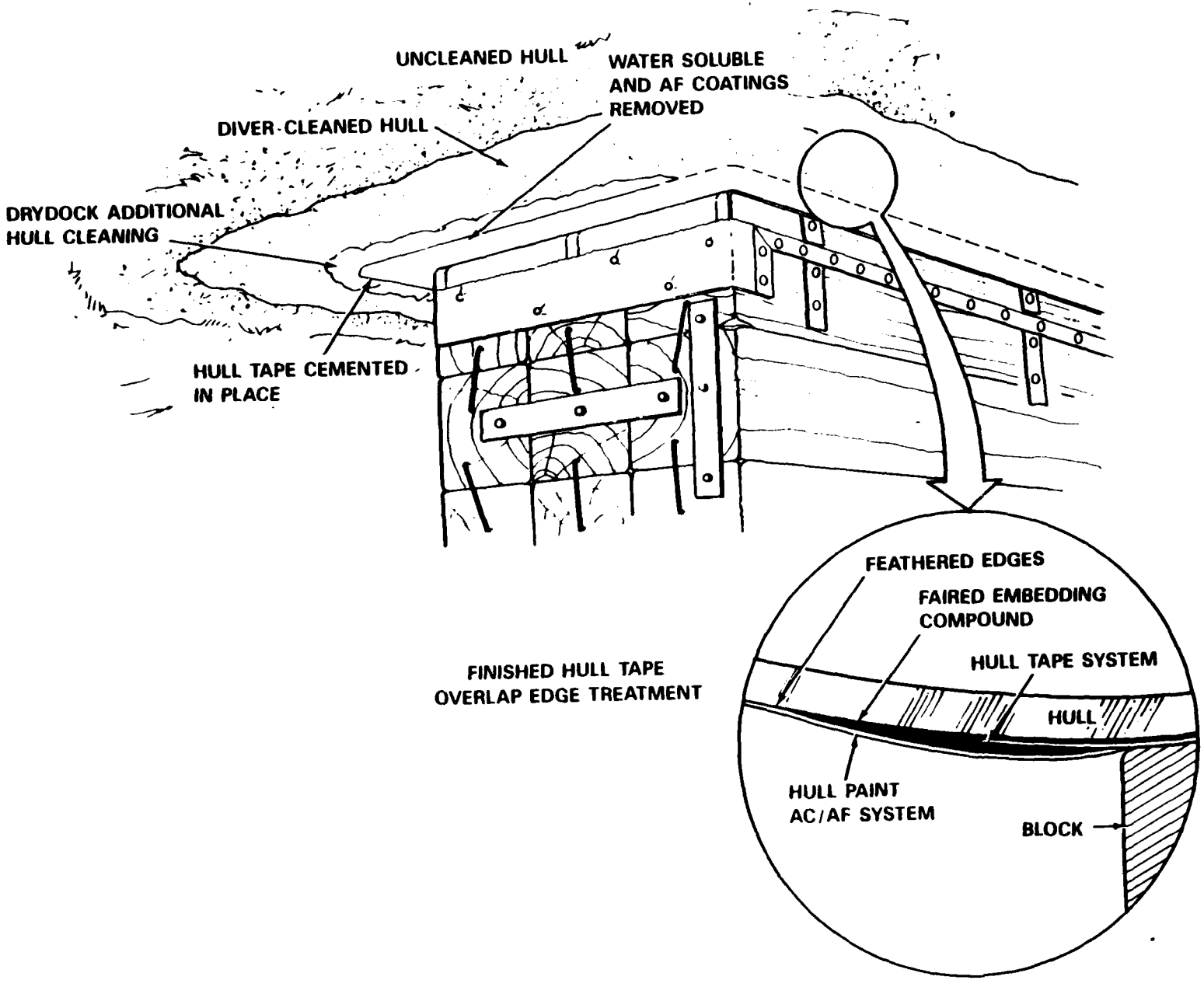

Fig. 8. Finished hull tape overlap edge treatment.

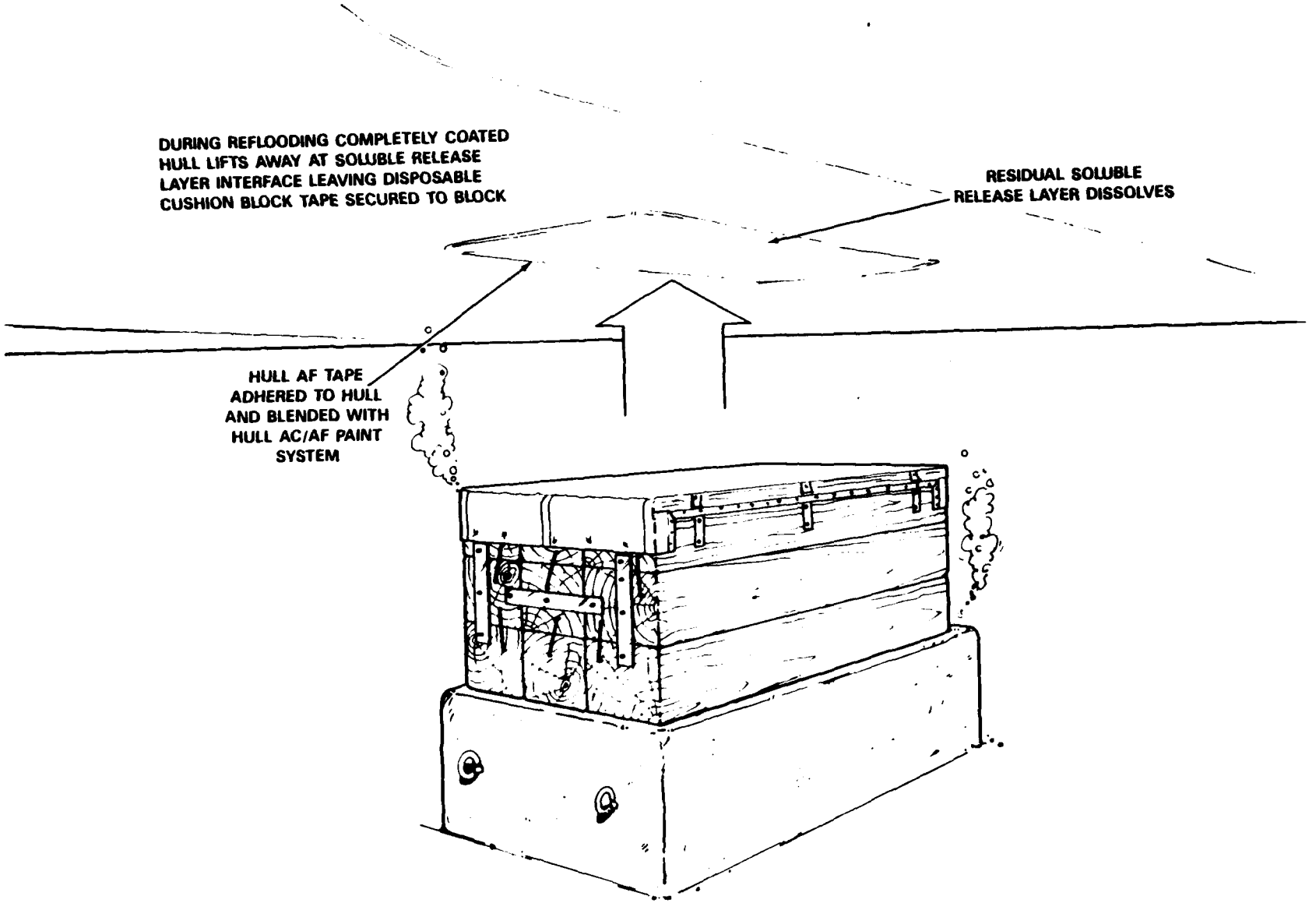

Fig. 9. Undocking

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