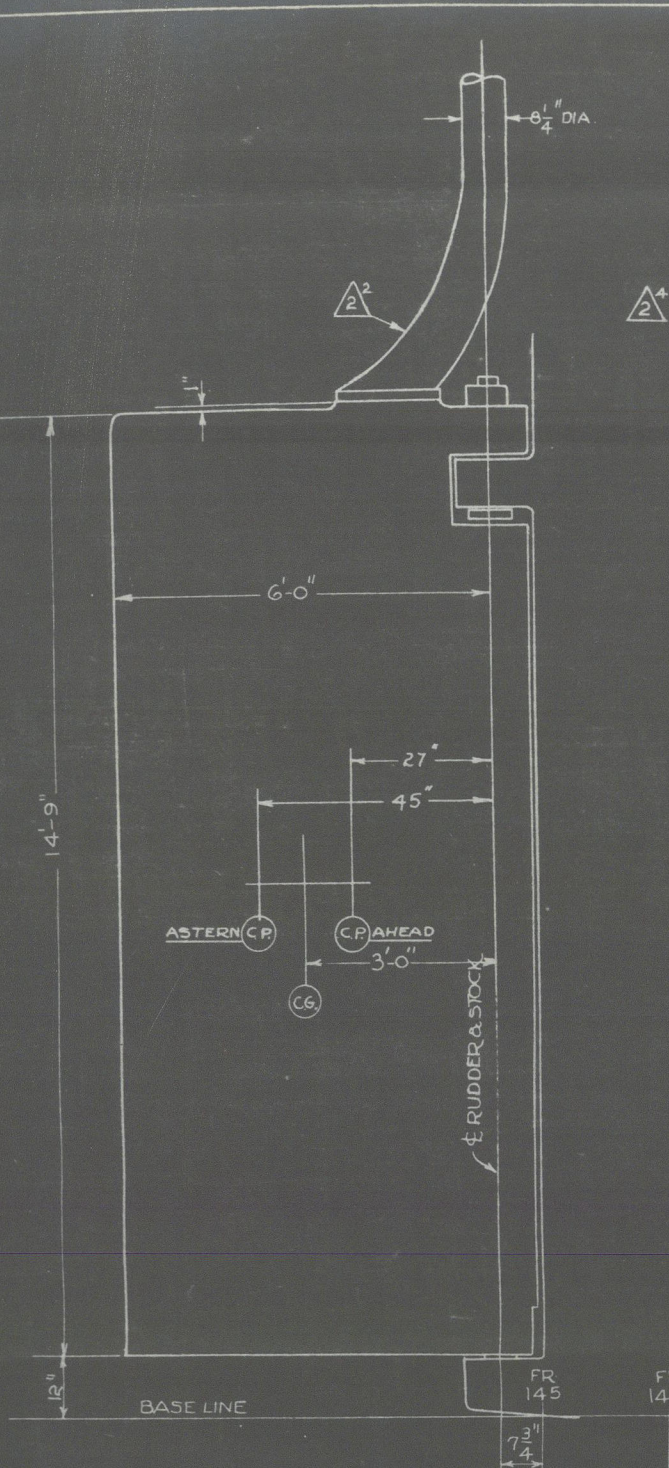


MATERIAL BILL FOR ONE SHIP														
PC NO.	NAME	PANEL DET.	NO. OF PCS.	MATERIAL	MAT. MARK	UFCO.	C.H. REF.	DESCRIPTION	MANUFACTURE OR EQUAL	CATALOG REFERENCE	DETAILS PLAN NO.	EST. WEIGHT UNIT TOTAL	ORDERED PLAN NO.	REG. NO.
1	RUDDER STOCK	B	1	FORGED STEEL				SEE GEN. NOTE NO. 3				2350 2350	3002	
2	KEY	A	2	MED. ST. L.G.				1 1/2 x 1 1/2 x 18 1/2 LG				42 84	3002	
3	KEY	A	2	MED. ST. L.G.				1 1/2 x 1 1/2 x 18 1/2 LG				42 84	3002	
4	SCREW, FLAT FILLISTER HEAD NUTS	B	6	BRASS				2" DIA. X 2 1/2 LG.				7 7	522-0-3	3002
5	EYE BOLT	B	1	FORGED STEEL				2" DIA. (ORDON' REF.)				7 7	522-0-3	3002

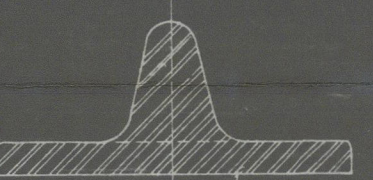
ORDERING DATA FOR MATERIAL BILL														
PC NO.	NAME	PANEL DET.	NO. OF PCS.	MATERIAL	MAT. MARK	UFCO.	C.H. REF.	DESCRIPTION	MANUFACTURE OR EQUAL	CATALOG REFERENCE	DETAILS PLAN NO.	EST. WEIGHT UNIT TOTAL	ORDERED PLAN NO.	REG. NO.
1	RUDDER STOCK	B	1	FORGED STEEL				SEE GEN. NOTE NO. 3				2350 2350	3002	
2	KEY	A	2	MED. ST. L.G.				1 1/2 x 1 1/2 x 18 1/2 LG				42 84	3002	
3	KEY	A	2	MED. ST. L.G.				1 1/2 x 1 1/2 x 18 1/2 LG				42 84	3002	
4	SCREW, FLAT FILLISTER HEAD NUTS	B	6	BRASS				2" DIA. X 2 1/2 LG.				7 7	522-0-3	3002
5	EYE BOLT	B	1	FORGED STEEL				2" DIA. (ORDON' REF.)				7 7	522-0-3	3002

PRINTS ISSUED

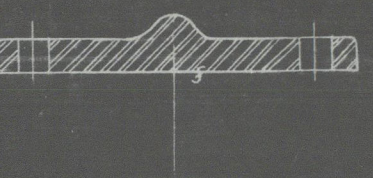
PRINT NO.														
PC NO.	NAME	PANEL DET.	NO. OF PCS.	MATERIAL	MAT. MARK	UFCO.	C.H. REF.	DESCRIPTION	MANUFACTURE OR EQUAL	CATALOG REFERENCE	DETAILS PLAN NO.	EST. WEIGHT UNIT TOTAL	ORDERED PLAN NO.	REG. NO.
1	RUDDER STOCK	B	1	FORGED STEEL				SEE GEN. NOTE NO. 3				2350 2350	3002	
2	KEY	A	2	MED. ST. L.G.				1 1/2 x 1 1/2 x 18 1/2 LG				42 84	3002	
3	KEY	A	2	MED. ST. L.G.				1 1/2 x 1 1/2 x 18 1/2 LG				42 84	3002	
4	SCREW, FLAT FILLISTER HEAD NUTS	B	6	BRASS				2" DIA. X 2 1/2 LG.				7 7	522-0-3	3002
5	EYE BOLT	B	1	FORGED STEEL				2" DIA. (ORDON' REF.)				7 7	522-0-3	3002



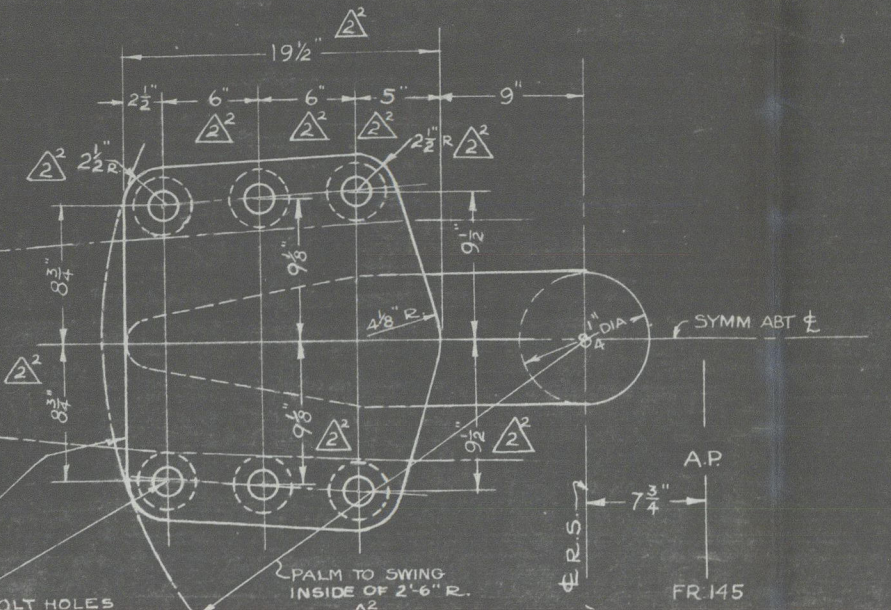
STOCK & RUDDER
SCALE 1/2" = 1'-0"



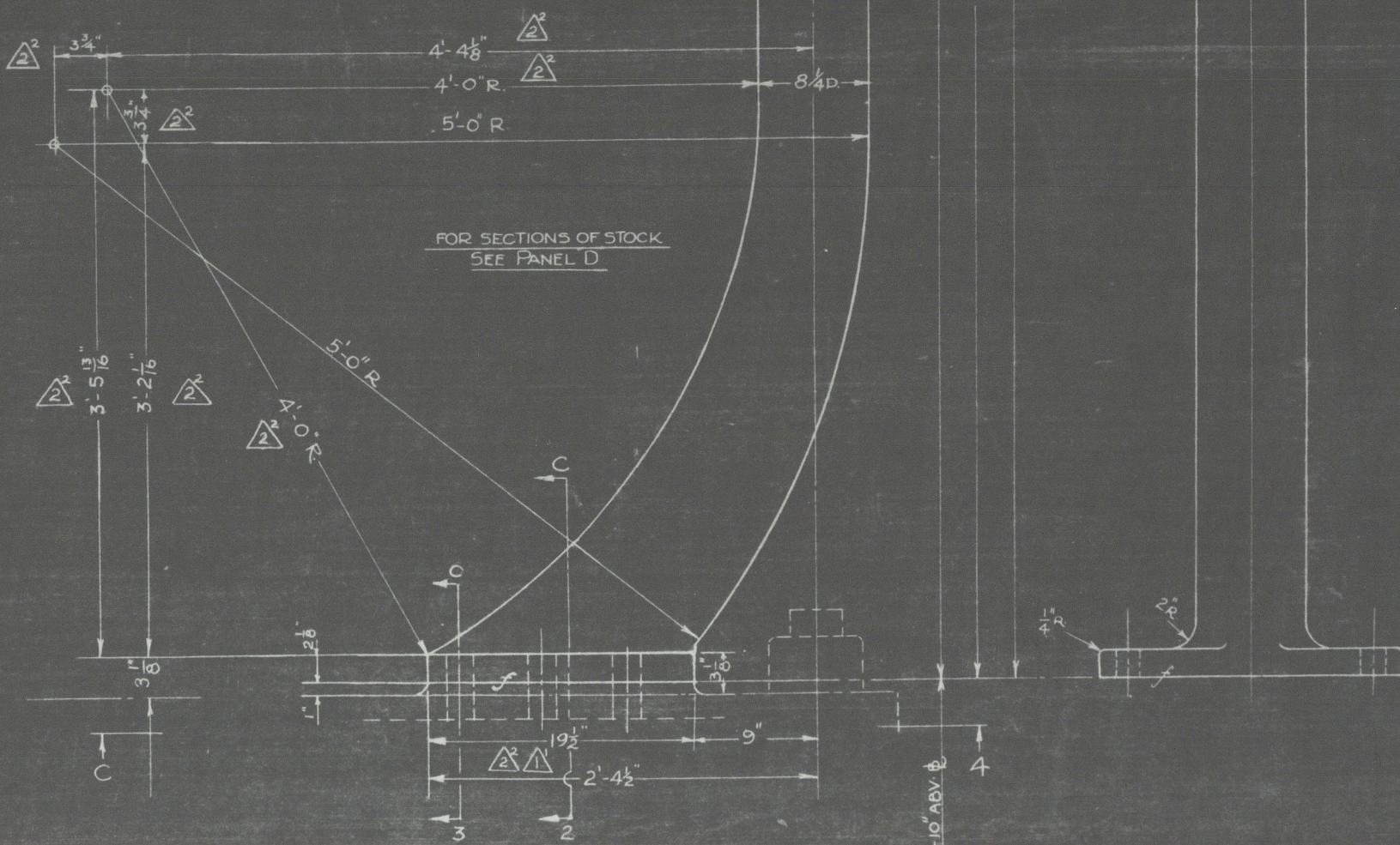
SECTION C-2



SECTION C-3



VIEW C-4
SCALE 1/2" = 1'-0"



STARBOARD ELEVATION
SCALE 1/2" = 1'-0"

RUDDER STOCK CALCULATIONS

LENGTH OF SHIP BETWEEN PERPENDICULARS 320'-0"
 BEAM OF SHIP, MOLDED 50'-0"
 DEPTH OF SHIP, MOLDED, AMIDSHIPS 18'-0"
 DRAFT 18'-0"
 V = 12.5 KNOTS (MAX. SPEED AHEAD) - 7 KNOTS (MAX. SPEED ASTERN)
 A = RUDDER AREA = 6'-0" X 14'-9" = 88.5 SQ. FT.
 RUDDER AREA COEFFICIENT = 88.5 X 100 = 1.547
 DRAFT = 320 X 18
 C = SIN 35°
 K = 76 AHEAD - 19 ASTERN
 A = RUDDER AREA IN SQ. FT.
 V = SPEED IN KNOTS
 AHEAD CONDITION
 $P = 4.6 \times \frac{\sin 35^\circ}{39 + .01 \sin 35^\circ} \times 75 \times 88.5 \times 12.5^2$
 $P = 37020$
 ASTERN CONDITION
 $P = 4.6 \times \frac{\sin 35^\circ}{39 + .01 \sin 35^\circ} \times 75 \times 88.5 \times 7^2$
 $P = 13940$
 DISTANCE TO CENTER OF PRESSURE FROM 1/4 OF RUDDER STOCK = 375 X 72 = 27'
 TWISTING MOMENT AHEAD AT 12.5 KNOTS = 37020 X 27 = 999,540 IN. LBS.
 TWISTING MOMENT ASTERN AT 7 KNOTS = 13940 X 45 = 627,300 IN. LBS.
 A.B.S. FORMULA FOR STOCK DIA. = $\sqrt[3]{\frac{3 \times \text{TWISTING MOMENT}}{16 \times \pi \times \text{SHEAR STRESS}}}$
 $= \sqrt[3]{\frac{3 \times 999,540}{16 \times \pi \times 10,000}} = 10.33"$
 AREA PER BOLT (6 BOLTS) = $\frac{16.31}{6} = 2.71$ SQ. IN. AREA PER 2 BOLT = 3.14 SQ. IN.
 MATERIAL OUTSIDE BOLT HOLES (A.B.S.) = 3/4" DIA. BOLT .66 X 2.00 = 1.32
 HORIZONTAL FORCE (DIST. CENTER OF SYSTEM OF BOLTS = 37020 X 27 = 999,540)
 $P = \frac{999,540}{2.0} = 499,770$
 FORCE PER BOLT = $\frac{499,770}{6} = 83,295$
 SHEARING STRESS PER BOLT = $\frac{83,295}{3.14} = 26,525$ PSI
 BEARING STRESS = $\frac{83,295}{2 \times 2.125} = 19,500$ PSI

GENERAL NOTES

1. MATERIAL TO COMPLY WITH A.B.S. CLASSIFICATION REQUIREMENTS, TESTS & INSPECTION.
2. MOLD LOFT TO FURNISH ALL NECESSARY TEMPLATES TO PATTERNMAKER.
3. RUDDER STOCK PC NO. 1 MAY BE MADE OF CAST STEEL.
4. RUDDER STOCK MANUFACTURER TO SUBDRILL THE RUDDER STOCK SIX PALM COUPLING BOLT HOLES TO 1 1/2" DIAMETER. THE 2" DIAMETER FITTED BOLTS ARE SHOWN IN DETAIL B-2 ON PLAN, REF. NO. 1.
5. FINISH REAMING OF BOLT HOLES TO FINAL DIAMETER WITH STOCK & RUDDER ASSEMBLED TO BE DONE BY SHIPYARD.

REFERENCE PLANS

G.G.S. PLAN NO. V-1700 ... 522-0-2 ... ALT. 4

RUDDER STOCK

SCALE: AS SHOWN DATE: 11-1-44
 DRN. HAK. TR. CHK. R.H.M. APP. J.M. Gilling
 C.I.M. AVI CARGO SHIPS
 U.S. MARITIME COMMISSION HULL NOS. 2101 THRU 2112
 GEORGE G. SHARP, 30 CHURCH STREET, NEW YORK
 U.S.M.C. APPROVAL STAMP
 U.S. MARITIME COMMISSION
 APPROVED AS NOTED IN
 M.C. LTR. DATED SEPT. 20, 1943
 M.C. LTR. FILE NO. 522 (HFA)
 BY T. GRANTON
 PRINCIPAL NAVAL ARCHITECT

SHIPYARD: KAISER, SAN FRANCISCO, CALIF.
 YARD HULL NO.: 58
 THRU 69
 U.S.M.C. HULL NO.: 2101 THRU 2112
 SHOWN AREA IS KEY TO LOCATION OF PLAN SHOWN ON THE SHEET
 G.G.S. PLAN NO. V-1700-522-0-2 ALT. 4
 U.S.M.C. PLAN NO.
 BUILDERS PLAN NO.
 SHEET DIMENSION: 27 1/2" X 44 1/2"
 SHEET AREA: 1226.51 SQ. IN.

"SOMMEN" ★

Rudder stock

RECORDS DEPT.,
LONDON

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Lloyd's Register
Foundation

003409-003416-0037