REPRODUCED AT THE NATIONAL ARCHIVES AND RECORDS ADMINISTRATION - PACIFIC REGION (SAN FRANCISCO)

S19-7/SS

FF12-10/A16-3/
S19/(70)

COMMANDER SUBMARINE FORCE
UNITED STATES PACIFIC FLEET

REF

Serial 01506

Care of Fleet Post Office,
San Francisco, California,
24 July 1944.

~~CONFIDENTIAL~~

From: The Commander Submarine Force, Pacific Fleet.
To : The Commander Submarine Squadron FOUR.
The Commander Submarine Squadron SIX.
The Commander Submarine Squadron EIGHT.
The Commander Submarine Squadron TEN.
The Commander Submarine Squadron TWELVE.
The Commander Submarine Squadron FOURTEEN.
The Commander Submarine Squadron SIXTEEN. (AIR MAIL).
The Commander Submarine Squadron EIGHTEEN. (AIR MAIL).
The Commander Submarine Squadron TWENTY.
The Commander Submarine Squadron TWENTY TWO.
The Commander Submarine Squadron TWENTY FOUR.
The Commander Submarine Squadron TWENTY SIX.
The Commander Submarine Squadron TWENTY EIGHT.
The Commander Submarine Squadron THIRTY.
The Commanding Officer, Submarine Base,
Pearl Harbor, T.H.
The Commanding Officer, Submarine Base,
Midway, T.H.
The Commanding Officer, U.S.S. HOLLAND (AS3).

Subject: Submarine Camouflage.

Reference: (a) Comsubpac Conf Ltr FF12-10/A16-3/(16) Serial 0808 of 29 April 1944. No Rec.
(b) Comsubpac Conf Ltr FF12-10/A16-3/(16) Serial 0852 of 5 May 1944 and enclosures. ys 2191

Enclosure: (A) Instruction for Applying Submarine Camouflage.
(B) Guide for counter shading, 32/3-SSB and 32/9SS details 1 to 6.
(C) Guide for counter shading, 32/3-SSB details 7 to 15.
(D) Guide for counter shading, 32/9-SS details 7 to 15.

1. Enclosures (A) to (D) are forwarded for information and to augment references (a) and (b).

2. Attention is invited to the fact that enclosure (B) applies to both camouflage designs, and enclosures (C) and (D) apply only to their respective design.

C.A. LOCKWOOD, Jr.

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UNITED STATES PACIFIC FLEET

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Subject: Submarine Camouflage.

Copy to: (with enclosures)

BuShips (2) (AIR MAIL)
Comsublant
Comserforpac
Comdt NYMI (AIR MAIL)
Comdt NYPH (AIR MAIL)
SubAd (AIR MAIL)
NDD HP (AIR MAIL)
AstIndMan, Ferry Bldg. (AIR MAIL)
Comsubs7thflt (AIR MAIL)
Comtaskfor 72 (AIR MAIL)
S.R.U. 134 (AIR MAIL)
S.R.U. 137 (AIR MAIL)

E. L. Hynes 2nd

E. L. HYNES, 2nd,
Flag Secretary.

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INSTRUCTION FOR APPLYING SUBMARINE CAMOUFLAGE

The two camouflage schemes now being used in the Pacific are refinements of gray and black designs that predate World War #1. The "light gray", design 32/3ssB dated 18 March, 1944, has for its basic tone a cold gray #27 which blends well with the water background under a wide range of conditions, both day and night. This gray tone (27% reflectant), is carried on most of the exposed vertical surfaces. Surfaces which slope away from the vertical and face upward are painted darker. Surfaces which slope away from the vertical and face more downward are painted lighter. Horizontal surfaces which face upward are painted black. Horizontal surfaces which face downward are painted white. The object of the design is to make the vessel appear like a soft gray cloud of one tone -- the same tone as the background. It is therefore necessary to use a more reflectant paint on the surfaces which get less light and a less reflectant paint on the surfaces which get more light. Under the roof of the bridge, in little corners around the sheers and inside the forward shield of the conning tower there are a number of places where the sunlight cannot reach directly. Unless these places are brightened up with paint, the whole area seen from astern will appear as a real dark spot on the sea when the rest of the vessel is invisible. Every place where the light from the sky is shut off by a horizontal platform the area below should be lightened as far as possible to compensate for it. This is called countershading. In the case of submarines, this must be done very carefully because if overdone, white spots or real light spots may be caught in the light of a low sun and be very revealing to enemy aircraft even when the vessel is submerged. In order to reduce the danger of detection in sunlight when at periscope depth, and also to permit submarines to approach toward a low full moon with the enemy silhouetted against it, the forward rounded portion of the superstructure and forward quarter of the sheers are darkened with a gray of 16% reflectance.

The vertical sides of the superstructure below the main deck abaft the conning tower are generally awash. When not awash, the side is still so small that it has very little effect upon the visibility to a surface ship. Since, also, the sides begin to slope upward and round upward near the stern of the vessel, these portions are darkened to afford greater concealment to enemy aircraft.

On all parts of the vessel excepting the flat horizontal portion of the deck, the paint is dull or "matte". On the deck a glossy black is used. This glossy black loses part of its shiny quality in a short time due to the combined galvanic action throughout the submarine, the salt deposited from the sea and bleaching and drying action of direct sunlight. In about twelve

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~~CONFIDENTIAL~~

INSTRUCTION FOR APPLYING SUBMARINE CAMOUFLAGE

days, the glossy black approaches an eggshell finish which is near the ideal for low visibility. In case submarines are painted with less than 12 days before they are to arrive in their operating area, #24 Glossy Black should be cut with an equal part of Dull Black #13 or #82-Y.

The "Dark Gray", design 32/9ss dated 18 March 1944, is less effective than the "Light Gray" for all surface work. However, it is the most difficult paint job to see at periscope depth and impossible to see in deep water below 150 feet. It has quite a bit of advantage over the plain black in other situations also and was designed especially for reconnaisance patrols in clear calm waters where enemy aircraft are the greatest danger. It is not bad for general patrol work, but the "Light Gray" is much better, especially at night. Even the so called "Light Gray" is too dark most of the time but to make it lighter would unduly increase its possibility of detection by enemy aircraft in the few situations that are bad.

In applying the Submarine Concealment Camouflage painting there are a few things which seem to give every one a little trouble at first, even after paint samples and paint in mixed form are at hand, spray equipment is hooked up and the vessel is prepared for painting with its primer coat on.

Dry and wet paint samples have been prepared by Navy Yard, P.H., and Sub Base, P.H. Six sets of dry samples have been prepared by the SPERRY. One set should be turned over to the Squadron Engineer and one to each Division Engineer aboard the SPERRY and BUSHNELL. Since all samples fade or darken in time, they should be replaced about once every five or six months, from Navy Yard, P.H., paint shop #71. Wet samples are being kept by the painter assigned to the Squadron Engineer on the SPERRY. A wet set should be kept by the BUSHNELL also.

BuShips has been requested to make specifications for the submarine paint shades and to direct Navy Yard, Mare Island, paint factory to supply the shades in ready mixed form. Pending this arrangement, the shades will have to be mixed in the field. The tenders can do this for the divisions. The tenders have also been requested to assist in checking up on paint supplies, brushes, spray guns, etc., and to provide the division relief crews with all assistance possible on these material matters.

Difficulties of obtaining any paint at all have been experienced in many Pacific areas, including Navy Yard, P.H., and Sub Base, P.H. It is recommended that a careful check be kept of paint stocks and 3 to 4 months allowed for filling new orders.

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INSTRUCTION FOR APPLYING SUBMARINE CAMOUFLAGE

The supplies now on the BUSHNELL and SPERRY are adequate for the present. The equipment in each case should be supplemented to some extent.

Special attention should be given the following:

1. The rounded shoulder from main deck to sides.

2. The outside upward rounded shoulder from the overhead of the bridge, to the sides of the bridge shield.

3. Inside of the bridge.

4. Forward rounded portion of superstructure below the 20 mm gun platform to the main deck.

5. In and around the shears.

There should be no difficulty on iteml: (the rounded shoulders), if the blueprint instructions are followed. The plans show a gradual shading from light to dark, going from the side to the deck. After the basic light gray has been painted on the sides, the next darker tone should be applied by just spraying right along the shoulder from bow to stern. The gun should be held partially over the side and pointed downward and outward at about 45° so that the lower part of the shoulder that rounds upward gets sprayed without getting the paint down below the rounded part. The next darker coat should go on in a similar way and the gun should be pointed at about the same angle, but run along the shoulder a little farther in from the side.

The third darker shade can be run along from bow to stern next with the gun shooting almost straight down and held farther inboard about where the rounded shoulder flattens out to the main deck surface. On some older classes of submarines, the rounded shoulder is small -- 6" or 8" diameter instead of 24". In this case, one dark intermediate shade on top is sufficient, with the shading done like the second run on the big shoulder.

The inside areas of bridge structures can not all be painted alike because of differences in construction. Those that have a "covered wagon" must be painted much lighter than those without any overhead. The undersides of all horizontal surfaces should be painted white. Inside of the bridge, the extreme forward bulkhead and the upward rounded shield covering around the forward escape hatch should be painted white. All of the complicated structures of beams and braces which shut off light from

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above and look darker than the basic shade on the sides, should be brightened up with a lighter paint as far as possible. As far as possible here means white paint only in places that cannot be hit by the sun at all and which cannot be seen from aircraft. "Off-white" (light gray #46) should be used in corners and near to white areas which may be hit by a low sun but which will not be hit by a sun higher than 30° altitude.

A shade made by mixing 3 parts of #46 with 2 parts of #27 can be used on the inside bulkheads of bridges that are entirely open - that is, where there is little or no overhead at all, but where a certain amount of light is shut off because of the closeness of other vertical structures.

In the eiffel tower type of construction the shield surrounding the base of the shears flares outward at the base where it meets the bridge deck. These lower surfaces which slope slightly upward should be painted #27 but no lighter.

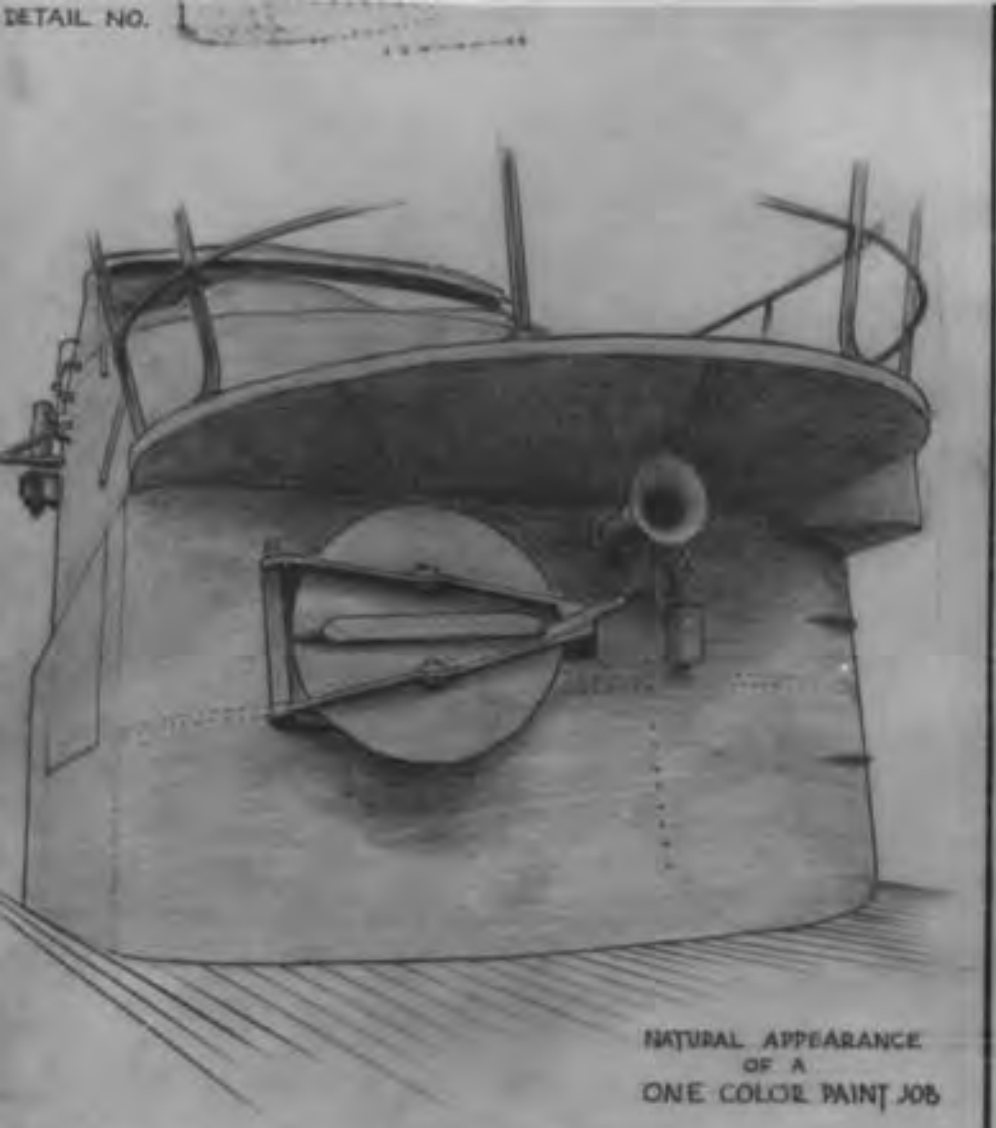
The tops of railings and other rounded surfaces which face upward or even partially upward should be painted dark. If facing straight up or are rounded, dull black #82-Y should be used. If sloping 45° dark gray #16 is better.

It is good policy to make a final inspection of the paint job from two levels: sea level and from well overhead. Take a sea level look first to see that there are no areas, except the tail, that are outstandingly dark. Correct all bad spots with a touch-up gun or by brush. Finally take a good look from overhead to see that no real bright spots stand out. If any show up badly they can show up to the enemy too. The difference between a good paint job and a sloppy one means 500 to 2000 yards of invisibility to the men who fight. It may well mean the difference between life and death.

C. H. Myrus 2nd

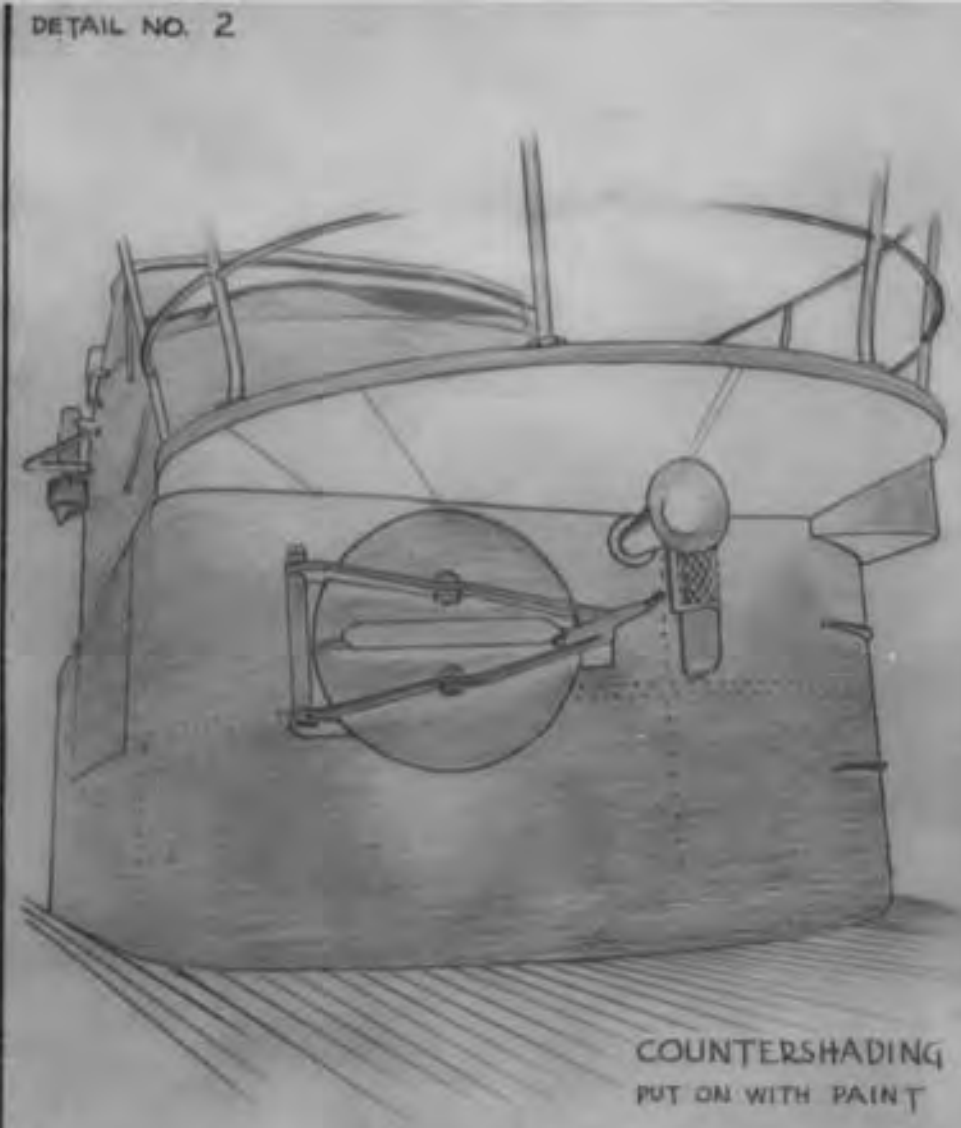
A. L. HYNES 2nd.
Flag Secretary.

DETAIL NO. 1



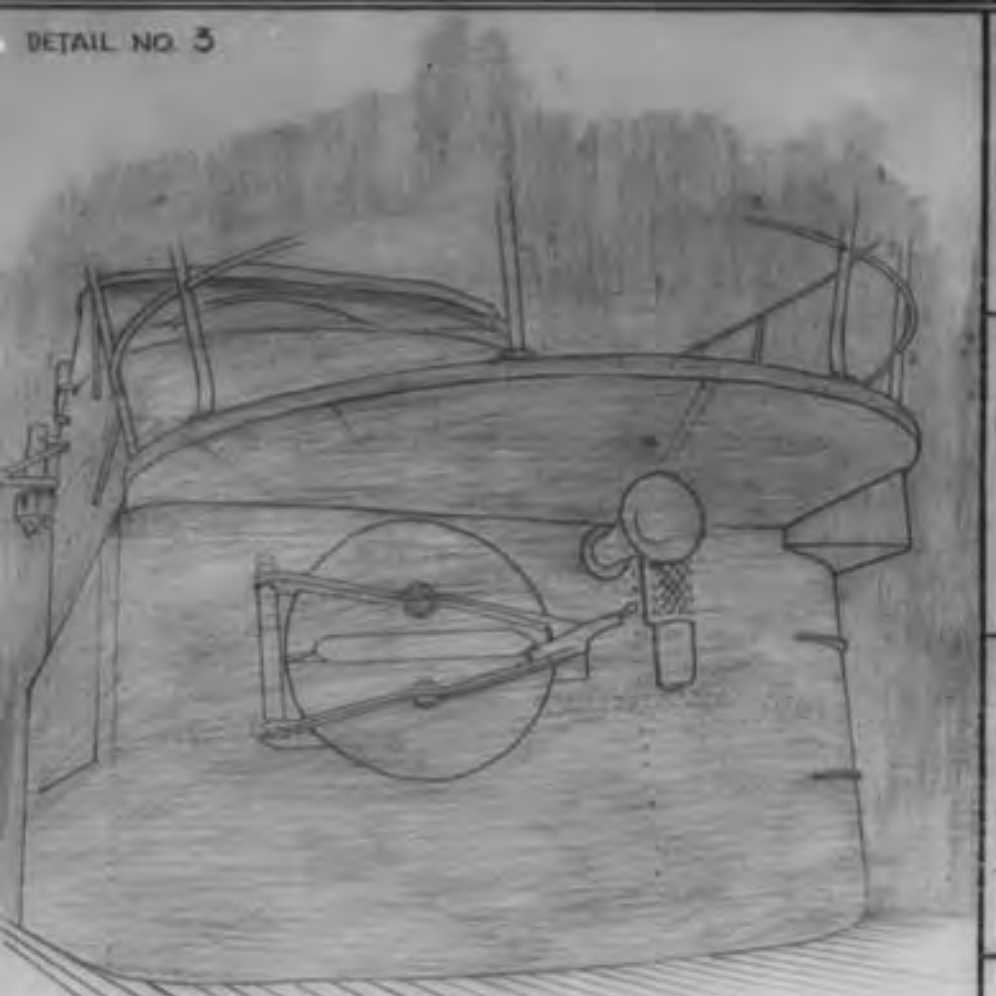
NATURAL APPEARANCE
OF A
ONE COLOR PAINT JOB

DETAIL NO. 2



COUNTERSHADING
PUT ON WITH PAINT

DETAIL NO. 3



THEORETICALLY PERFECT
RESULT
ON SUB PAINTED WITH
"COUNTERSHADING"

DETAIL NO. 4

NATURAL APPEARANCE OF A
ONE COLOR PAINT JOB

DETAIL NO. 5

COUNTER SHADING
PUT ON WITH PAINT

DETAIL NO. 6

THEORETICALLY PERFECT RESULT
ON SUB PAINTED WITH
"COUNTER SHADING"

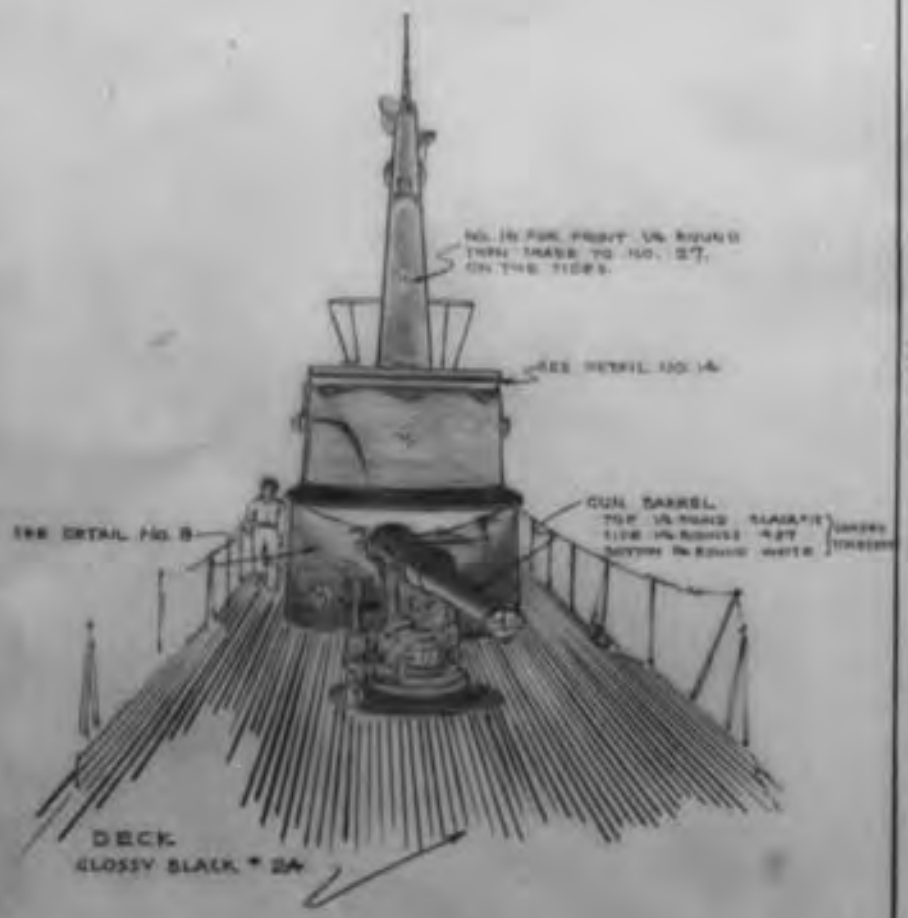
GUIDE FOR COUNTER SHADING

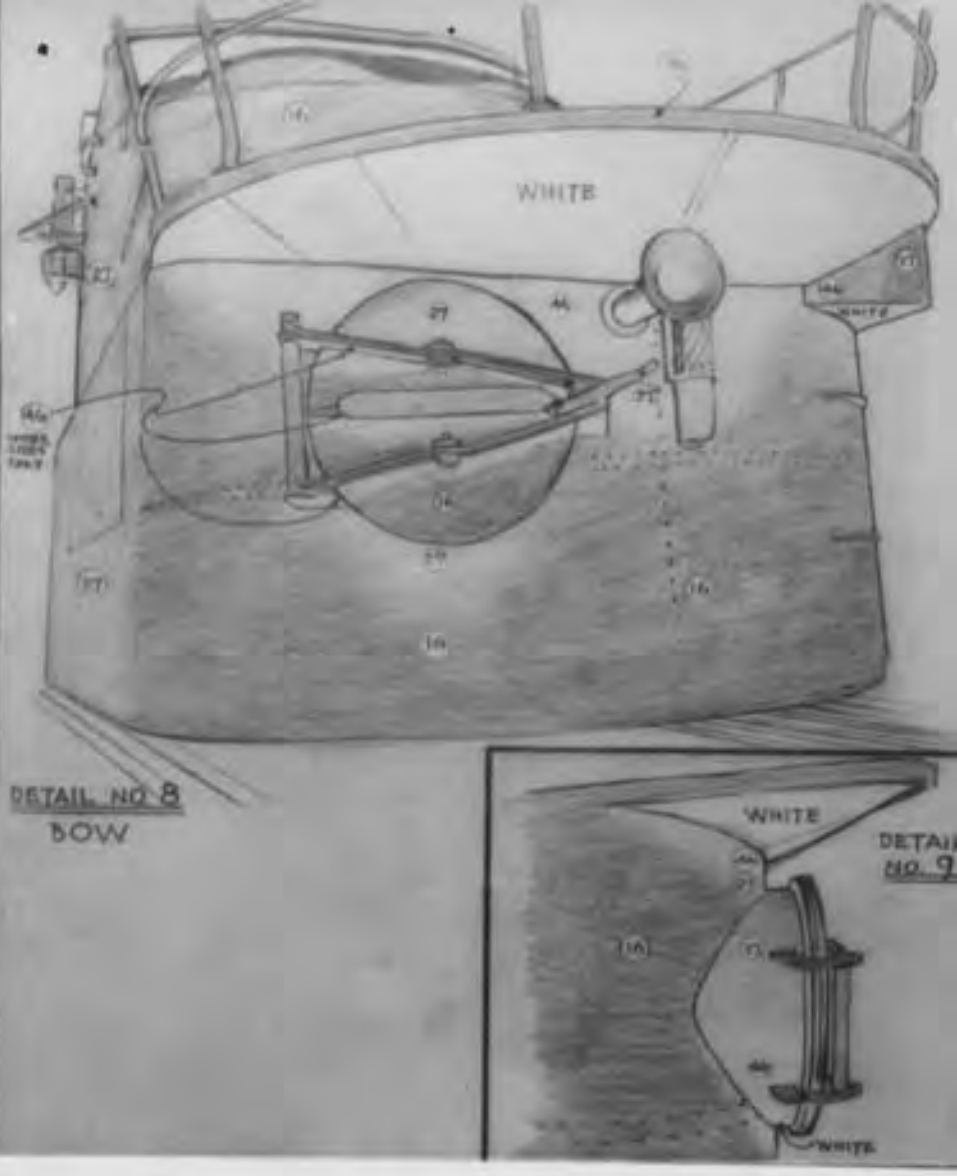
SUPPLEMENTARY INSTRUCTIONS
FOR CAMOUFLAGE DESIGNS
32/3-55B
AND
32/955

COUNTER SHADING
SHEET NO. 1 OF 3

BUREAU OF SHIPS BY
DAVID E. [illegible]
CAPTAIN, U.S.N.
LT. COMDR. U.S.N.R.
16 MARCH 1944

DETAIL NO. 7





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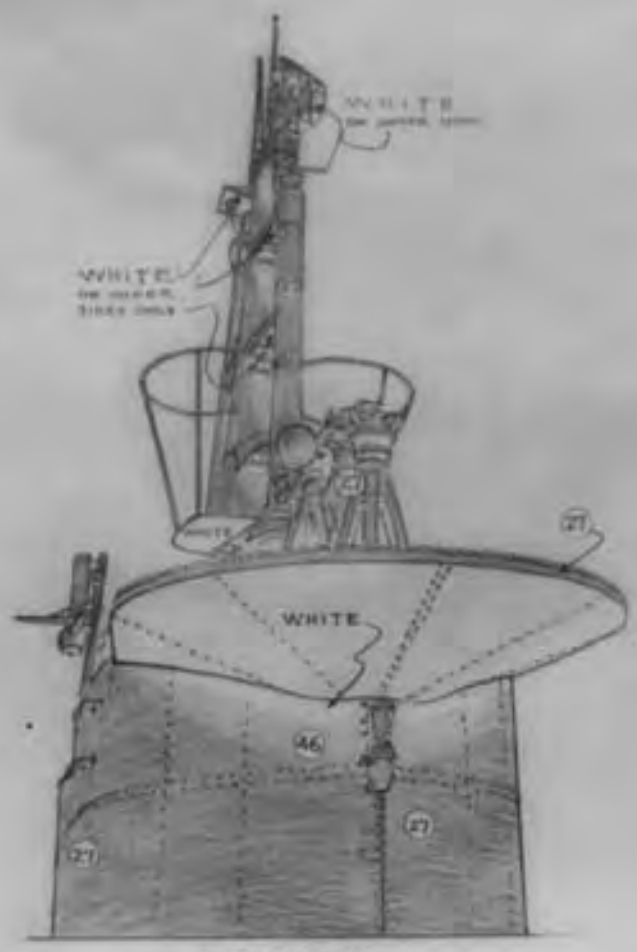

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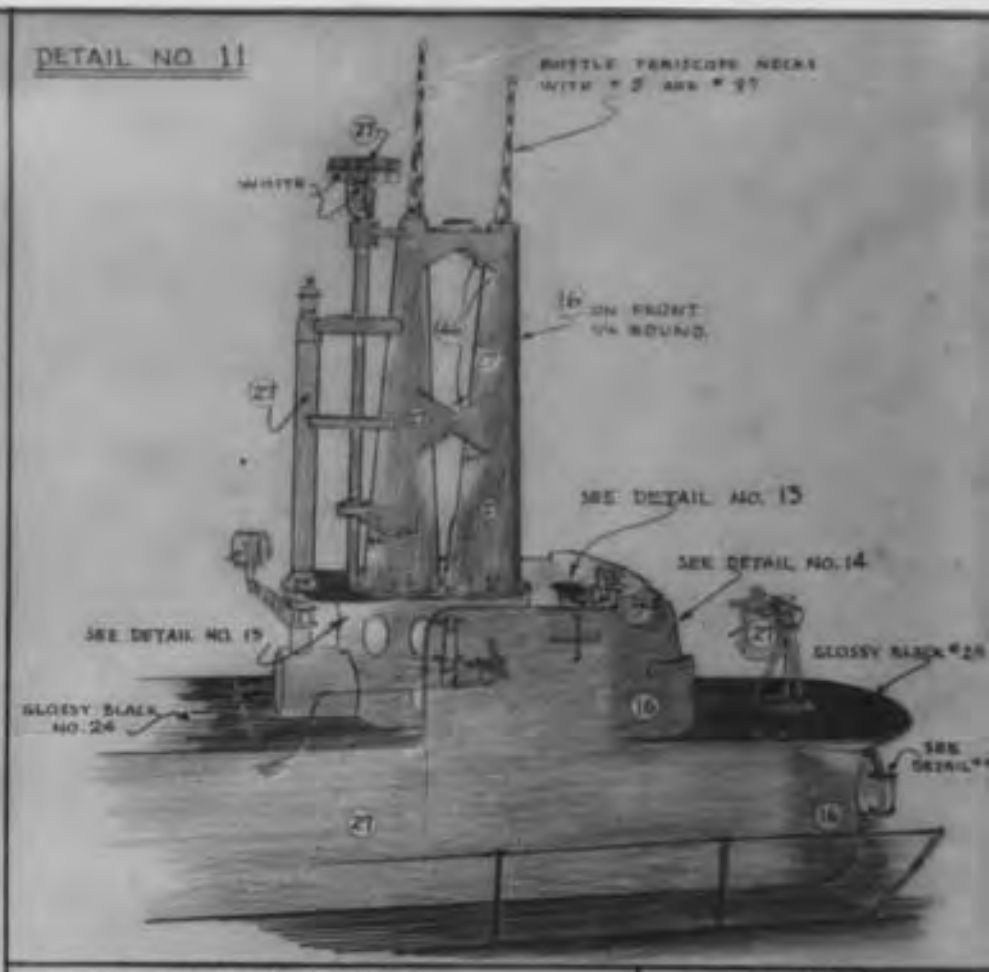


GUIDE FOR COUNTER SHADING

SUPPLEMENTARY INSTRUCTIONS FOR CAMOUFLAGE DESIGN

32 / 3-SSB

DETAILS

SHEET NO. 2 OF 3

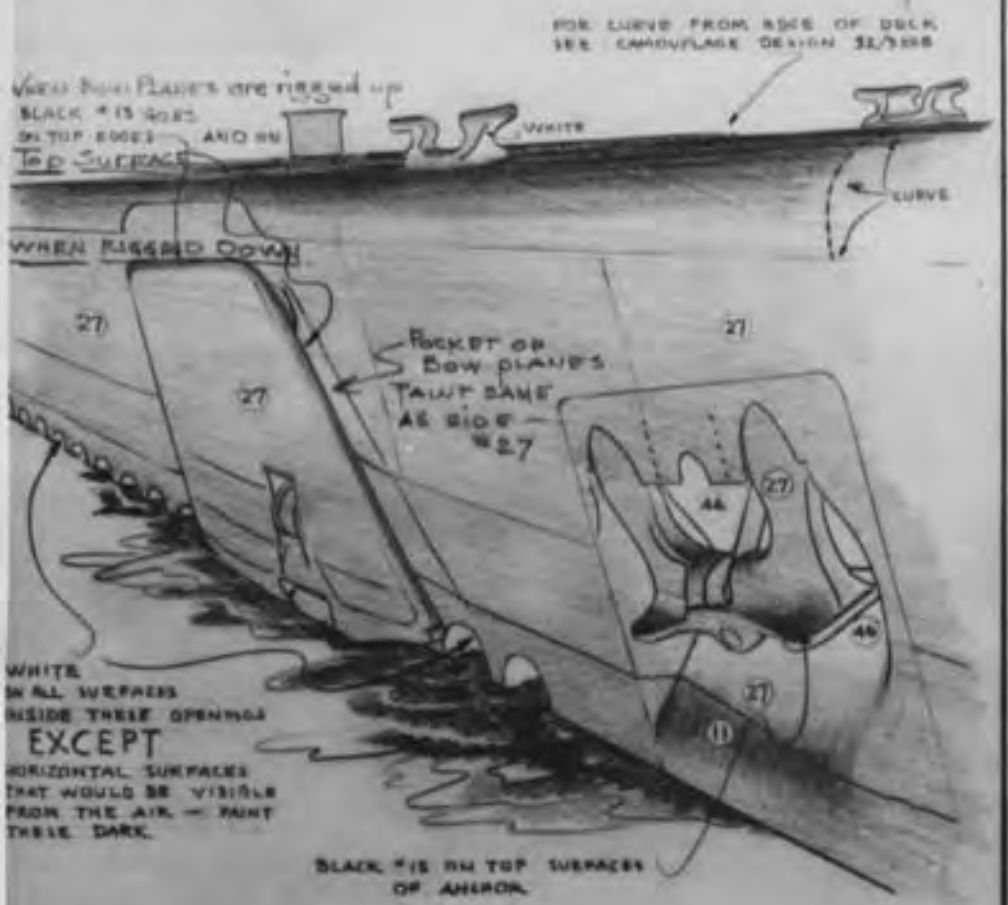
BUREAU OF SHIPS, NAVY DEPT.

D. E. R.

DAVID E. ROSENBAUM
LT. COMDR., U.S.N.R.

18 MARCH 1944

DETAIL NO. 12



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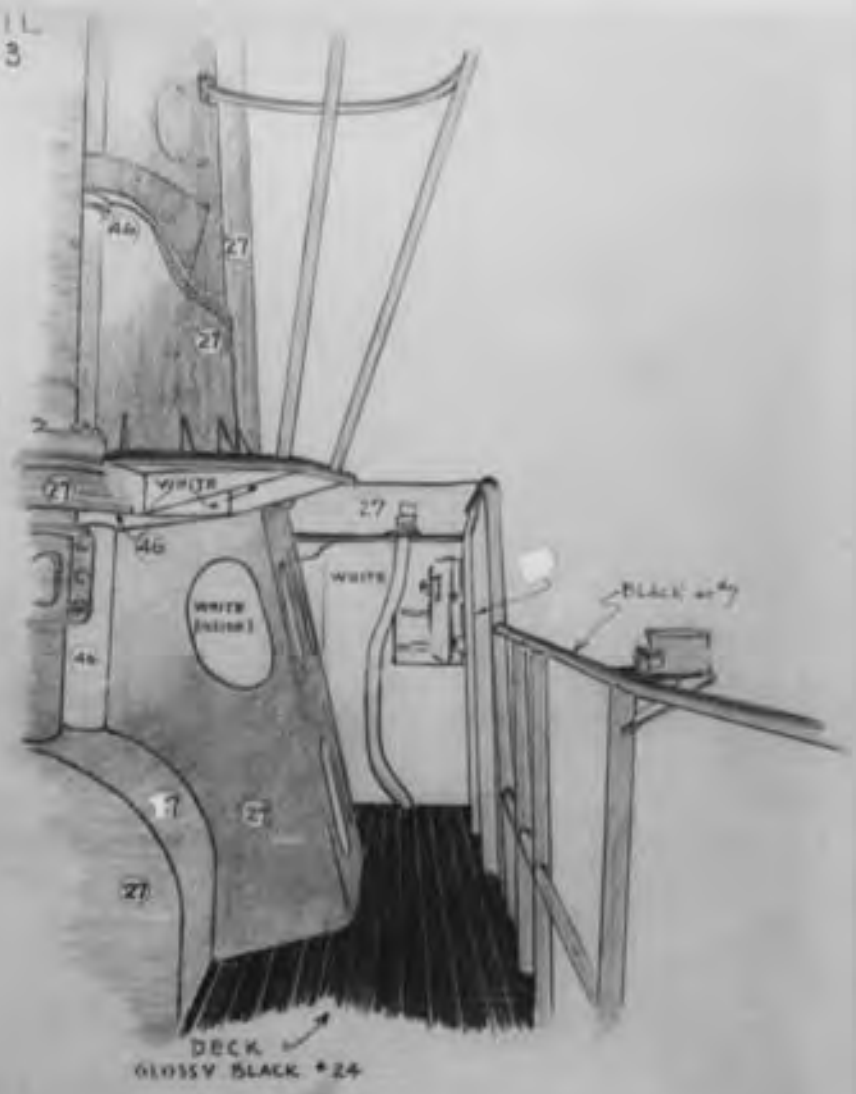

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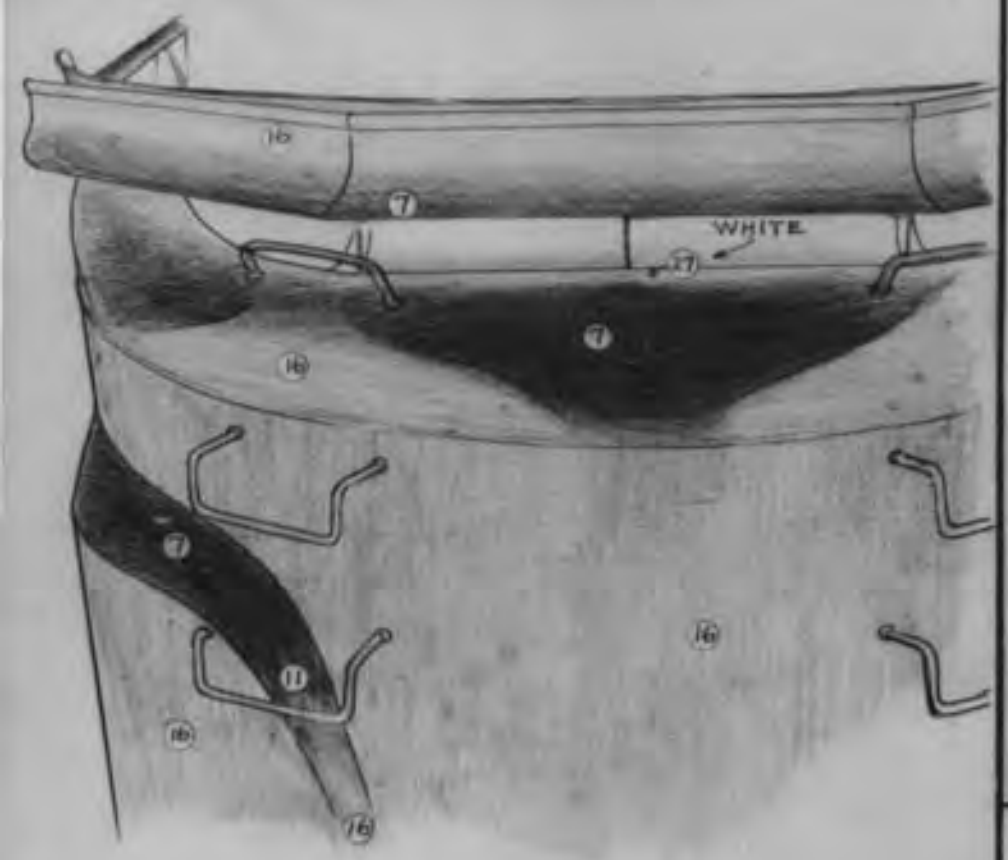


DETAIL NO. 15

GUIDE FOR COUNTER SHADING

SUPPLEMENTARY INSTRUCTIONS FOR CAMOUFLAGE DESIGN

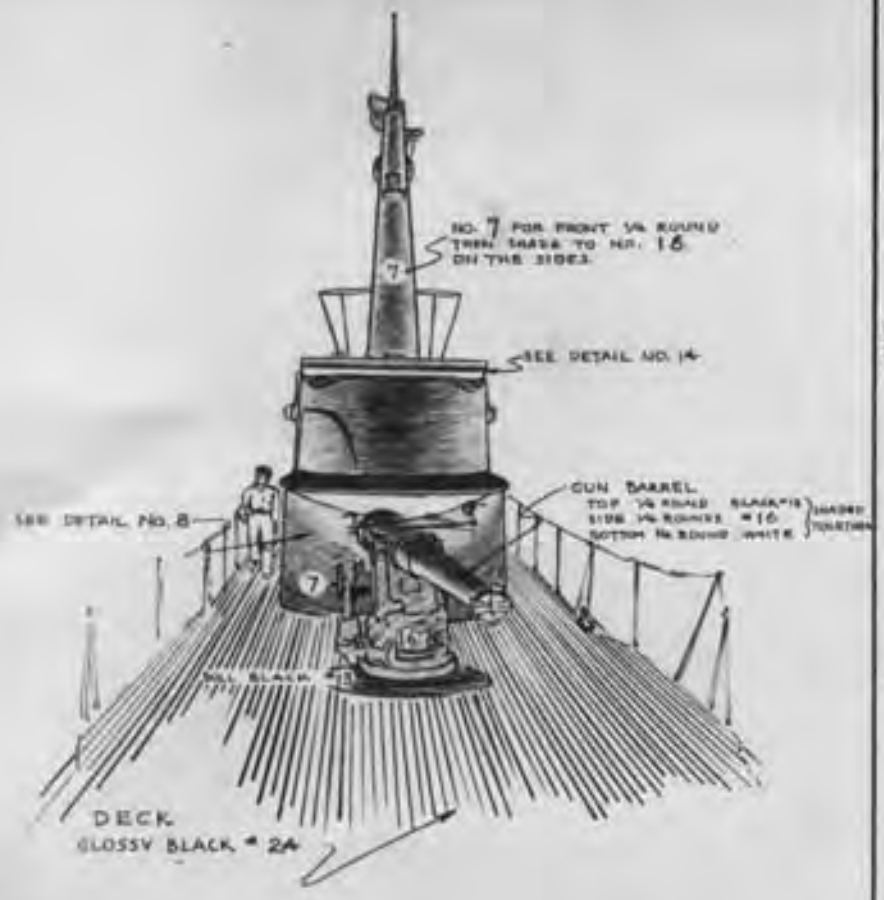
32 / 3-SSB

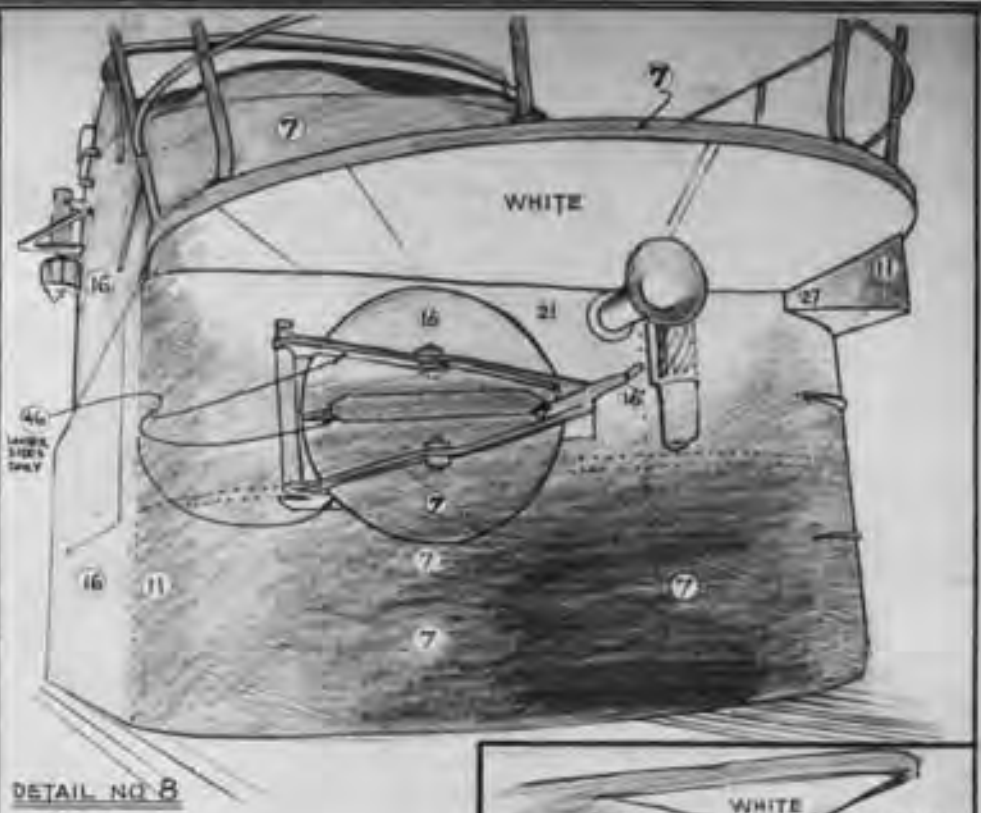
DETAILS
SHEET NO. 3 OF 3

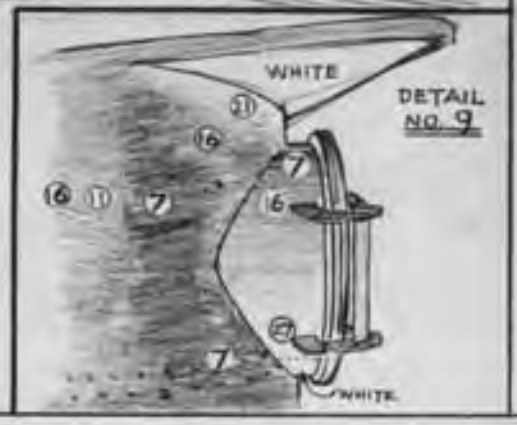
BUREAU OF SHIPS, NAVY DEPT.
Dayton R.E. Brown
DAYTON R.E. BROWN
LT. (JG) USNR

18 MARCH 1944

DETAIL NO. 7







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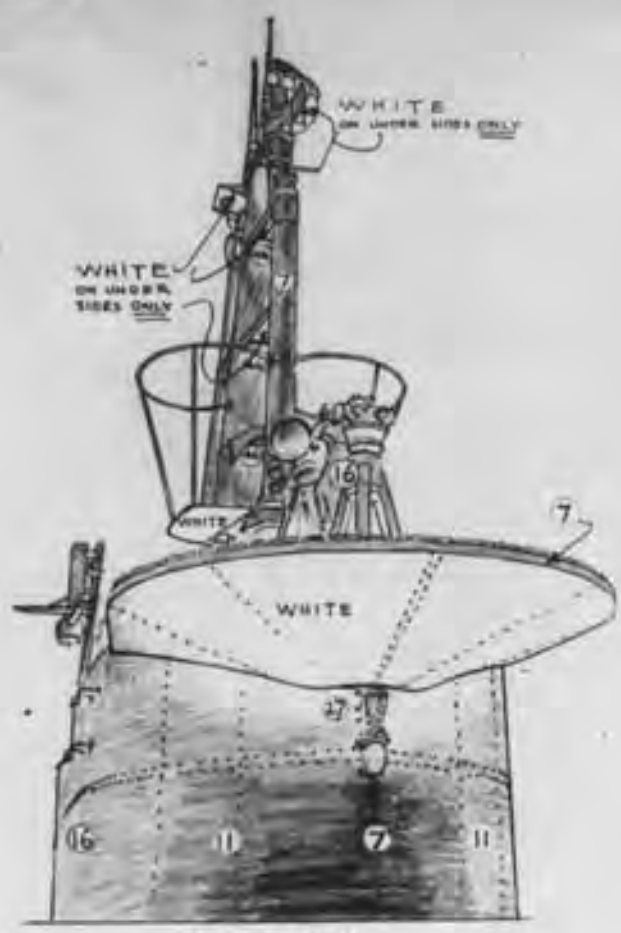

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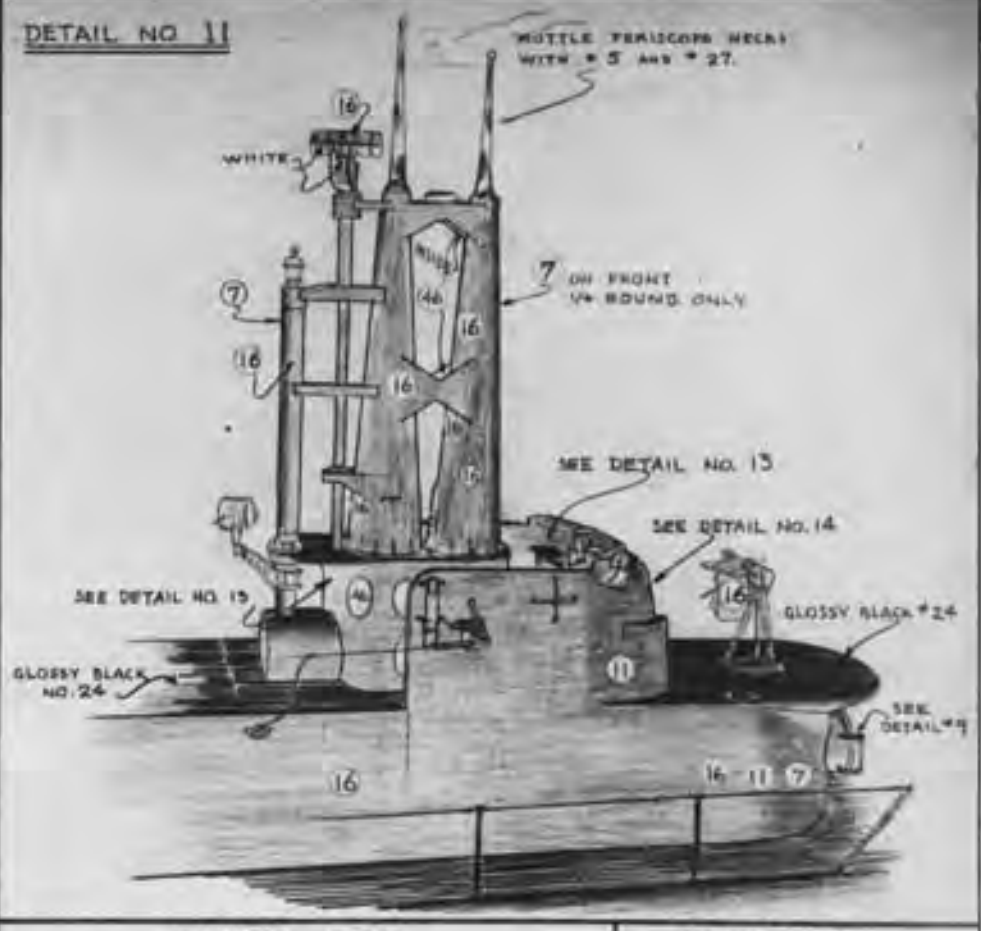


GUIDE FOR COUNTER SHADING

SUPPLEMENTARY INSTRUCTIONS FOR CAMOUFLAGE DESIGN

32 / 9 - SS

DETAILS

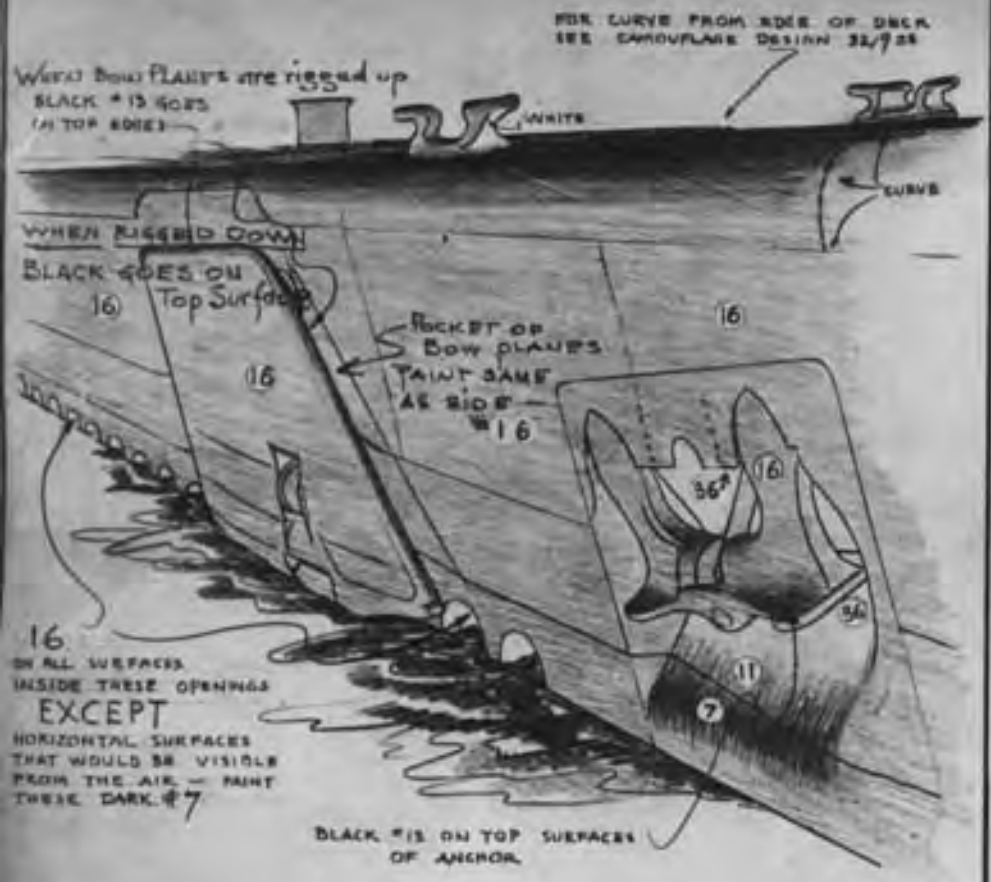
SHEET NO. 2 OF 3

BUREAU OF SHIPS, BY

DAYTON R. E. BROWN
LT. COMDR., U.S.N.R.

18 MARCH 1944

DETAIL NO. 12



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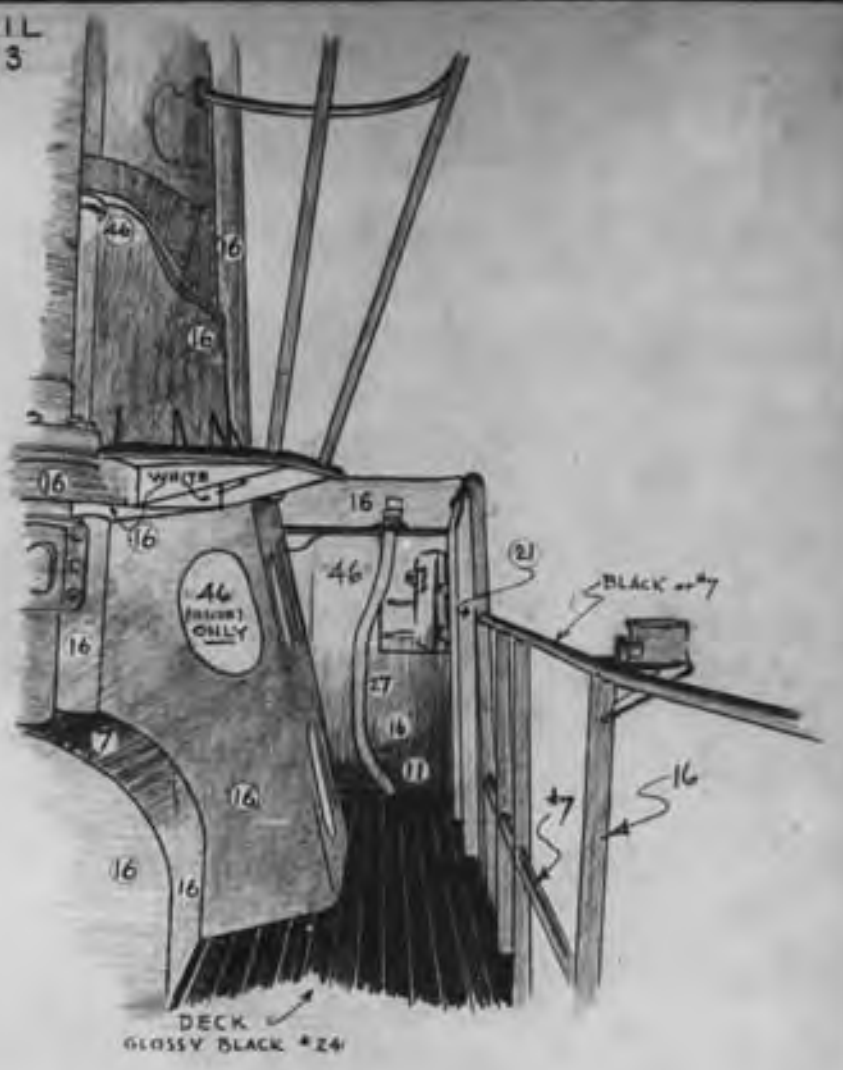

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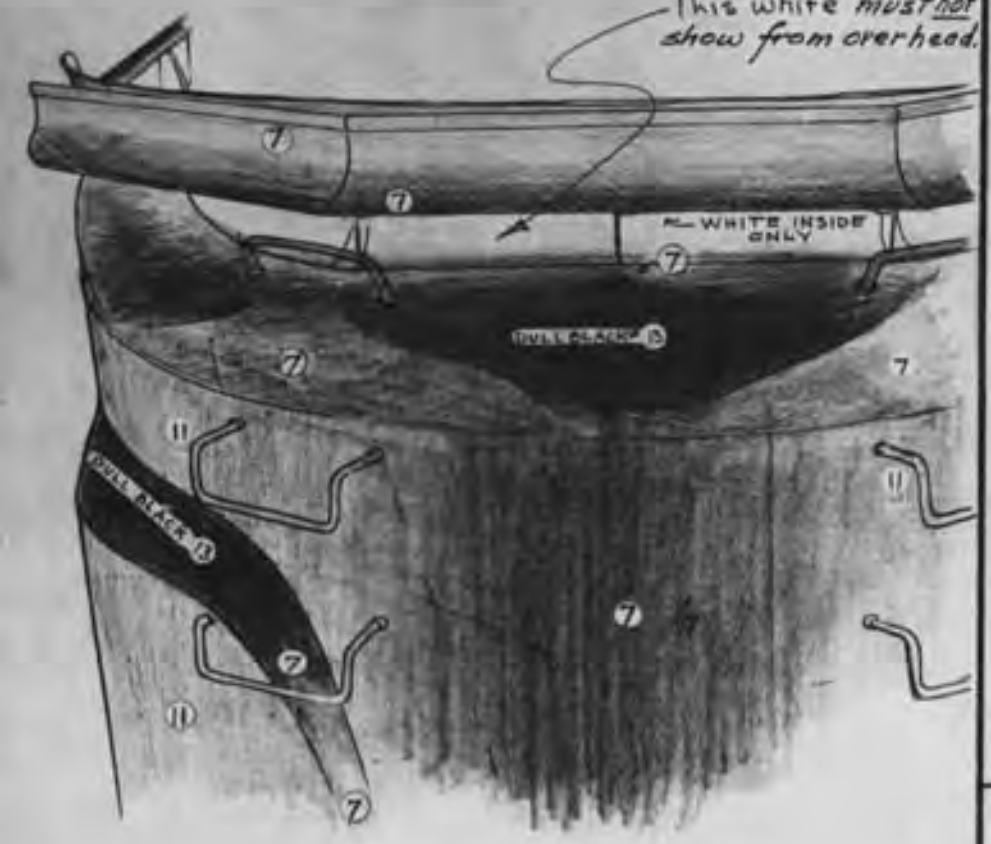


DETAIL NO. 15

GUIDE FOR COUNTER SHADING

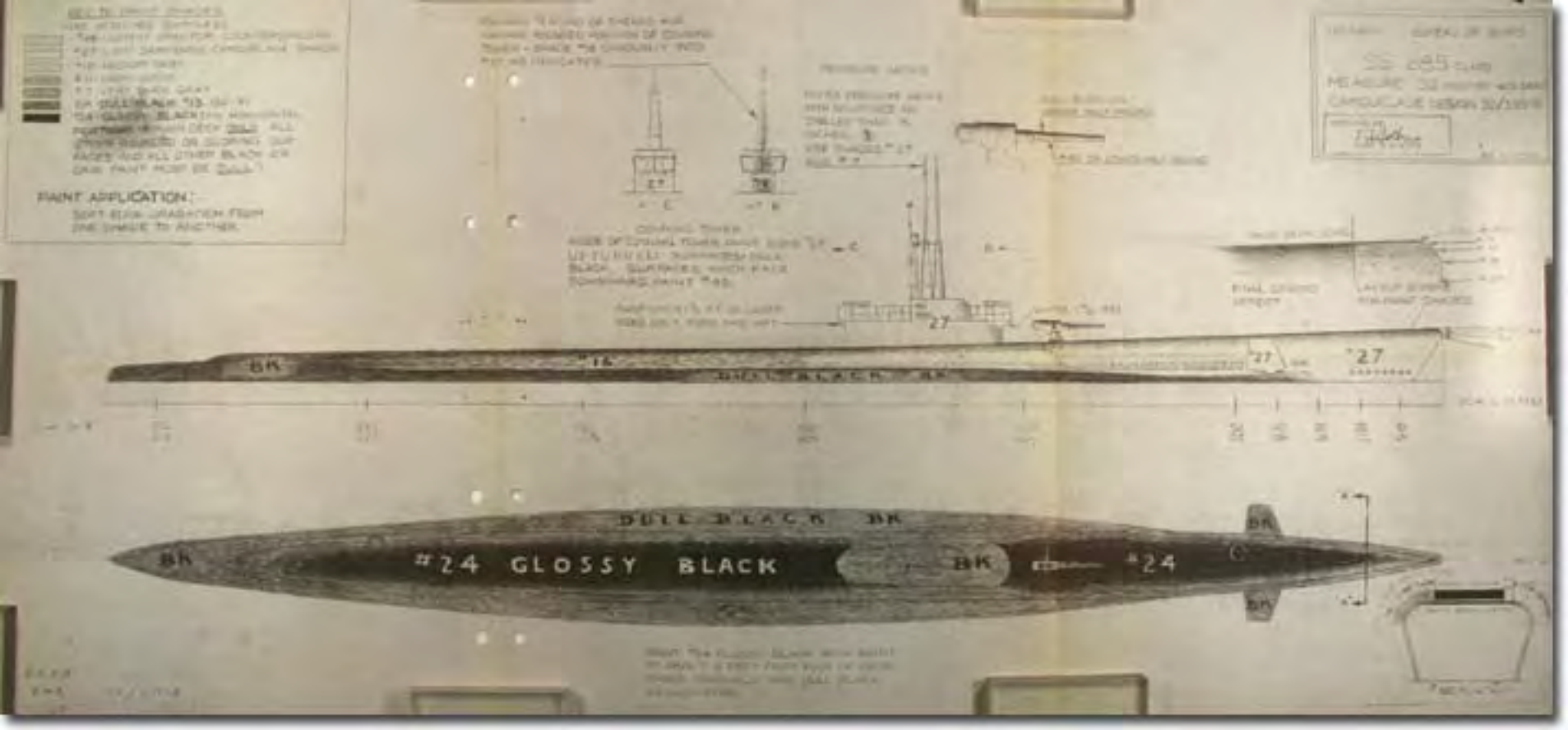
SUPPLEMENTARY INSTRUCTIONS FOR CAMOUFLAGE DESIGN

32/9-SS

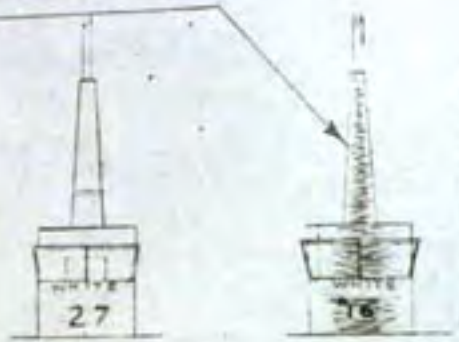
DETAILS
SHEET NO. 3 OF 3

BUREAU OF SHIPS, BY
Dayton R.E. Brown
DAYTON R. E. BROWN
LT. COMDR., U.S.N.R.

18 MARCH 1944


PAINT APPLICATION:
SOFT EDGE GRADATION FROM ONE SHADE TO ANOTHER.
BK
#24 GLOSSY BLACK
DULL BLACK BK
#24

FORWARD ¼ ROUND OF SHEARS AND FORWARD ROUNDED PORTION OF CONNING TOWER – SHADE #16 GRADUALLY INTO #27 AS INDICATED.



AT C' AT B

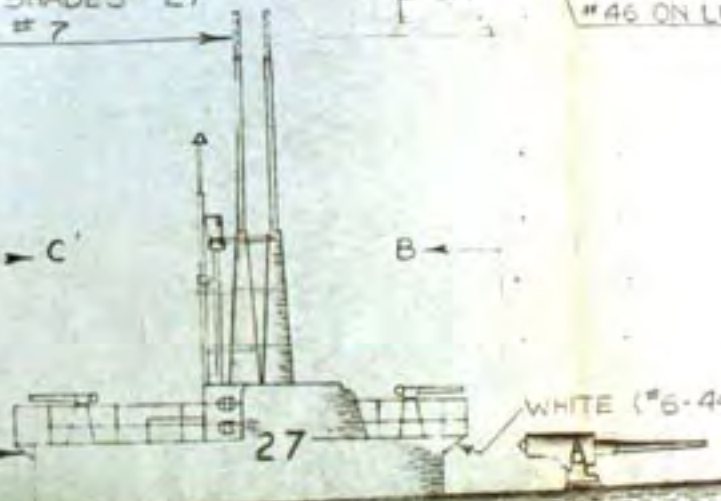
PERISCOPE NECKS

MOTTLE PERISCOPE NECKS WITH SPLOTCHES NO SMALLER THAN 5 INCHES. USE SHADES #27 AND #7

CONNING TOWER

INSIDE OF CONNING TOWER, PAINT SIDES #27

UPTURNED SURFACES, DULL BLACK. SURFACES WHICH FACE DOWNWARD, PAINT #46.



PAINT WHITE (#6-44) ON UNDER SIDES ONLY, FORE AND AFT

WHITE (#6-44)

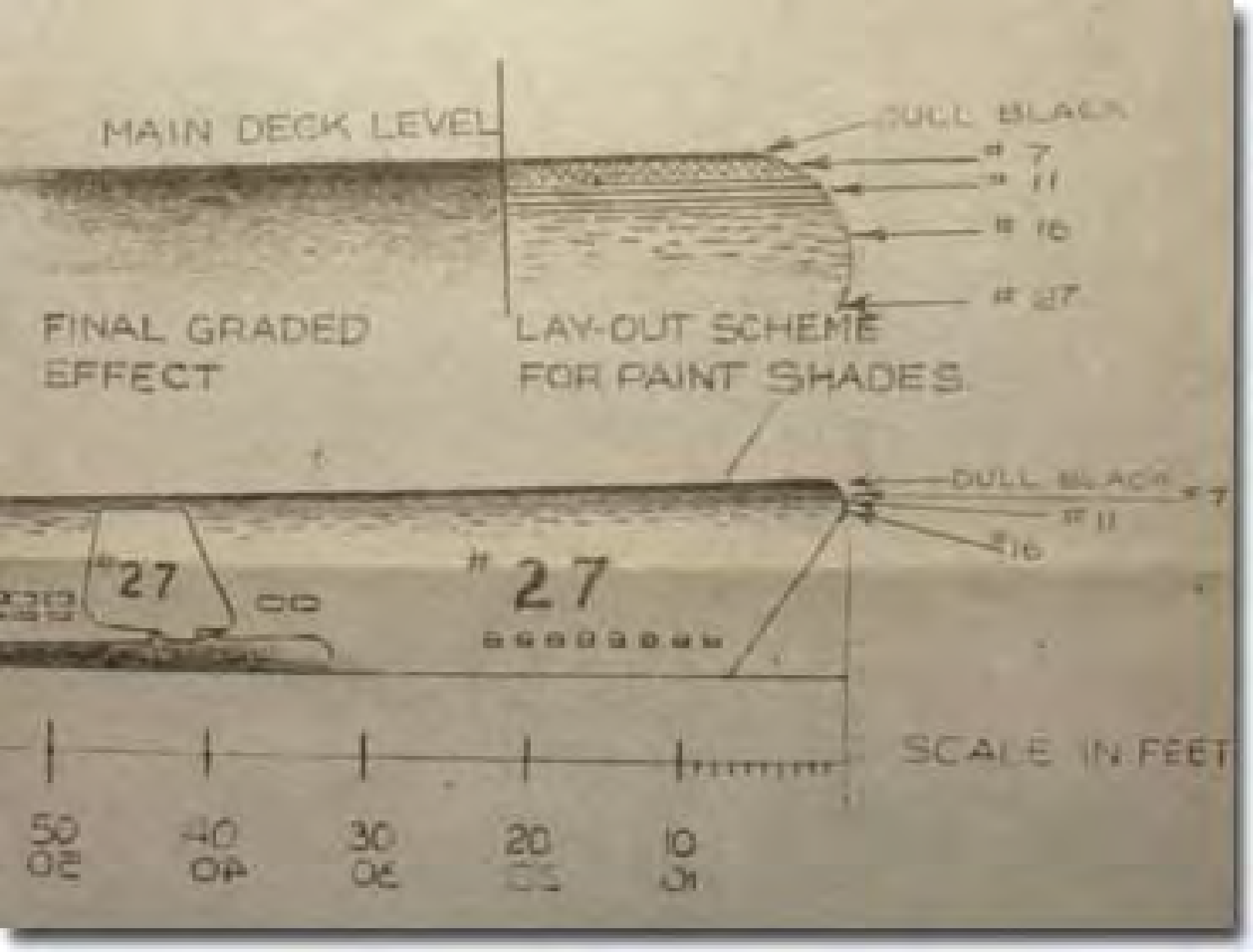
#16

DULL BLACK BK

20'

150'

100'


MAIN DECK LEVEL
DULL BLACK
7
11
16
27
FINAL GRADED EFFECT
LAY-OUT SCHEME FOR PAINT SHADES.
DULL BLACK
7
11
16
27
27
SCALE IN FEET
50
40
30
20
10