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SECTION S21-1

HYDRAULIC POWER TRANSMISSION SYSTEM (dated 1 July 1954)

S21-1-a. Scope

S21-1-b. Definitions

S21-1-c. Design

Page 1, lines 31-33, "Hydraulic---MIL-L-15017" not applicable, substitute "~~Hydraulic liquid shall be~~

"Hydraulic fluid shall be a fire and explosion resistant (safety) type conforming to Military Specification MIL-L-19457. Petroleum oil contamination of safety type hydraulic fluid from any source shall not exceed 2 percent by volume."

Lines 38-42, "with---4500 p.s.i." not applicable, substitute "Design the main and vital hydraulic systems for a maximum working pressure of 1500 p.s.i. Total pressure under hydraulic shock shall not exceed 4500 p.s.i."

"The working pressure in piping, valves and fittings in return lines shall be based on oil supply tank pressure plus expected pressure drop between operating gear and the oil supply tank."

After line 51, add "The increase in pressure due to hydraulic shock, $P_s$, shall be added to the maximum design working pressure and when this total is in excess of the system test pressure, the total pressure shall be used to determine the proper wall thickness in piping in accordance with section S48-0."

Lines 56-59, "Piping---section" not applicable, substitute "Design piping for hydraulic systems in accordance with section S48-0 using stresses as specified in that section and pressures as specified above."



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Page 2, lines 22-23. "Ordnance Standard 63" not applicable, substitute "section S48-0"

Lines 76-81 "Gray---approval." not applicable, substitute "~~High grade cast iron~~ (nodular iron) (cast iron) in accordance with Mil. Spec. MIL-I-17166 or Fed. Spec. QQ-I-652, class 40 or better, shall be considered along with the usual steel, bronze and aluminum materials for cases or bodies of components used in hydraulic systems. Use of ~~high grade~~ cast iron materials will be acceptable under the following conditions:

(a) When the pumps or motors are selected from the qualified products list available with the applicable specification. (nodular or)

(b) When pressure, volume and directional control valves are a gasket (panel) mounted type.

All other uses of cast iron in hydraulic systems shall be submitted for approval by the Bureau."

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Lines 82-84, "The---avoided" not applicable, substitute "Cadmium plating shall not be applied to any part of hydraulic equipment which may be in contact with hydraulic fluid.

"Cadmium plating or zinc plating shall not be used on surface of internal parts which are in moving-wearing contact during operation.

"Internal surfaces of components in contact with fire resistant hydraulic fluids shall not be painted.

"All O-ring packings and gaskets where used shall be in accordance with Military Specification MIL-P-5516 or MIL-P-18017 except for material which shall be a butyl rubber compound compatible with safety type hydraulic fluid. Rod and rod packings shall be in accordance with Specification MIL-P-21099. Valve stem packings shall be a braided asbestos, teflon impregnated type such as Garlock Packing Company Style 5861. All other packings shall be a safety fluid resistant type as approved by the Bureau."

Quad rings may be used in place of O-rings providing the rubber compounds are compatible with the fluid being used."

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S21-1-d. Components

Page 2, line 51, after "MIL-P-17869" add "except that the equipment may also qualify by having previously had at least two years of satisfactory operation on board submarines in a similar application."

Line 112-Page 3, line 12, "Accumulators---System" not applicable, substitute "Piston type accumulators shall be used. Accumulators shall be designed to withstand five times the working pressure of the hydraulic system. Accumulators shall be of standardized design as shown on BuShips plans.

Line 14, after "Copper" add ", copper-base alloy".

Line 20, "N.D. Spec. 46Z3, see section S19-3." not applicable, substitute "Mil. Spec. MIL-Z-17871, see section S19-3, except when the reservoir is bounded by the pressure hull, in which case the tank shall be painted ~~in accordance with Section S19-1 for lube oil tanks~~ with an epoxy resin type paint as approved by the Bureau."

Lines 22-24 "All---cleaning" not applicable, substitute "When it is necessary to stress-relieve welded tanks the heat treatment shall be accomplished before cleaning. See section S9-1."

[redacted] After line 61, add "Full flow filter elements shall comply with Mil. Spec. MIL-F-5504 and shall be capable of removing particles 10 microns or greater in size. Pilot valves in servo control systems shall be protected on the high pressure side by individual full flow filters." Done Item 447

Lines 66-76, "Portable---filter" not applicable.

Line 80, "be large enough" not applicable, substitute "be sized in accordance with section S48-9".

Lines 99-100, "150 percent---margin." not applicable, substitute "1-2/3 times the design system working pressure."

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