



Navy Replenishment Oiler *Wichita* (1968)

Design Type: Auxiliary
Official Number: AOR-1



PRINCIPLE CHARACTERISTICS

BUILDER: GENERAL DYNAMICS CORPORATION

BUILT: 1969

LOA: 658'-0"

BEAM: 96'-0"

DRAFT: 33'-3"

SPEED: 20 KNOTS

PROPULSION: TWIN-SCREW PROPELLER, 32,000 SHAFT-HORSEPOWER, 3 FOSTER & WHEELER BOILERS, 2 ELECTRIC TURBINES P&S

TONNAGE: 37,360 TON (GROSS)

DISPLACEMENT: 14,048 TONS (LIGHTWEIGHT)
39,790 TONS (FULL LOAD)

COMPLEMENT: OFFICERS 22
ENLISTED 398

ARMAMENT: 2 PHALANX CIWS (CLOSE IN WEAPONS SYSTEM)
MK 29 SEA SPARROW MISSILE LAUNCHER

AIRCRAFT: 2 CH-46E SEA KNIGHT HELICOPTERS



USS WICHITA, CIRCA 1968. U.S. NAVY PHOTOS



THE USS *WICHITA* WAS THE FIRST OF SEVEN SHIPS DESIGNED AS AUXILIARY REPLENISHMENT OILERS (AOR) THAT SERVED IN THE U.S. NAVY. THE NAVY BASED THE DESIGN OF THE *WICHITA* CLASS ON THE *SACRAMENTO* (AOE-1), WHICH WAS A FAST COMBAT SUPPORT SHIP. THE AOR WAS SLIGHTLY SMALLER, SLOWER, AND CARRIED LESS CARGO THAN AN AOE, BUT RETAINED THE SAME CONFIGURATION FOR TRANSFERRING SUPPLIES.

WICHITA SERVED FOR TWENTY-FOUR YEARS IN THE U.S. NAVY AND WAS THE SECOND SHIP NAMED AFTER THE CITY OF WICHITA, KANSAS. SHE EARNED FOUR BATTLE STARS IN VIETNAM, THE COVETED BATTLE EFFICIENCY AWARD, THE NAVY EXPEDITIONARY MEDAL, THE HUMANITARIAN SERVICE MEDAL, AND THE ARMED FORCES EXPEDITIONARY MEDAL.

THIS PROJECT WAS COSPONSORED BY THE HISTORIC AMERICAN ENGINEERING RECORD (HAER) AND THE U.S. MARITIME ADMINISTRATION, DEPARTMENT OF TRANSPORTATION (MARAD). THE PROJECT WAS COORDINATED BY ERHARD KOEHLER (MARAD), BARBARA VOULGARIS (MARAD) AND TODD CROTEAU (HAER). THE TEAM CONSISTED OF ARCHITECTS BRYAN DUBARD AND ASHLEY WALKER, HISTORIAN BRIAN CLAYTON, AND PHOTOGRAPHER JET LOWE.



NOTE: COURSES DEPICTED ON MAP ARE ABSTRACTED TO CONNECT LOCATIONS. THEY DO NOT REPRESENT THE EXACT COURSES TRAVELED.

HISTORIC AMERICAN ENGINEERING RECORD

Wichita (AOR-1)

HAER No. CA-356

Location: Suisun Bay Reserve Fleet, Benicia vicinity, Solano County, California

Type of Craft: Auxiliary

Trade: Replenishment oiler

Principal Dimensions: Length (oa): 658'
Beam (molded): 96'
Draft: 33'-3"
Displacement: 40,100 long tons
(The listed dimensions are current, but it should be noted that draft, displacement, and tonnages were subject to alteration over time as well as variations in measurement.)

Dates of Construction: Keel laying: 16 June 1966
Launching: 16 March 1968
Commissioned: 7 June 1969

Designer: U.S. Navy—Bureau of Construction and Repair

Builder: General Dynamics Corporation, Quincy, Massachusetts

Present Owner: U.S. Maritime Administration

Disposition: Decommissioned 12 March 1993; currently inactive and housed in the National Defense Reserve Fleet

Significance: The *Wichita* is significant as the first of seven ships designed as auxiliary replenishment oilers (AOR) that served in the U.S. Navy. The *Wichita* class design was based on the *Sacramento* (AOE-1), which was a fast combat support ship. The AOR was slightly smaller and slower and carried less cargo than the AOE, but it retained the same configuration for transferring supplies. The *Wichita* served for twenty-four years in the U.S. Navy and earned four battle stars in the Vietnam War. These honors included the coveted Battle Efficiency Award, the Navy Expeditionary Medal, the Humanitarian Service Medal, and the Armed Forces Expeditionary Medal.

Historian: Brian Clayton, HAER Contract Historian, summer 2009

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The project was prepared under the direction of Todd Croteau (HAER Maritime Program Coordinator). Ashley Walker (HAER) generated vessel drawings. Jet Lowe (HAER Photographer) produced the large-format photographs. Special thanks to Erhard Koehler (U.S. Maritime Administration) whose help and assistance greatly benefited this project.

BACKGROUND

The USS *Wichita* (AOR-1) was the first ship in a class of seven replenishment oilers specifically built for the U.S. Navy during the Cold War. The navy based the design of the *Wichita* on the USS *Sacramento* (AOE-1), a fast combat support ship that provided logistics for an aircraft carrier battle group (CV). The *Wichita* was a smaller version of the USS *Sacramento* and designed to function as a one-stop resupply vessel for an anti-submarine warfare group (ASW). The *Wichita* carried less cargo, had a smaller crew, and traveled at a reduced speed, which suited the needs of the ASW units since they were centered on modified *Essex* class carriers (CVS).¹ Although the U.S. Navy designed the *Wichita* class for a specific mission, it also utilized the class as an economical alternative to the larger and more expensive AOE's. The U.S. Navy soon recognized the limitations of the AOR when it was attached to a carrier task force (CV), and the end of the Cold War signaled its early retirement as the ASW missions became less critical.²

The development of a one-stop resupply vessel began in earnest during the Korean War as the U.S. Navy identified shortcomings in its tactical pursuit, most notably in underway replenishment (UNREP). The attack carriers were spending every fourth day away from the battlefield to take on supplies. During replenishment by merchant ships, ammunition had to be broken out twenty-four hours in advance and stored on the upper deck, which was hazardous in inclement weather. In addition, the resupply ships experienced a high rate of booms breaking down when transferring goods, known as "tight lining." These issues resulted in Adm. William M. Fechteler, Chief of Naval Operations (CNO), convening a conference to address the issues with UNREP in 1952 in San Francisco. The conference laid the groundwork for the development of new support ships. To compensate for boom failures, a U.S. Navy Bureau of Ships research project examined developing a counterweight inside a kingpost to tension the line at a predetermined weight even as the ship rolled, pitched, or yawed in the sea. Problems persisted even with the new system, however, and it was ultimately replaced by the pneumatic ram-tensioner.³

The navy also activated the *Dithmarschen*, a German combination oiler and supply vessel the United States had received in 1946 from the Inter-Allied Reparations Commission. The *Dithmarschen* had operated in the Norwegian fjords as a supply ship carrying ammunition, fuel, and stores during World War II. The U.S. Navy renamed the vessel the *Conecuh* (AOR-110) and converted it into a replenishment fleet tanker in September 1952. The *Conecuh*'s performance during extensive testing impressed naval officials, who began to discuss designing the U.S. Navy's first multi-product ship. Adm. Arleigh Burke (CNO) called for another underway replenishment conference in 1957 to assess the state of the fleet. It was brought to his attention that the ships participating in UNREP had not made any significant gains since the last conference, and that new systems for resupplying ships needed to be developed. The success of the *Conecuh*'s operations convinced Admiral Burke that a

¹ See Appendix A for a comparison of the capacity plans of the AOE and the AOR.

² Marvin O. Miller, John W. Hammett, and Terence P. Murphy, "The Development of the U.S. Navy Underway Replenishment Fleet," *SNAME Transactions* 95 (1987): p. 138.

³ Miller, et al., "Development of the U.S. Navy," pp. 126-128.

review of the design should be undertaken. Eventually, the navy hired Bethlehem Shipbuilding to integrate the design of the *Conecuh* into a new supply ship for the fleet that combined the roles of oiler, ammunition ship, and store ship in one vessel.⁴

Bethlehem Shipbuilding's Central Technical Office in conjunction with Admiral Burke's staff created a draft for the fast combat support ship (AOE) and submitted it to the U.S. Navy for review. The resulting AOE "was the first UNREP ship to fully integrate the mission (supporting an aircraft carrier task force) with the UNREP ship design."⁵ After several modifications by the Bureau of Ships, the U.S. Navy laid the keel of the *Sacramento* (AOE-1) on 30 June 1961 at the Puget Sound Naval Shipyard. This was the first ship in the class of four AOE's specifically designed from the keel up to provide logistical support for an aircraft carrier battle group (CV). The *Sacramento* entered service on 14 March 1964. Traveling at 26 knots, the ship could maintain station with the battle group. It carried 5.2 million gallons of marine fuel, 2.7 million gallons of aviation fuel, 6,000 tons of ammunition, 300 tons of refrigerated stores, 500 tons of dry stores, and 150 tons of various fleet supplies. During underway replenishment missions, the ship could resupply a carrier on its port side and a screening vessel on its starboard side, as well as transfer fuel and supplies simultaneously. The ship performed faster than using three separate ships, and the design saved money, both in construction and operating expenditures.⁶

WICHITA CLASS

During the mid-1960s, the *Essex*-class aircraft carriers were modified for antisubmarine warfare (ASW). The auxiliary replenishment oilers (AORs) were developed at the same time as one-stop UNREP support vessels for the *Essex* class. The *Wichita* class was based on the *Sacramento* but was two-thirds the size of the AOE and slower to suit the needs of the ASW warfare group since ASW warfare did not require large amounts of ammunition or speed. The *Wichita* class consequently had an economical design and lower operating costs since it required a smaller crew.⁷

When the AORs went into service in the Vietnam War replenishing the carrier strike groups, the officers in command noted deficiencies in the design that prevented them from serving as low-cost alternatives to the AOE's. The ammunition capacities and transfer stations were not suited for the attack carrier, but the convenience of friendly bases in the region and the operating area of the carriers did not hamper UNREP operations. The U.S. Navy again

⁴ Miller, et al., "Development of the U.S. Navy," p. 128.

⁵ Miller, et al., "Development of the U.S. Navy," p. 128.

⁶ Miller, et al., "Development of the U.S. Navy," pp. 128-130; "USS Sacramento (AOE-1)," available at <http://navysite.de/ships/aoe1.htm>, accessed 21 June 2006. See Appendix A for a comparison between the AOE and the single product ships.

⁷ Miller, et al., "Development of the U.S. Navy," p. 138; Thomas Wildenberg, *Gray Steel and Black Oil: Fast Tankers and Replenishment at Sea in the US Navy, 1890-1990* (Stanford, CA: Stanford University Press, 1994), p. 240; George W. Baer, *One Hundred Years of Sea Power: The U.S. Navy 1890-1990* (Stanford, CA: Stanford University Press, 1994), pp. 338, 348. During the development phase of the AOR, U.S. naval doctrine was based on containment policy, meaning the navy's role was to surround the Soviet Union with offensive forces and the blue water in between (power projection and sea control).

recognized the limitations of the AORs during Persian Gulf operations at the time of the Iranian Revolution in 1979. In that theater, the nearest friendly base was Diego Garcia, which was 4,000 miles away, and senior commanders noted the AORs deficient speed and cargo capacities.⁸

The role for which the *Wichita* had been designed changed in the post-Vietnam War era. The defense department experienced large budget cuts, and the U.S. Navy sought to minimize the effects by retiring some of the older vessels. The expensive *Essex*-class carriers used for ASW missions were cut back as the navy's doctrine shifted from sea control to power projection. Eventually, the navy decommissioned the *Essex* class, and the AORs began to replenish the carrier battle groups in the fleet. After another wave of budget cuts hit the military at the end of the Cold War, the navy retired the *Wichita* class in the early 1990s.⁹

CONSTRUCTION

The U.S. Navy awarded the *Wichita* contract to General Dynamics' Fore River Yard in Quincy, Massachusetts, on 2 June 1965. Thomas Watson had opened the shipyard in 1901 as the Fore River Engine Company.¹⁰ The property was 10 miles south of Boston near Quincy and occupied 111 acres along the Fore River. The company changed hands in 1913 when Bethlehem Steel bought it. Bethlehem Steel operated a successful shipbuilding business until 1963 when a budgetary crisis forced its sale to General Dynamics Corporation. In 1981, the federal government ended its shipyard subsidy program, and the shipyard began to suffer financially as a result. General Dynamics launched its last ship in 1986 after constructing six ships in the *Wichita* class. National Steel and Shipbuilding Company in San Diego, California, built the last one: the USS *Roanoke*.¹¹

DESCRIPTION

The *Wichita* measured 658' long overall with a breadth of 96' and 33'-3" draft. The hull was steel, as was the superstructure. The ship maintained a raked bow, battleship stern, and two islands, including a forward conning station and an aft deckhouse. For added stability, the design incorporated bilge keels on the port and starboard sides of the hull and a skeg at the stern that followed the keel outward. The American Bureau of Shipping rated the vessel at 37,360 gross tons, and it displaced 13,662 tons of water. The twin-screw propulsion plant generated 32,000 shaft horsepower to propel the vessel at 20 plus knots.¹²

⁸ Miller, et al., "Development of the U.S. Navy," p. 138; Wildenberg, *Gray Steel and Black Oil*, p. 241.

⁹ Baer, *One Hundred Years of Sea Power*, pp. 338, 348, 409, 445; Wildenberg, *Gray Steel and Black Oil*, p. 266.

¹⁰ Thomas Watson was Alexander Graham Bell's young assistant when Bell was developing the telephone.

¹¹ "General Dynamics Corporation," available at <http://www.fundinguniverse.com/company-histories/General-Dynamics-Corporation-Company-History.html>; "Quincy Shipbuilding Division, General Dynamics Corp, Fore River Shipyard, Quincy, MA," available at <http://www.globalsecurity.org/military/facility/quincy.htm>; "A History of Shipbuilding at Fore River," available at <http://thomascranelibrary.org/shipbuildingheritage/history/historyindex.html>, accessed 28 July 2009; Wildenberg, *Gray Steel and Black Oil*, p. 284.

¹² Miller, et al., "Development of the U.S. Navy," p. 141; *Booklet of General Plans USS Wichita (AOR-1)*, plates 2-3, in Record Group 19, National Archives and Records Administration-College Park, Maryland (hereafter cited as NARA-College Park).

The machinery spaces were divided into three separate watertight areas. The aft fire room contained three Foster and Wheeler boilers that provided steam for the main turbines and auxiliary equipment. The working steam pressure was 700 psi at 850 degrees Fahrenheit. Each boiler had three Todd burners for combustion. In the forward machinery room, there were two General Electric turbines on the port and starboard sides. Each turbine utilized high and low pressures for maximum efficiency, and a General Electric double reduction gear stepped the shaft revolutions down to 105 rpm (maximum power). Two General Dynamic service generators rated at 450 volts were located on the upper platforms. The aft steering compartment housed two Western Gear electric-hydraulic rams that were double-opposed and turned each rudder simultaneously.¹³

Most of the space on board the *Wichita* was devoted to carrying petroleum products. The ship could carry 7,100,000 gallons of cargo fuel, including aviation gas, JP-5 (jet propellant), and marine fuel. The tanks varied in size and ran forward from the machinery area up to frame 25. Saddle tanks also protected the two cargo weapon spaces deep within the hull. A sophisticated control center above the aft pump room contained a control panel that remotely managed all the gates, pumps, and valves in the aft and forward pump rooms during underway replenishment evolutions.¹⁴

The remaining cargo space was devoted to ammunition, dry and refrigerated stores, and fleet supplies. The capacity plan for the *Wichita* allowed for 66,500 cubic feet of ammunition, 61,500 cubic feet of dry stores, and 15,000 cubic feet of refrigerated stores. There were two ammunition spaces: one forward of frame 59 and the other forward of frame 44. The aft weapons space was three decks deep while the forward one was two decks deep. An elevator passed through each space, and the crew used fork trucks to move the palletized ammunition up and out to the main deck for transfer. The second deck contained the rest of the storerooms, and a long corridor stretched between the two islands for the fork trucks. The refrigerated rooms were aft (port and starboard sides), and the dry store cargo room ran forward (port and starboard). A third elevator in the aft end allowed the fork trucks to carry palletized stores up and outside to the main deck. It also extended to the mezzanine deck, which allowed the fork trucks to drop off cargo on the stern helicopter pad so the ship's helicopter could pick up and deliver cargo to the receiving ship. The *Wichita* carried two Sea Knight helicopters for vertical replenishment (VERTREP) operations, which were stored in the aft deckhouse on the port and starboard sides of the 02 level. A vertical conveyor inside the starboard hangar could carry an 85-pound package from the second deck to the mezzanine deck for VERTREP delivery.¹⁵

The forward house contained a sea cabin and rooms that contributed to the safe navigation of the ship. The navigation bridge was in the forward house at the 03 level. The bridge was

¹³ Miller, et al., "Development of the U.S. Navy," p. 141; *Booklet of General Plans*, plate 9; site visit by author to Suisun Bay, California, July 2007.

¹⁴ Miller, et al., "Development of the U.S. Navy," p. 143; *Booklet of General Plans*, plates 4 and 9; site visit.

¹⁵ *Booklet of General Plans*, plates 4, 6, 8; site visit.

modern and contained the latest navigation equipment, including a compass, engine order telegraph, fathometer, gyro repeater, helm, and radar. Behind the bridge was the chart room and off to the sides were the bridge wings complete with peloruses. Below the pilothouse were two more starboard rooms used to operate the ship: the radar room and the command information center (CIC). The captain's sea cabin was to the port side of the radar room. Adjacent to this cabin was the navigation department office and on the far side of the port bulkhead was an operations office. The gyro room was inside the ship on the first platform, slightly forward of the amidships line.¹⁶

The 01 level in the forward house included berthing for senior officers serving on the ship. In the center of the house were two large cabins for the captain and commander of the underway replenishment group. Their staterooms were off the centerline, with the commander on the port side and the captain on the starboard side. The galley for both officers was aft of their rooms. More staterooms for senior officers were on the aft bulkhead and on the far port side.¹⁷

Ship offices, storerooms, and workrooms were in the deckhouse on the main deck. On the main deck of the forward house were a variety of communication spaces, including the cryptographic room used for decoding and encoding message traffic, the radio transmitter room, and radio central. Forward of the communication center was the first class lounge while off to the port and starboard sides were various storerooms and offices.¹⁸

The aft house contained a majority of the crew berthing spaces, the galley and mess rooms, offices, and storerooms. A majority of the space on board the ship was for the enlisted crew. The ship accommodated 398 enlisted personnel and twenty-two officers. The crew's berthing was stacked three high on the 01 level and main deck. The galley was on the main deck above the engineer room with the crew mess hall directly aft. Cooks served the sailors cafeteria style, and a scullery was towards the rear of the mess. The chief petty officer's mess room and wardroom were on the 01 level, located on the forward port and starboard sides. The offices and storerooms were on the 01 level in rooms on the centerline and the port side of the ship. Communal showers and washrooms were located beside the living spaces, while the officer rooms had private ones.¹⁹

Good health was important in the confined ship, so space was allocated for a doctor and medical staff. To treat patients for both minor and major maladies, there was a doctor's office and evaluation room on the 01 level near the stern that was equipped with an X-ray machine. Located in front of this office was an operating room and surgical dressing room. There was also a lab and pharmacy for diagnosing illnesses and prescribing medicine. Due

¹⁶ *Booklet of General Plans*, plates 2, 5, 6, 14.

¹⁷ *Booklet of General Plans*, plate 7.

¹⁸ *Booklet of General Plans*, plate 8.

¹⁹ *Booklet of General Plans*, plates 7, 8.

to the size of the crew, there were seven wardrooms with bunks for patient recovery, and the medical staff had accompanying rooms.²⁰

Morale was another important aspect of ship life, so there was space in which the crew could relax. An ice cream bar, library, post office, recreation room, and ship's store were located on the main deck near the stern. Crew members could relax in this section of the ship and purchase personal items. Movies could be relayed through closed circuit televisions from the motion picture equipment room on designated movie nights. The ship also had a barbershop and laundry department in the stern area of the second deck.²¹

To protect the ship against attack, there were four twin mounted 3"/50 caliber guns, two forward mounts on the bow directly in front of the house on the port and starboard sides, and two more on the stern 03 level, off the sides of the exhaust stack. Mk 56 gun directors, one forward and one aft, controlled each gun mount automatically. The gun director control room was beneath each mount, as was an ammunition store room. In the early 1980s, the navy modernized the ship by installing two Phalanx CIWS (Close In Weapons System), built by General Dynamics, on the bow and one Mk 29 Sea Sparrow missile launcher on the stern, built by General Dynamics and Raytheon.²²

The *Wichita* carried motor boats and life rafts that could safely accommodate all the personnel onboard. There were two 40' utility craft (seventy-five-person), two 26' motor whaleboats (twenty-two-person), and two 26' personnel craft (twenty-person). All the boats were located on the main deck and could be picked up and lowered into the water by a 20,000-pound cargo boom located at deck frame 52. The motor whaleboats were attached to self-lowering cradles. In case of sinking, the ship was equipped with twenty-seven static release life rafts (fifteen-person) that were capable of carrying the entire ship.²³

The *Wichita*'s crew performed general maintenance while underway and could conduct minor repairs. The boatswain storerooms were in the bow and stern of the ship, and there was a small repair area in the stern of the ship on the second deck. Crew in the mechanical and electric shops completed small tasks to keep the machinery operable for each department. Major repairs required the ship to dock in port.²⁴

UNDERWAY REPLENISHMENT TECHNIQUES

Initially, the U.S. Navy used the Fast Automatic Shuttle Transfer (FAST), developed in the early 1960s, in its UNREP operations. FAST was difficult to maintain, however, and the navy developed Standard Tensioned Replenishment Alongside Method (STREAM) as an alternative in the mid-1970s. The navy retained one component of the FAST system, the pneumatic ram tensioner, which was a device that kept a highline wire tensioned at a

²⁰ *Booklet of General Plans*, plate 7.

²¹ *Booklet of General Plans*, plates 7, 8, 9.

²² *Booklet of General Plans*, plates 3, 5, 7.

²³ *Booklet of General Plans*, plates 2, 8.

²⁴ *Booklet of General Plans*, plates 7, 8, 9.

predetermined weight. The ram tensioner would compensate for the movement between the two ships when they rolled, pitched, or yawed by paying out or taking in line through the movement of a vertical ram piston. The STREAM method used trolleys that traveled along the highline to deliver products.²⁵

The *Wichita* used two version of the STREAM method: one for fuel and the other for cargo. During refueling operations, a flexible hose measuring 7" in diameter with a male probe on one end was carried by trolleys along the highline by means of a span wire attached to a winch. When it reached the receiving ship, the probe would slide into a coupling and lock into place. The *Wichita*'s pumps could transfer 180,000 gallons of fuel per hour to the receiving ship, and there were four fueling stations on each side. The STREAM cargo transfer method worked in a similar manner by using a single trolley riding a highline back and forth as it carried a palletized load of cargo. There was a double-headed winch with one head paying out line and the other head taking it in to control the movement of the load. The *Wichita* also used a sliding block that lifted the highline up for the load to clear the rail as it traveled on the trolley. The receiving ship had a sliding block as well, and it lowered the load down for personnel to detach and store the cargo. There were two cargo stations on the port side and two on the starboard side. The ship's personnel managed the cargo movement through enclosed winch control stations.²⁶

OPERATIONAL HISTORY

On 7 June 1969, General Dynamics delivered the *Wichita* to the U.S. Navy. At the commissioning ceremony, Mrs. Howard B. Yeager christened the ship, and Capt. Robert B. Deibler took command. The ship set sail for the Boston Naval Shipyard for the final machinery installation. On 17 June, the ship departed for the new homeport of Long Beach, California. The *Wichita* made ports-of-call in the Caribbean at San Juan and Guantanamo before transiting the Panama Canal and heading to the West Coast. After arriving in Long Beach, the *Wichita* remained in port for four months while the navy modified the equipment. After the fitting out, the *Wichita* underwent sea trials and training cruises in December. The navy conducted further tests in February 1970 that lasted for two months. After shakedown, the ship sailed to join the fleet on 22 June for its first deployment.²⁷

The *Wichita* joined the Seventh Fleet on 4 July and made a port-of-call at Subic Bay before heading to the coast of Vietnam to support naval forces operating against North Vietnam. The ship made five UNREP stops and took on supplies at Subic Bay to complete the missions. After each replenishment stop, the *Wichita* made liberty calls in the Philippines and two port calls in Hong Kong. As the first deployment ended, the ship returned to Long

²⁵ Wildenberg, *Gray Steel and Black Oil*, p. 235-236; Miller, et al., "Development of the U.S. Navy," p. 132.

²⁶ Wildenberg, *Gray Steel and Black Oil*, pp. 234-237; Miller, et al., "Development of the U.S. Navy," p. 132; *Booklet of General Plans*, plate 8.

²⁷ U.S. Navy, *Dictionary of American Naval Fighting Ships*, vol. VIII (Washington, DC: Naval Historical Center, 1991), p. 291.

Beach on 2 February 1971 and spent six months operating off the West Coast conducting resupply missions as well as ports-of-call.²⁸

On 7 August 1971, the *Wichita* set sail for Subic Bay and arrived on 24 August to rejoin the Seventh Fleet on its second deployment to the Far East. At the end of August, the ship began provisioning the battle group operating off the coast of Vietnam. The *Wichita* continued operating off Vietnam and made a port-of-call in Sattahip, Thailand, towards the end of October. The ship continued its normal duties in November but was redirected on 10 December and assigned to a task force heading towards the Indian Ocean to observe the Indo-Pakistani War and react if necessary. The *Wichita* returned to the coast of Vietnam in early January 1972 and began regular duty supplying the battle group that was participating in the war. The ship continued resupplying the fleet until February as it set sail for Long Beach for an overhaul. On 31 March, the *Wichita* arrived home and went to Hunters Point Naval Shipyard for repairs.²⁹

After completing the yard visit, the *Wichita* returned to the Philippines on 17 July and arrived in Subic Bay on 4 August 1972. The ship resumed underway replenishment duties off the coast of Vietnam and remained in the operational area for the next six months. In Subic Bay, the *Wichita*'s holds were stocked, and the ship traveled back and forth to the battle group. The ship made ports-of-call in Hong Kong and Sattahip before returning to the United States on 16 March 1973. The end of the ship's deployment marked the closing stages of American operations in the Vietnam War.³⁰

After the war, the *Wichita* continued to support the Seventh Fleet, traveling between the West Coast of the United States and the Far East. The first tour lasted six months as the ship resupplied the fleet off the West Coast. For its next assignment, the navy sent the *Wichita* to the Indian Ocean, where it operated with a carrier task force from the Seventh Fleet supplying the group. The *Wichita* returned to its homeport at Long Beach on 26 March 1974, remaining in port for a short time before heading out to sea and operating off the West Coast. On 28 June, the navy moved the *Wichita* back to the Long Beach Naval Shipyard for repairs, and it remained in the shipyard for ten months.³¹

After the refit, the navy changed the *Wichita*'s homeport to San Francisco on 24 January 1975. The ship went on a shakedown cruise beginning 28 January and continued south for a port-of-call in Acapulco, Mexico. The *Wichita* returned to San Diego for training and reached San Francisco on 4 April. The ship remained in port for a month to prepare for deployment to the Far East before sailing on 12 April 1977. The *Wichita* arrived at the forward base in Subic Bay on 4 May. The orders changed after 26 July, and the ship began operating in the East China Sea and the Sea of Japan from bases at Sasebo and Yokosuka to assist the Seventh Fleet in its operations. The *Wichita* left Yokosuka on 6 November and set

²⁸ U.S. Navy, *Dictionary*, p. 291.

²⁹ U.S. Navy, *Dictionary*, p. 291.

³⁰ U.S. Navy, *Dictionary*, p. 291.

³¹ U.S. Navy, *Naval Dictionary*, pp. 291-292.

sail for the United States. The ship and crew completed deployment on 21 November, arriving in Alameda, California.³²

After four months operating off the West Coast, the ship headed into the Pacific for a multinational training mission known as RIMPAC. During this time, the ship made ports-of-call along the west coast of the United States and Canada before heading into the Pacific to take part in RIMPAC 78. The *Wichita* made a short liberty call in Pearl Harbor in early April 1978, participated in more exercises, and returned to Pearl Harbor at the end of the month, which coincided with the end of RIMPAC. On 2 November, the *Wichita* sailed to Hunters Point, California, for a nine-month refit at Triple A Shipyard and returned to Alameda. From May 1979 to March 1980, the *Wichita* underwent a shakedown cruise and refresher training, in the process earning the coveted Battle Efficiency Award.³³

CONCLUSION

Critical to the success of the U.S. Navy is its auxiliary fleet, which provides a multitude of services that keep warships operating. Since their inception in World War I, underway replenishment vessels have been a vital component of the U.S. Navy. The *Wichita* is significant as the first of seven ships designated as AORs in the U.S. Navy and represents evolving UNREP operations. The *Wichita* class, including the *Wichita*, currently resides in the National Defense Reserve Fleet in Suisun Bay, California, awaiting disposal.

³² U.S. Navy, *Naval Dictionary*, p. 292.

³³ U.S. Navy, *Naval Dictionary*, p. 292. The dictionary ends its entry in 1980, and it has not been updated. Wikipedia contains an entry from 1980-1990 (accessed 28 July 2009), but does not contain citations and cannot be verified through textual records.

APPENDIX A: Ship Lists & Comparisons

Wichita Class

From: “Naval Vessel Register,” <http://www.nvr.navy.mil/>, accessed 20 July 2009.

Wichita (AOR-1) – decommissioned 1993, National Defense Reserve Fleet (NDRF) Suisun Bay, CA

Milwaukee (AOR-2) – decommissioned 1994, scrapped in January 2009 by Bay Bridge Enterprises

Kansas City (AOR-3) – decommissioned 1994, NDRF Suisun Bay, CA

Savannah (AOR-4) – decommissioned 1995, NDRF Suisun Bay, CA

Wabash (AOR-5) – decommissioned 1994, NDRF Suisun Bay, CA

Kalamazoo (AOR-6) – decommissioned 1996, scrapped in July 2008 by Esco Marine

Roanoke (AOR-7) – decommissioned 1995, NDRF Suisun Bay, CA

Comparison - Fast Combat Support Ship (AOE) and Replenishment Oiler (AOR)

From: Miller, et al., “Development of the U.S. Navy,” p. 143.

	AOE	AOR
Cargo Fuel	7,500,000 gallons	7,100,000 gallons
Cargo Ammo	296,000 cubic feet	66,500 cubic feet
Cargo Stores	100,500 cubic feet	76,500 cubic feet
Ammo Delivery Stations	7	4
Crew	600	389
Sustained Speed	26+ knots	20 knots
Estimated Cost	\$550,000,000	\$350,000,000

Comparison between an AOE and Three Support Vessels

From: Miller, et al., “Development of the U.S. Navy,” p. 128.

	AOE	AO + AE + AFS
Speed	26+ knots	20 knots
Fuel Consumption	3,100 gallons per hour	4,500 gallons per hour
Crew Size	600	1,100
Fuel Capacity	177,000 barrels	120,000 barrels
Ammunition Capacity	296,000 bale cubic	344,000 bale cubic
Stores Capacity	100,500 bale cubic	458,000 bale cubic
Estimated Construction Cost	\$550,000,000	\$750,000,000

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HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

WICHITA
(AOR-1)
Suisun Bay Reserve Fleet
Benicia
Solano County
California

HAER CA-356

INDEX TO BLACK AND WHITE PHOTOGRAPHS

Jet Lowe, photographer, July 2007

CA-356-1	Starboard bow view.
CA-356-2	Starboard bow and deck, taken from neighboring ship.
CA-356-3	Backside of forward bridge, looking toward bow.
CA-356-4	Bridge superstructure, looking aft from adjacent ship.
CA-356-5	Interior of bridge, looking forward.
CA-356-6	Bridge, looking port.
CA-356-7	Combat information center (CIC).
CA-356-8	Bridge alarm systems.
CA-356-9	Officer's wardroom, damage control center.
CA-356-10	Captain's stateroom.
CA-356-11	Chief engineer's stateroom/office.
CA-356-12	Officer's wardroom.
CA-356-13	Crew berthing quarters.
CA-356-14	Crew's mess hall.
CA-356-15	Galley, cooking equipment.
CA-356-16	Galley, with baking area in rear.

WICHITA
HAER CA-356
INDEX TO PHOTOGRAPHS

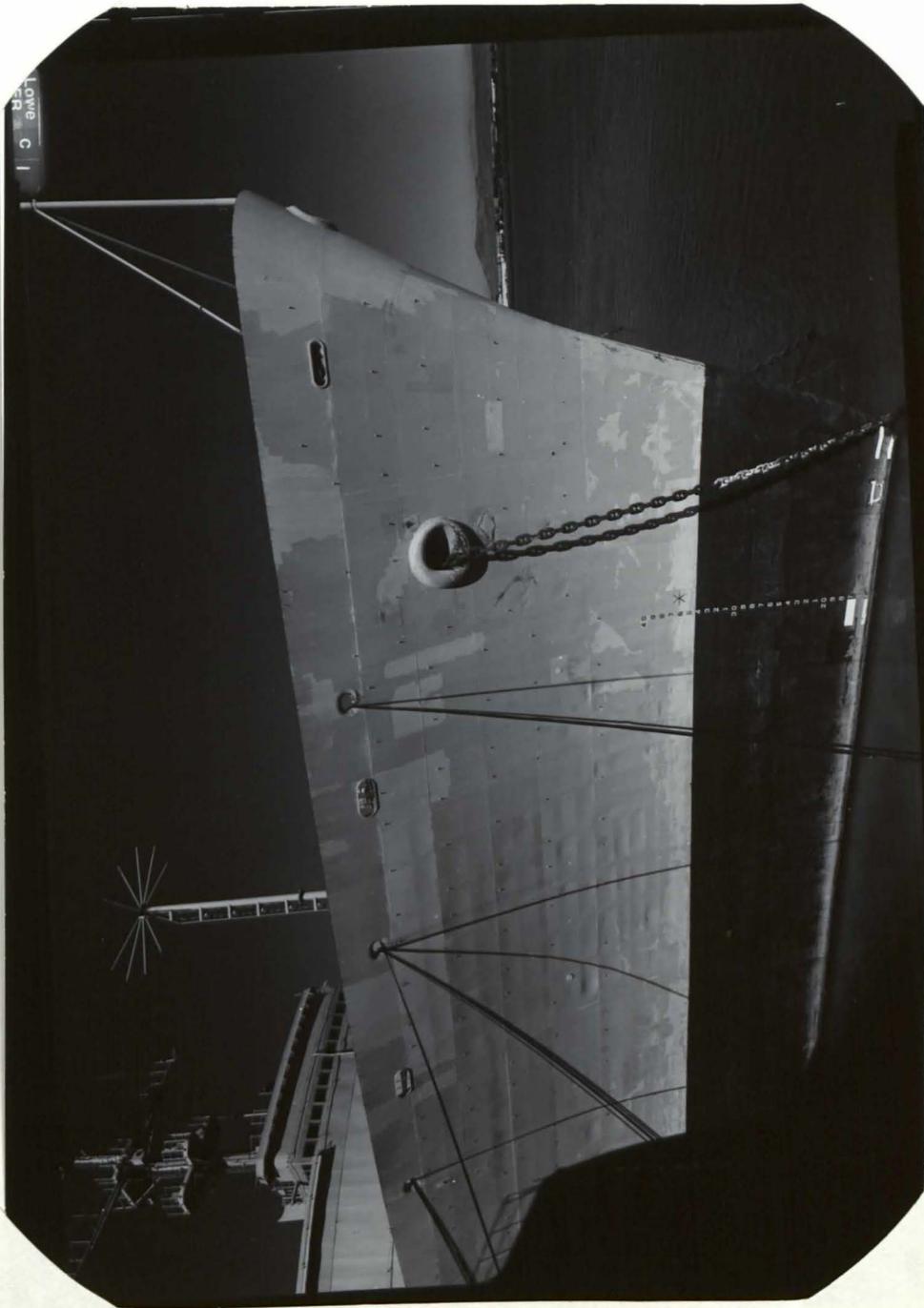
- CA-356-17 Operating room - sick bay.
- CA-356-18 Starboard turbines from above with compressors along left side of view. Looking aft.
- CA-356-19 Engine control space, looking aft.
- CA-356-20 Main control center in boiler room, looking aft.
- CA-356-21 Port side boiler, looking aft. Manufactured by Foster Wheeler Corporation with a design pressure of 700 psi and a design steam temperature of 875 degrees.
- CA-356-22 Port side low pressure and high pressure turbines manufactured by General Electric. The high pressure turbine has the following specifications: 16,000 shp; 6683 rpm; inlet - 605 psig, 850 degrees; outlet - 52 psig. The low pressure turbine has the following specifications: 16,000 shp; 3816 rpm; inlet - 41 psig; 399 degrees F.
- CA-356-23 Starboard low pressure turbine, looking aft.
- CA-356-24 Port side condenser. Manufactured by Maryland Shipbuilding and Drydock Company in 1966. Operating pressure 30 psig with water velocity of 7 ft/sec.
- CA-356-25 Starboard side reduction gear. General Electric double reduction gear - dual input double reduction. The high pressure pinion first reduction is 6683 rpm, 8112 shp. The low pressure pinion first reduction is 3816 rpm, 7888 shp. The main gear second reduction is 105 rpm, 18,000 shp.
- CA-356-26 Cargo fuel control center, looking forward.
- CA-356-27 Detail of control board in fuel control center, looking forward.
- CA-356-28 Pump room. Note stripping pump on left and main cargo pumps on right.
- CA-356-29 Fuel cargo piping in pump room. Note hydraulically actuated gate, butterfly valves, and controls on wall.
- CA-356-30 Double opposed ram type steering gear (starboard side), looking forward.

WICHITA
HAER CA-356
INDEX TO PHOTOGRAPHS

- CA-356-31 Double opposed ram type steering gear (port side unit).
Minimum rudder speed is 3 degrees per second. Electro-
hydraulic.
- CA-356-32 Front side of aft island. Note awards and mural.
- CA-356-33 Stack, looking east to reserve fleet.
- CA-356-34 Main deck equipment, looking aft. The *Wichita* is in the center.
- CA-356-35 View on top of tower, looking forward to middle of ship and
deck equipment.
- CA-356-36 Amidships main deck with equipment.
- CA-356-37 Amidships deck equipment from adjacent ship.
- CA-356-38 Steam system/ram tensioner for underway fuel transfer.
- CA-356-39 View looking toward bow at deck equipment.
- CA-356-40 Cargo tanks, port side.
- CA-356-41 Mezzanine deck, hangars, and elevator.
- CA-356-42 Cargo elevator, looking aft. Elevator has working load of
10,500 lbs.
- CA-356-43 Second deck, looking aft. Note elevator in background and to
left of shot.
- CA-356-44 Fourth deck, weapons cargo storage space, looking forward.
Note elevator.
- CA-356-45 Third deck cargo weapons space, looking aft. Note elevator and
division columns.
- CA-356-46 Second deck, looking forward.
- CA-356-47 Port side, reefer interior on second deck.
- CA-356-48 Cargo storage room.
- CA-356-49 Engine room details.
- CA-356-50 Flight deck and control towers for helicopters.
- CA-356-51 Aft flight deck, looking forward with hangar doors.
- CA-356-52 Helo hangar, starboard side, and package elevator.

HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-1



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

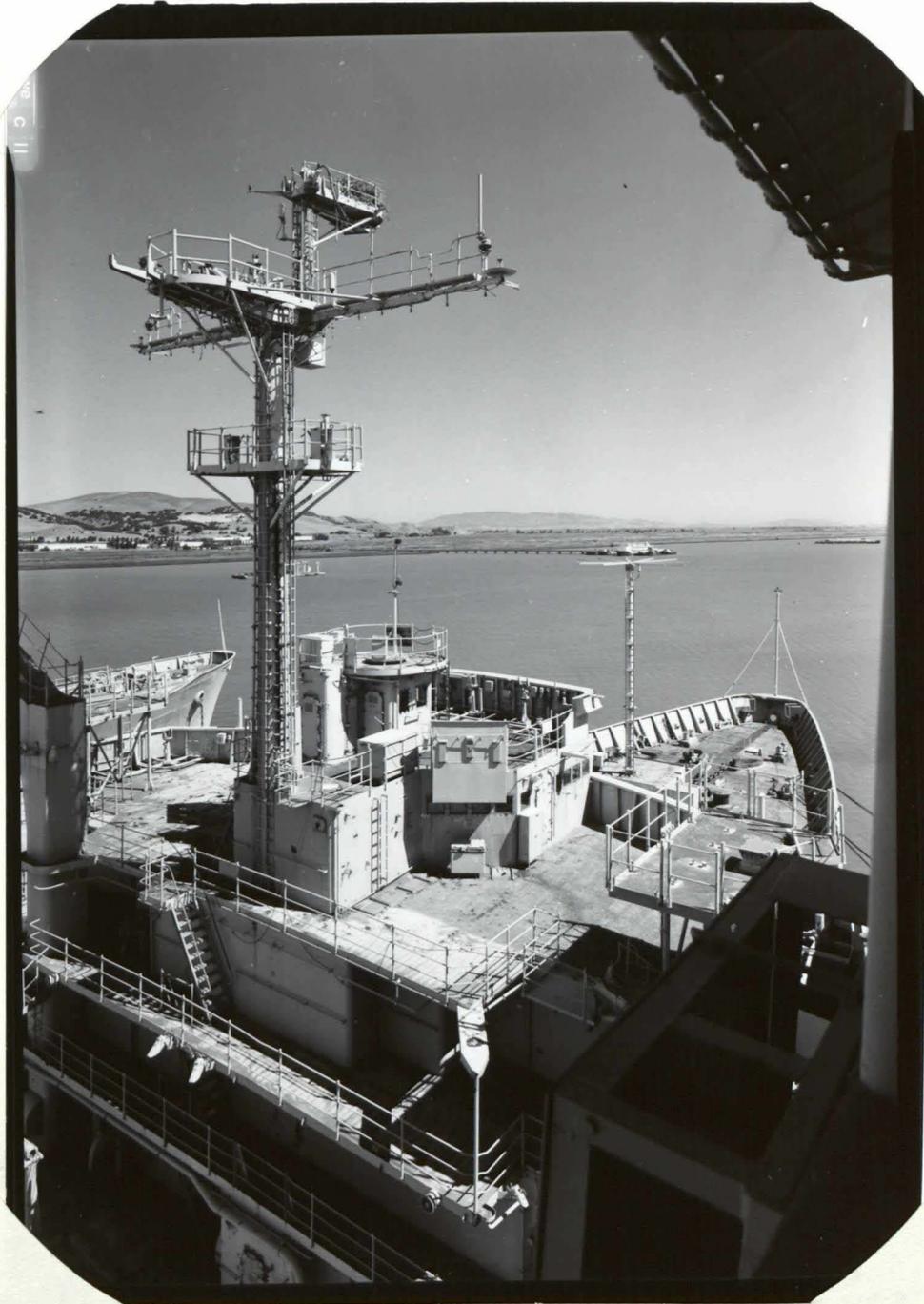
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-5



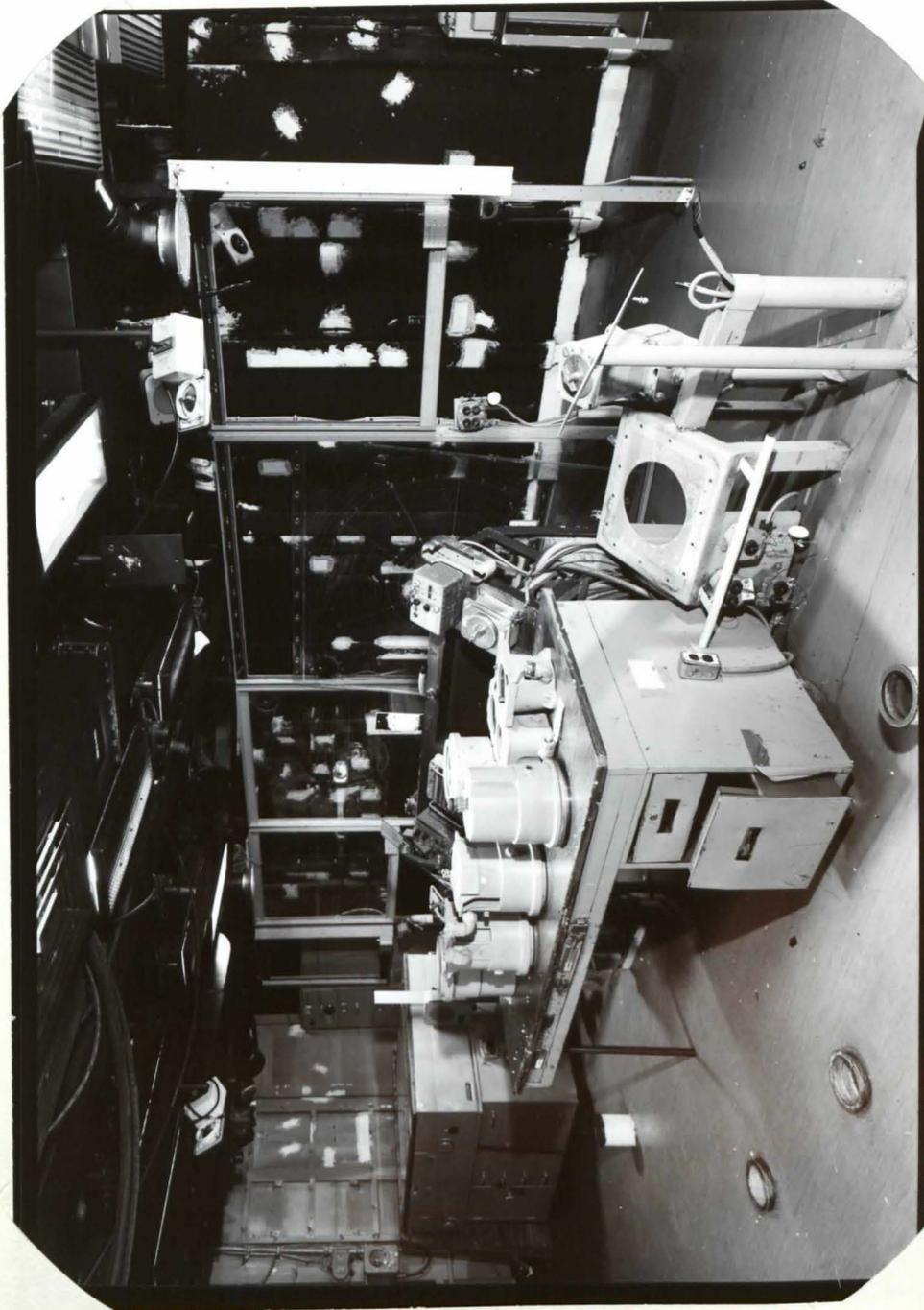
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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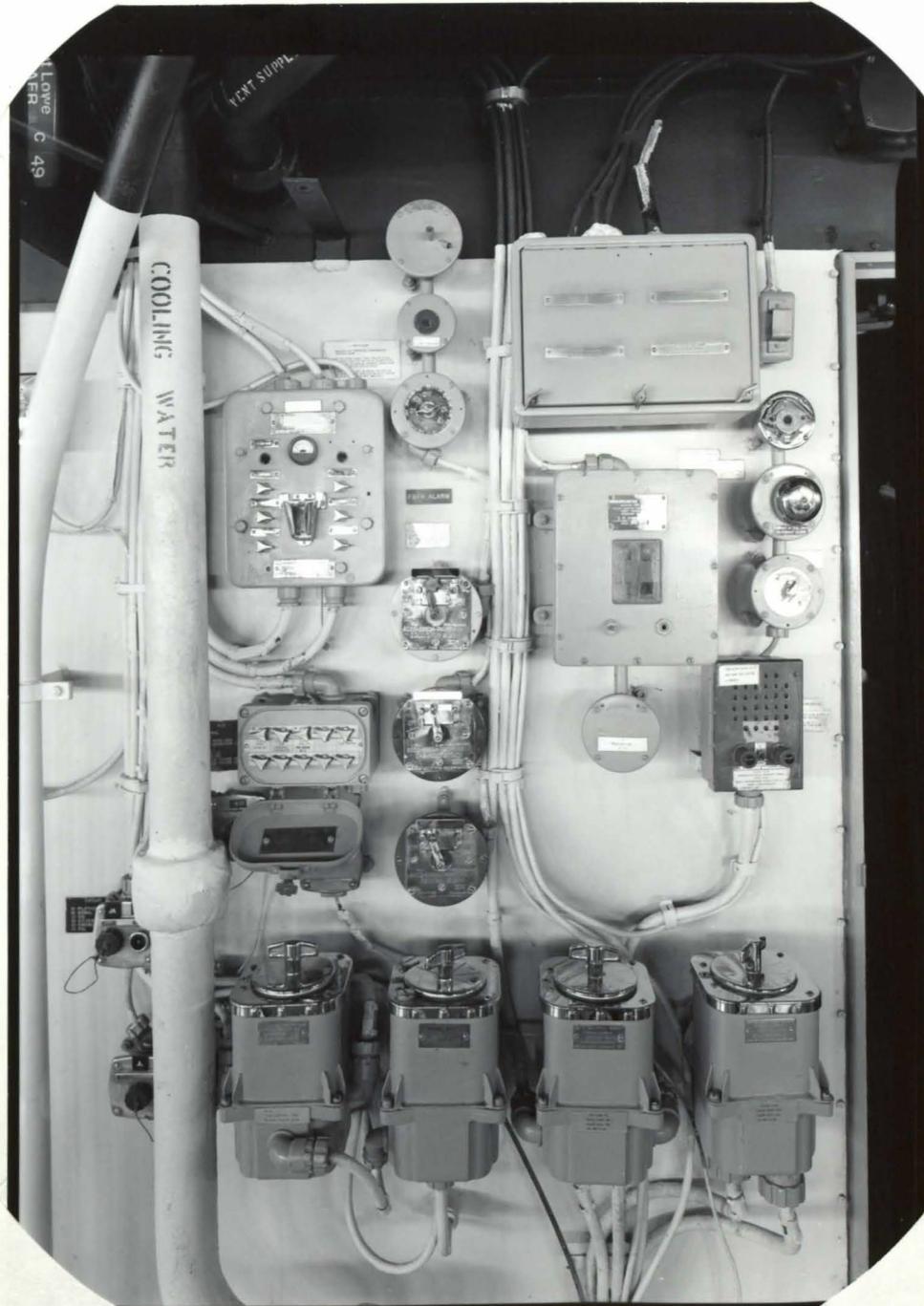
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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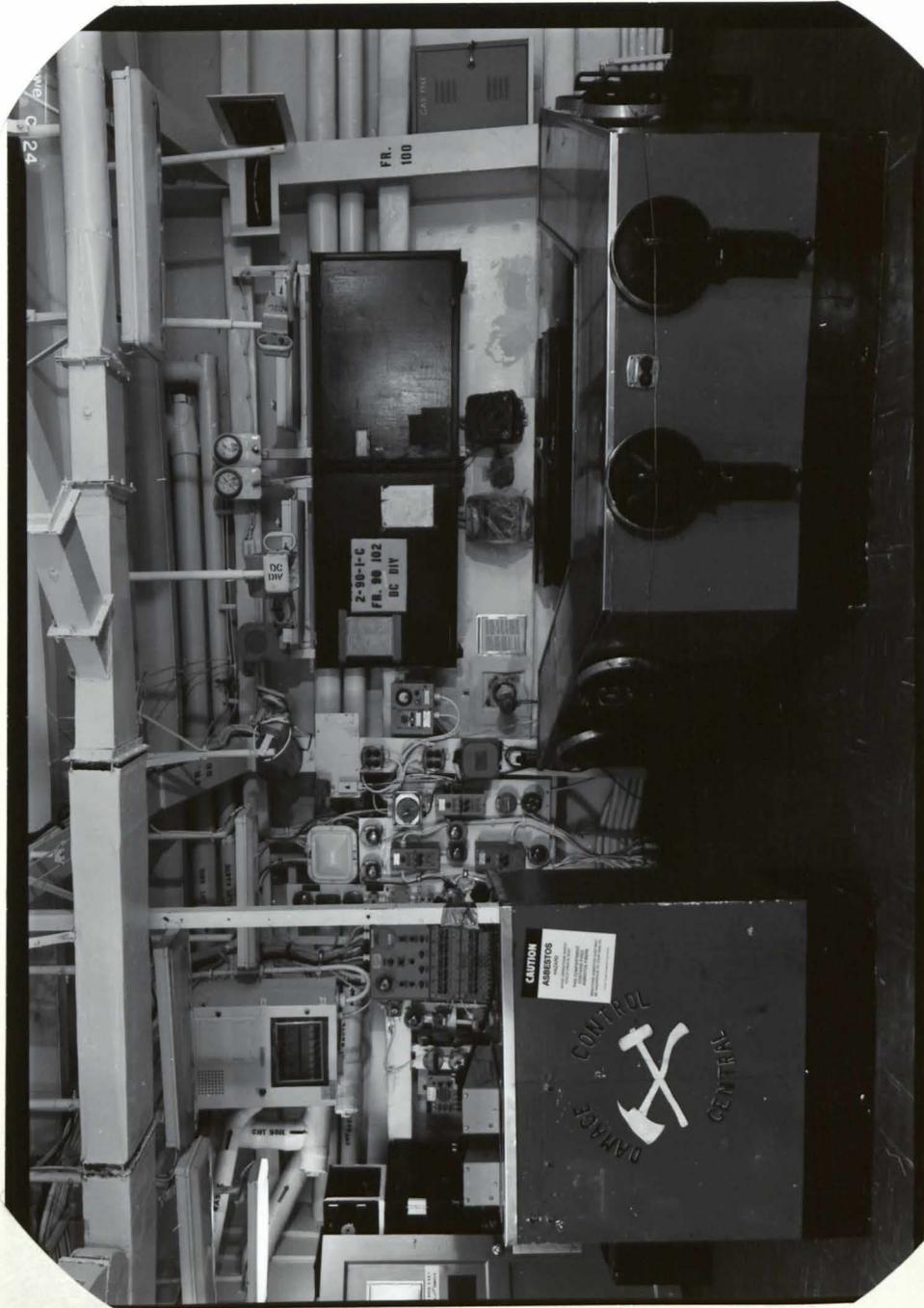
HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-8



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-9



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-10



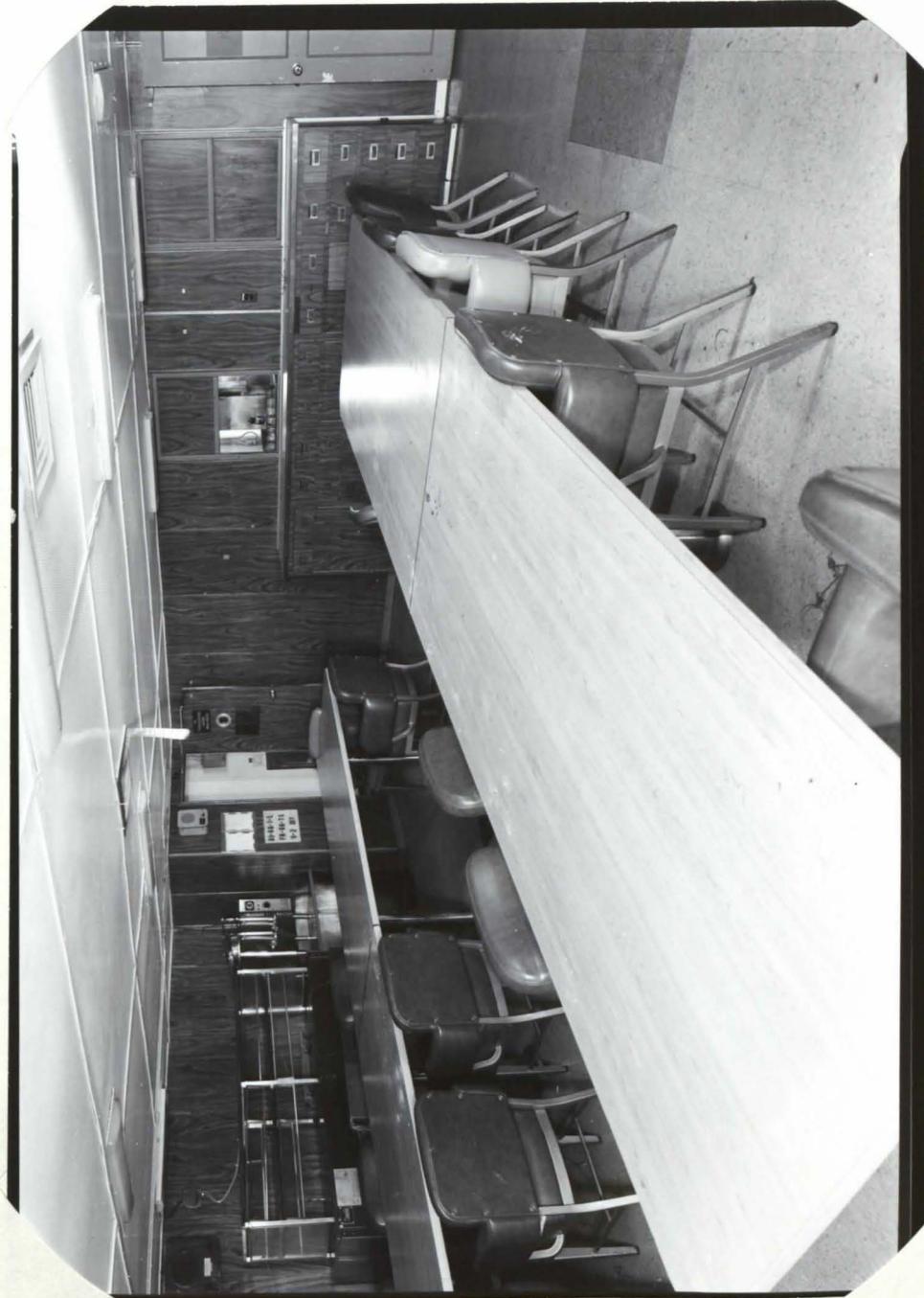
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-11



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-12



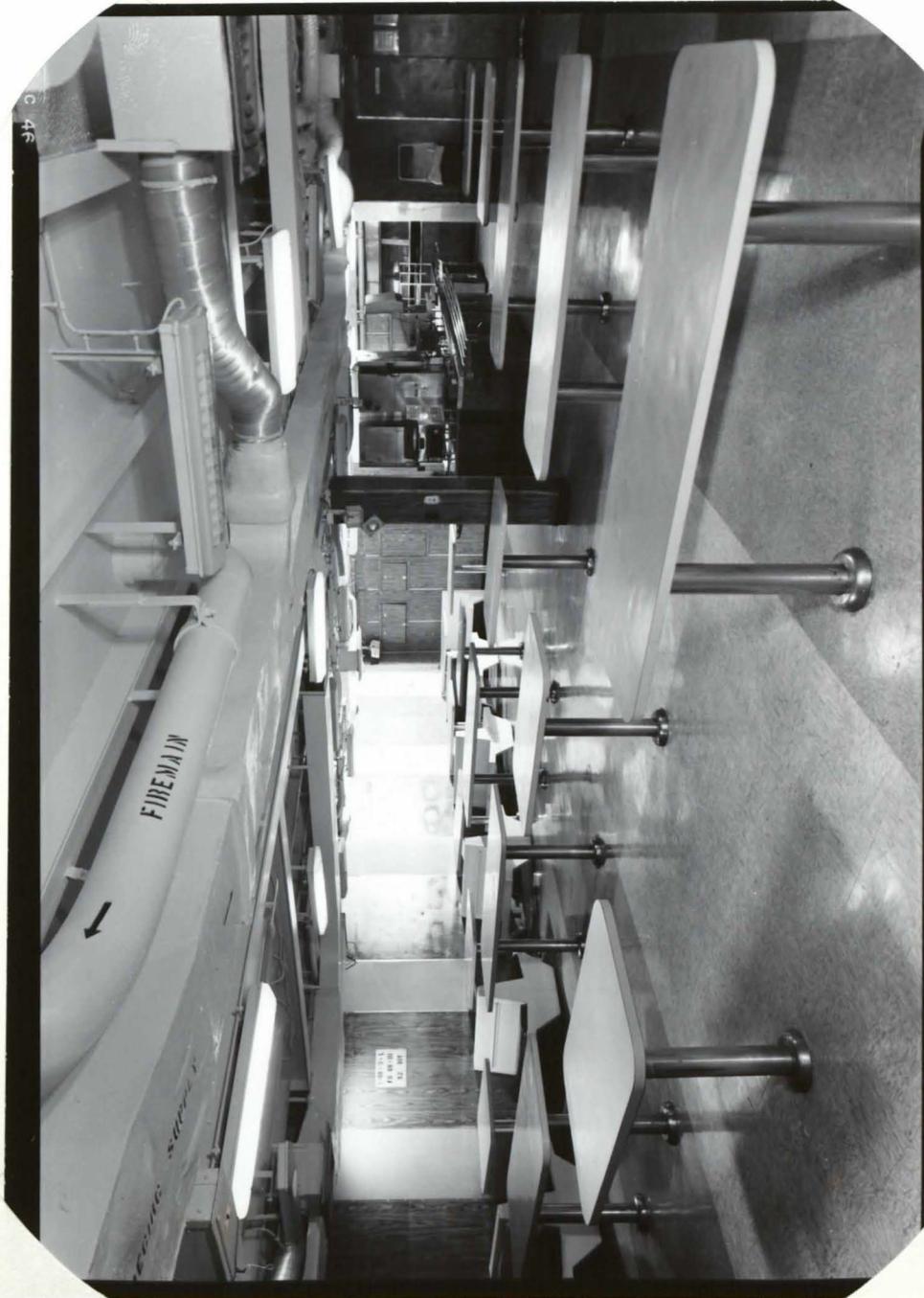
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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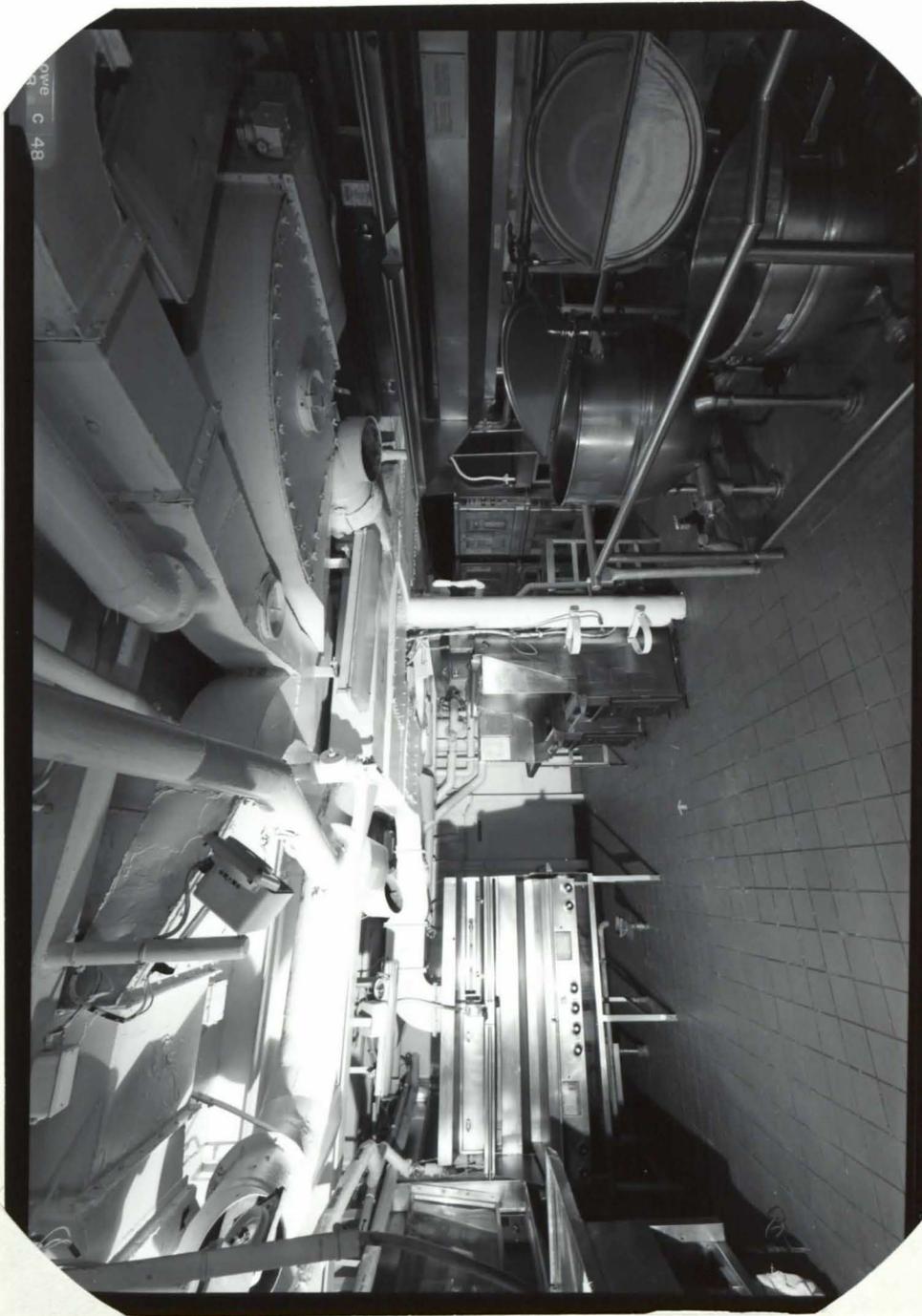
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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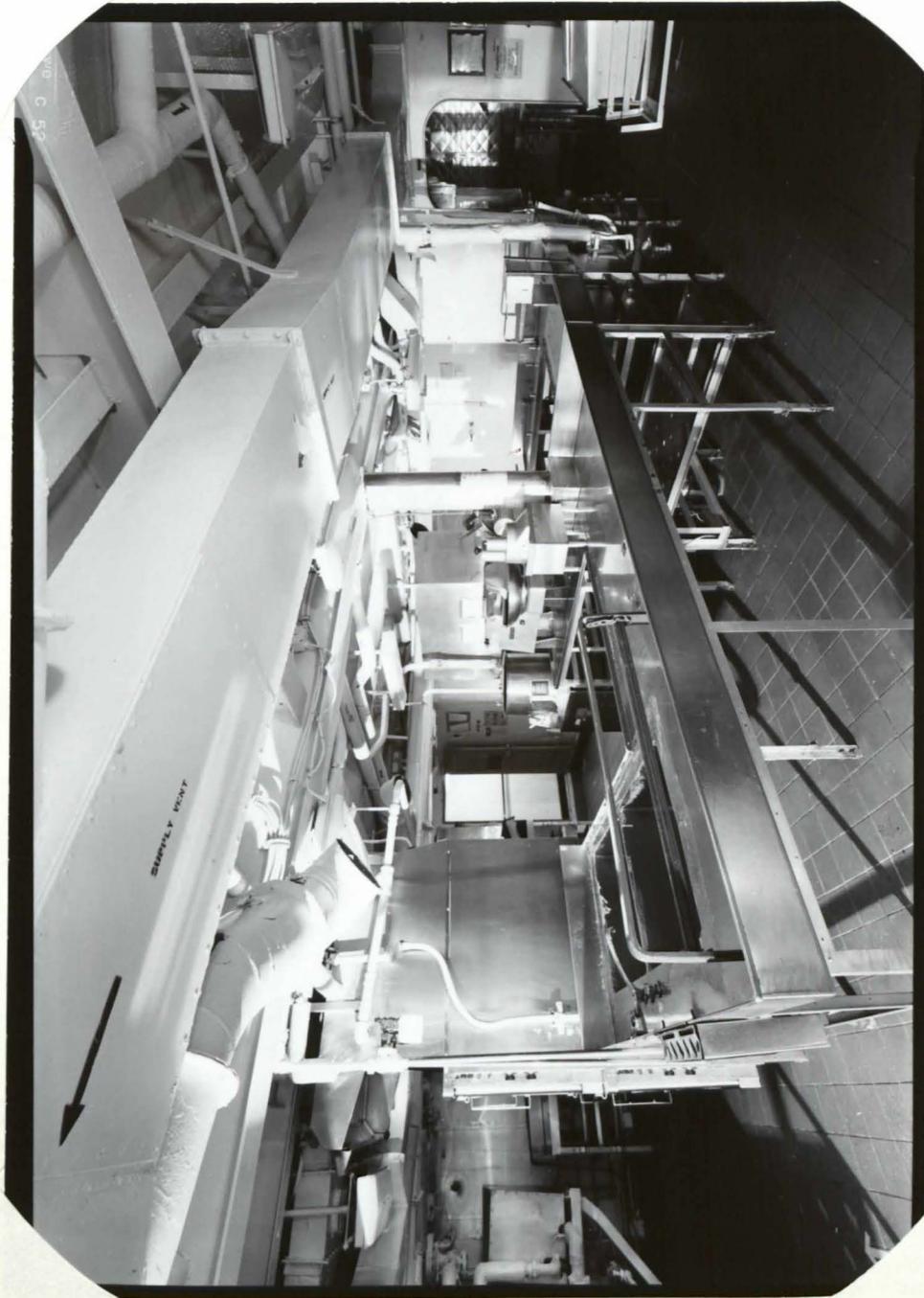
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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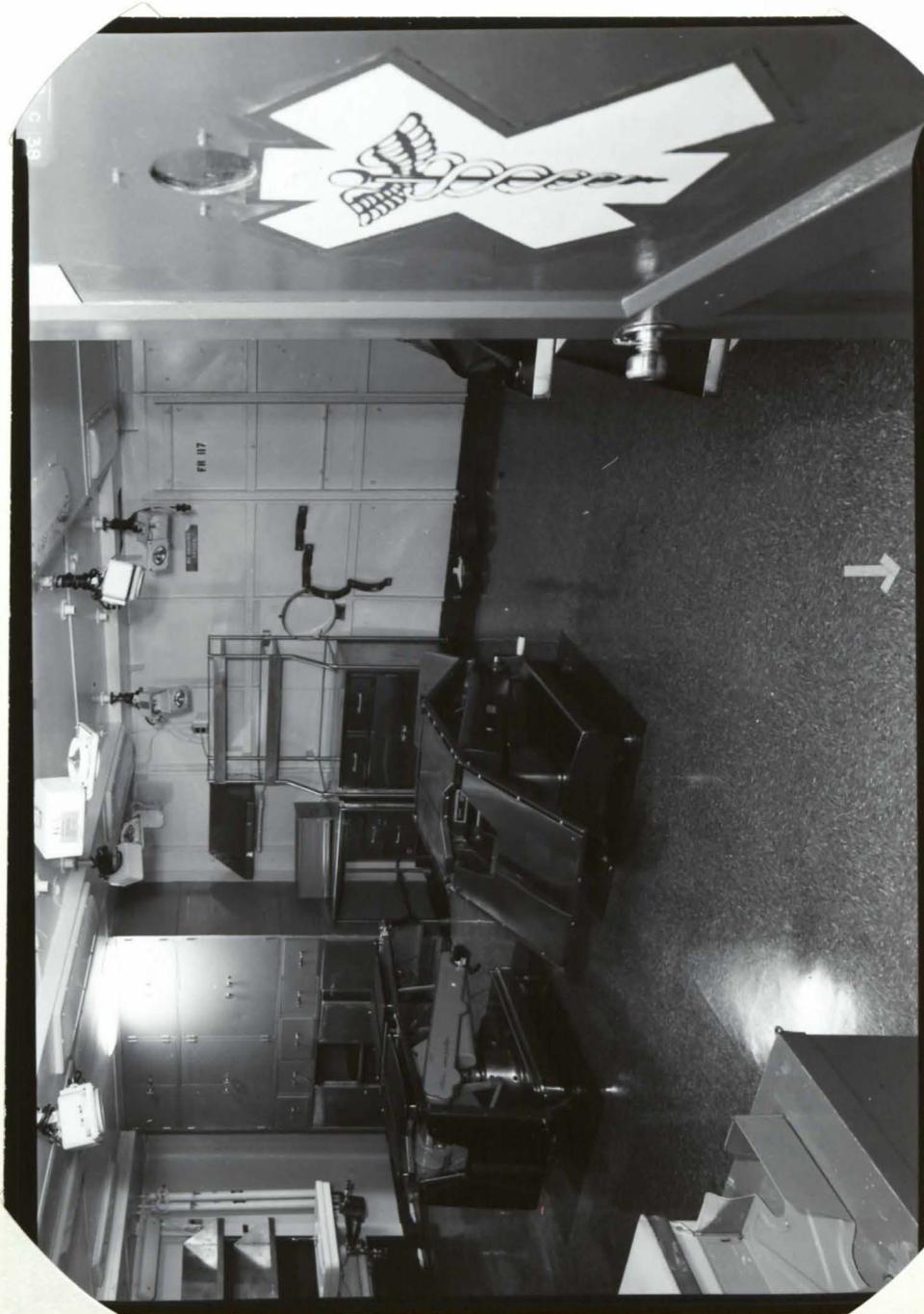
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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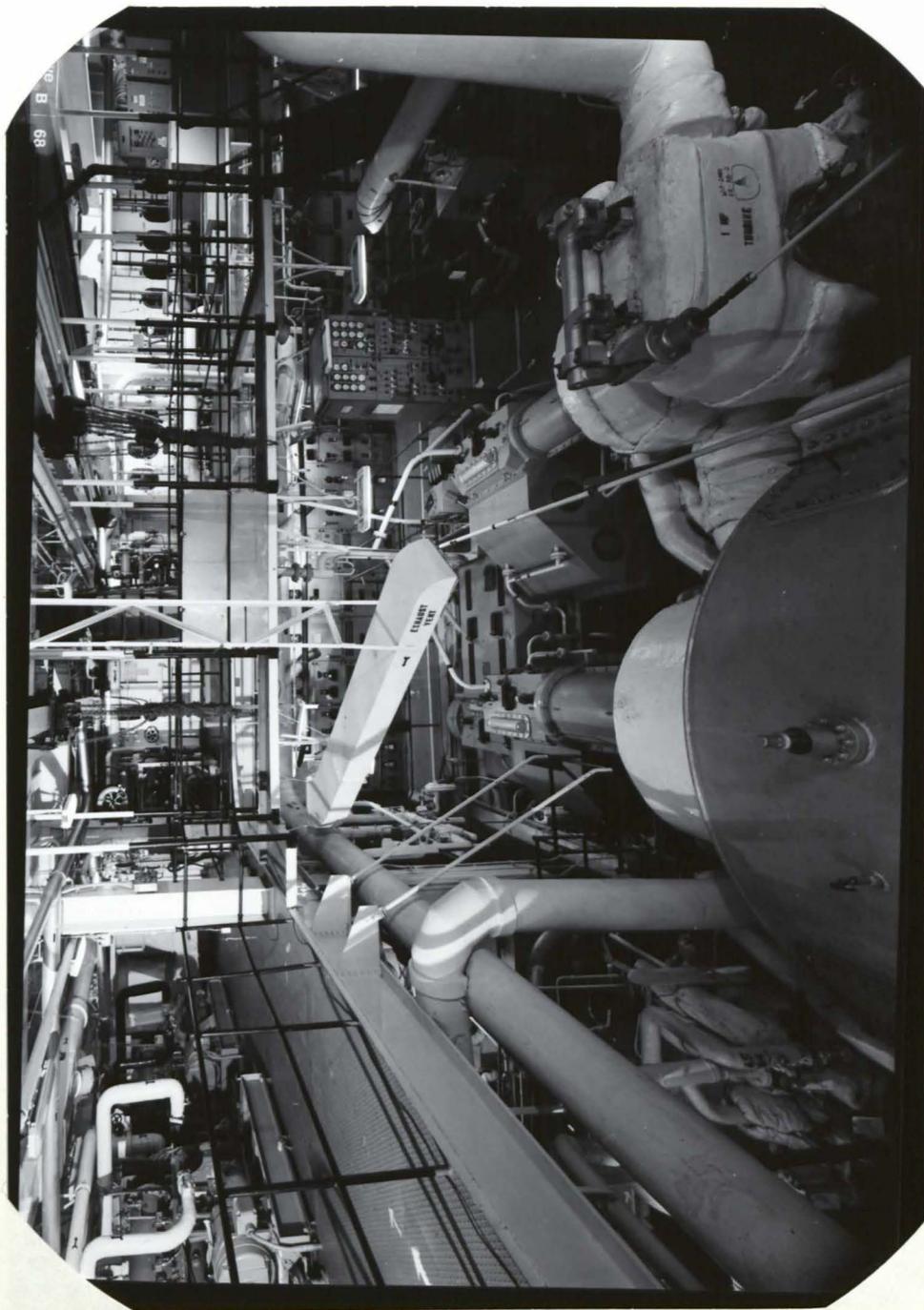
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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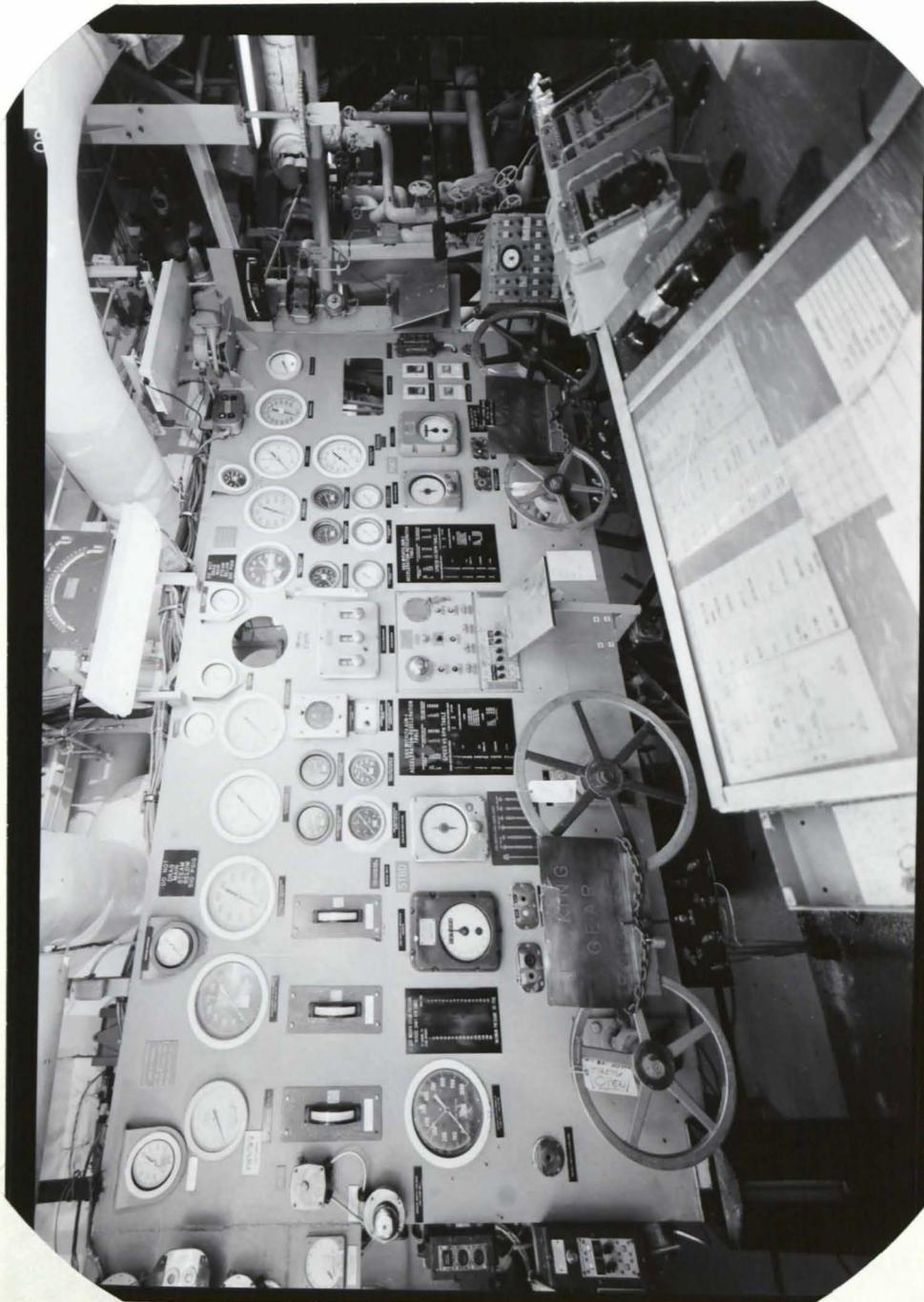
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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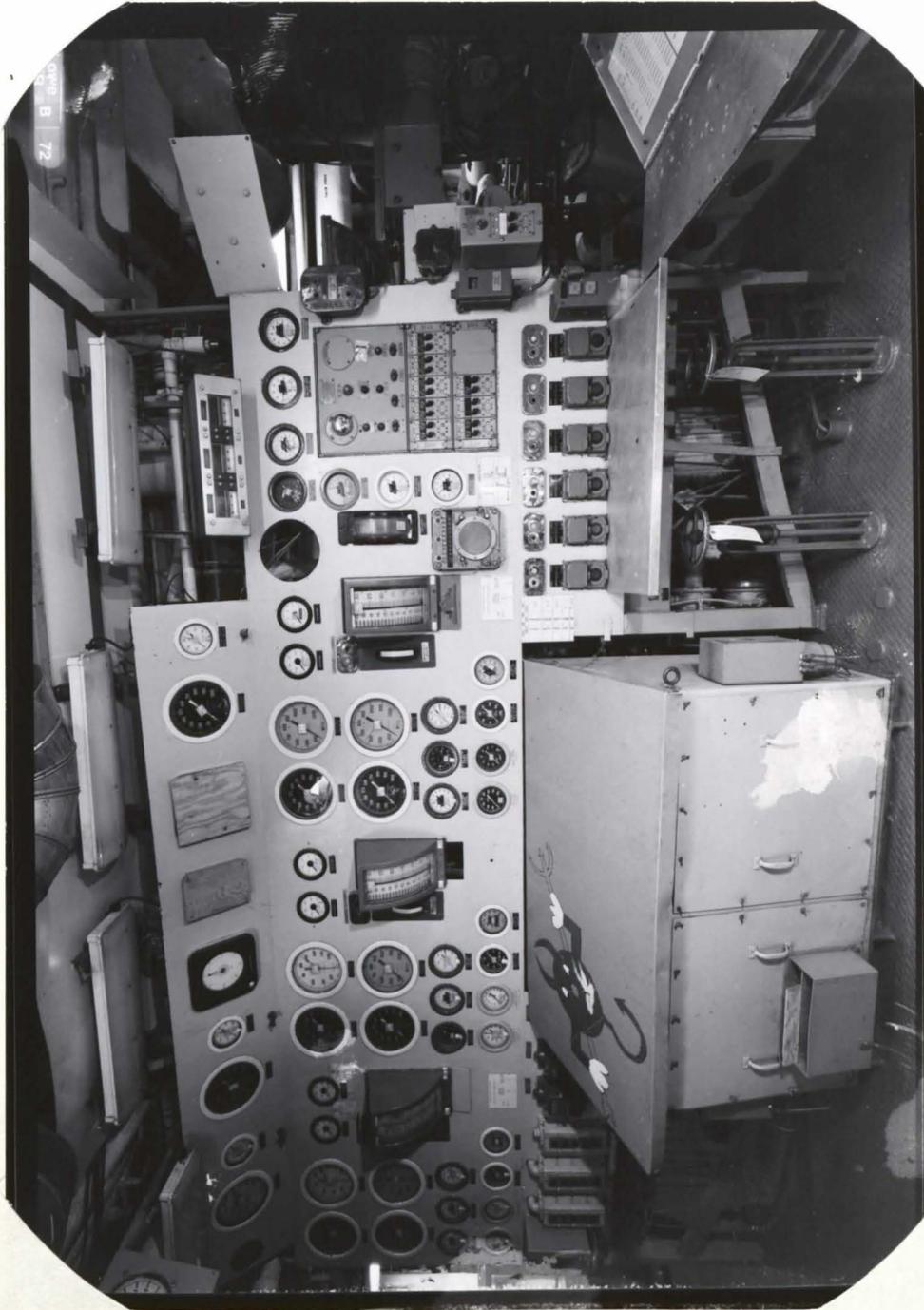
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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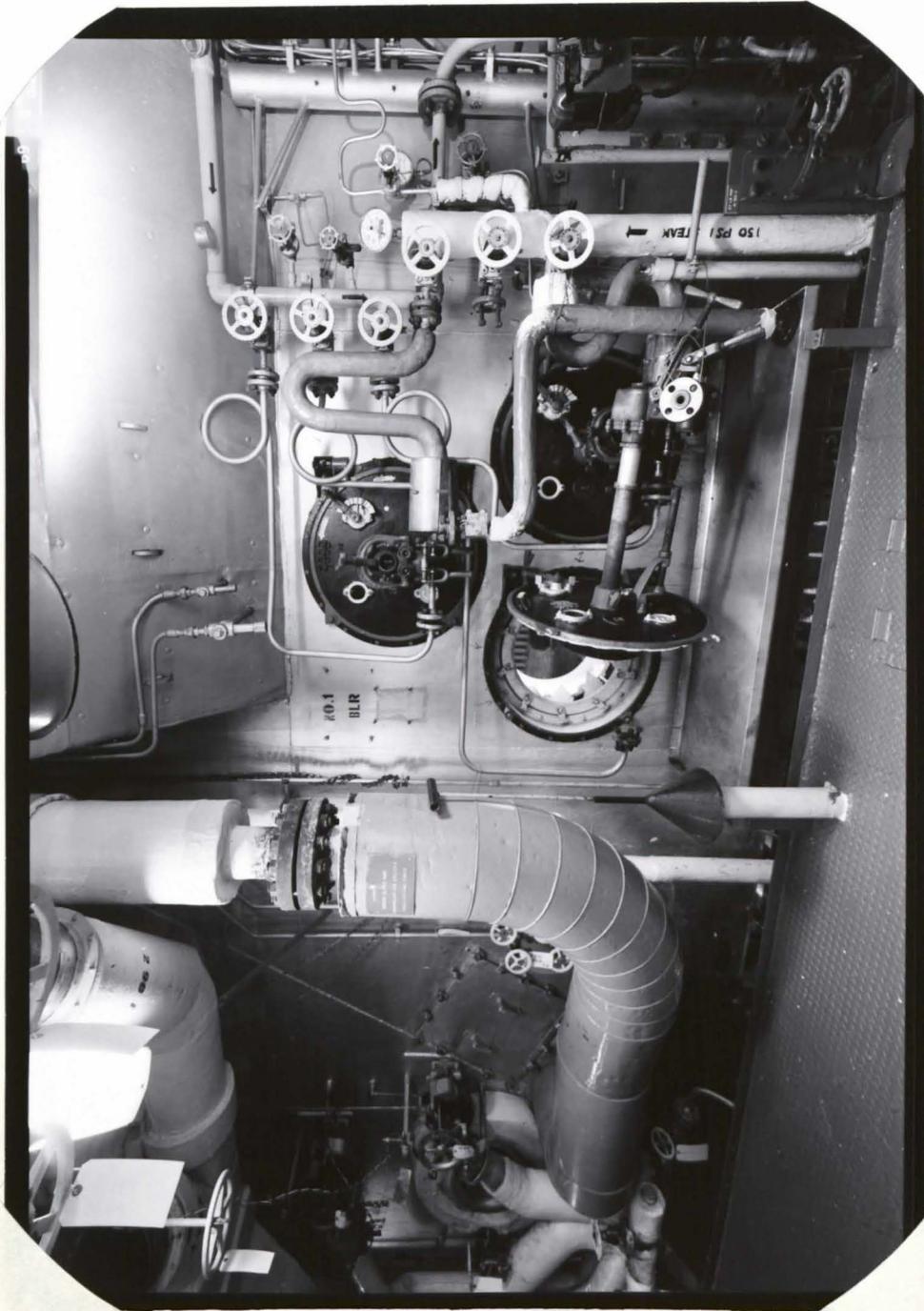
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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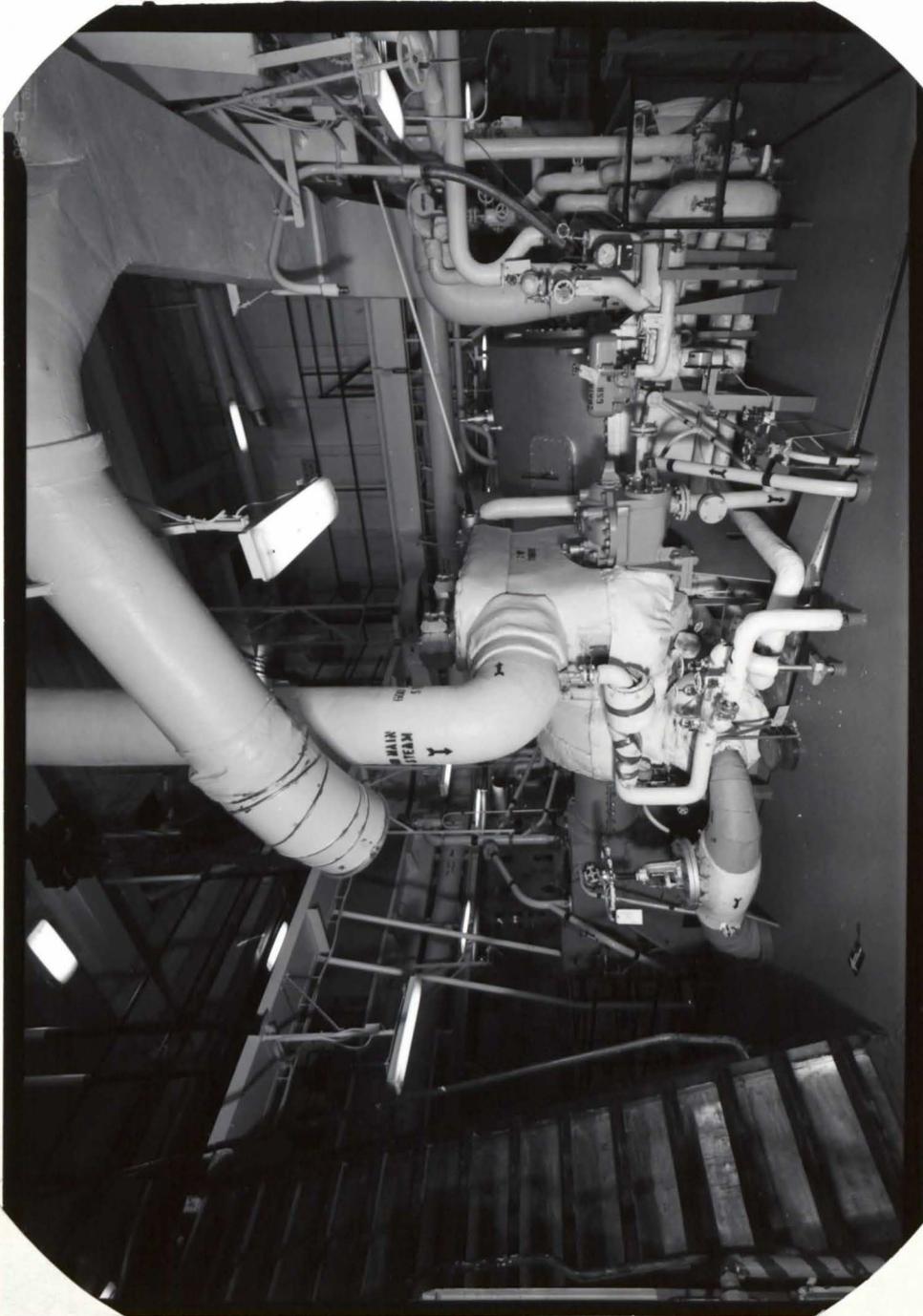
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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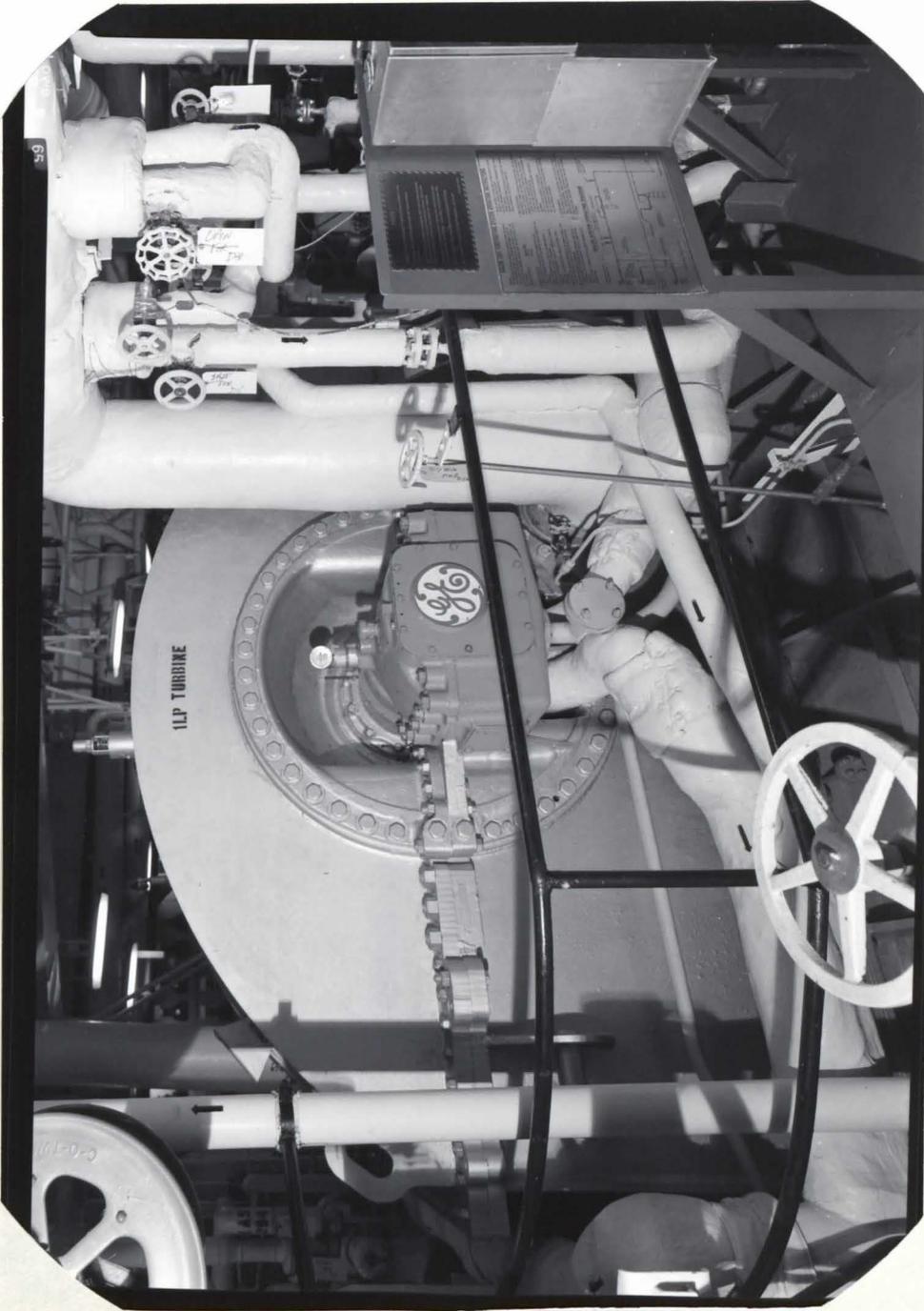
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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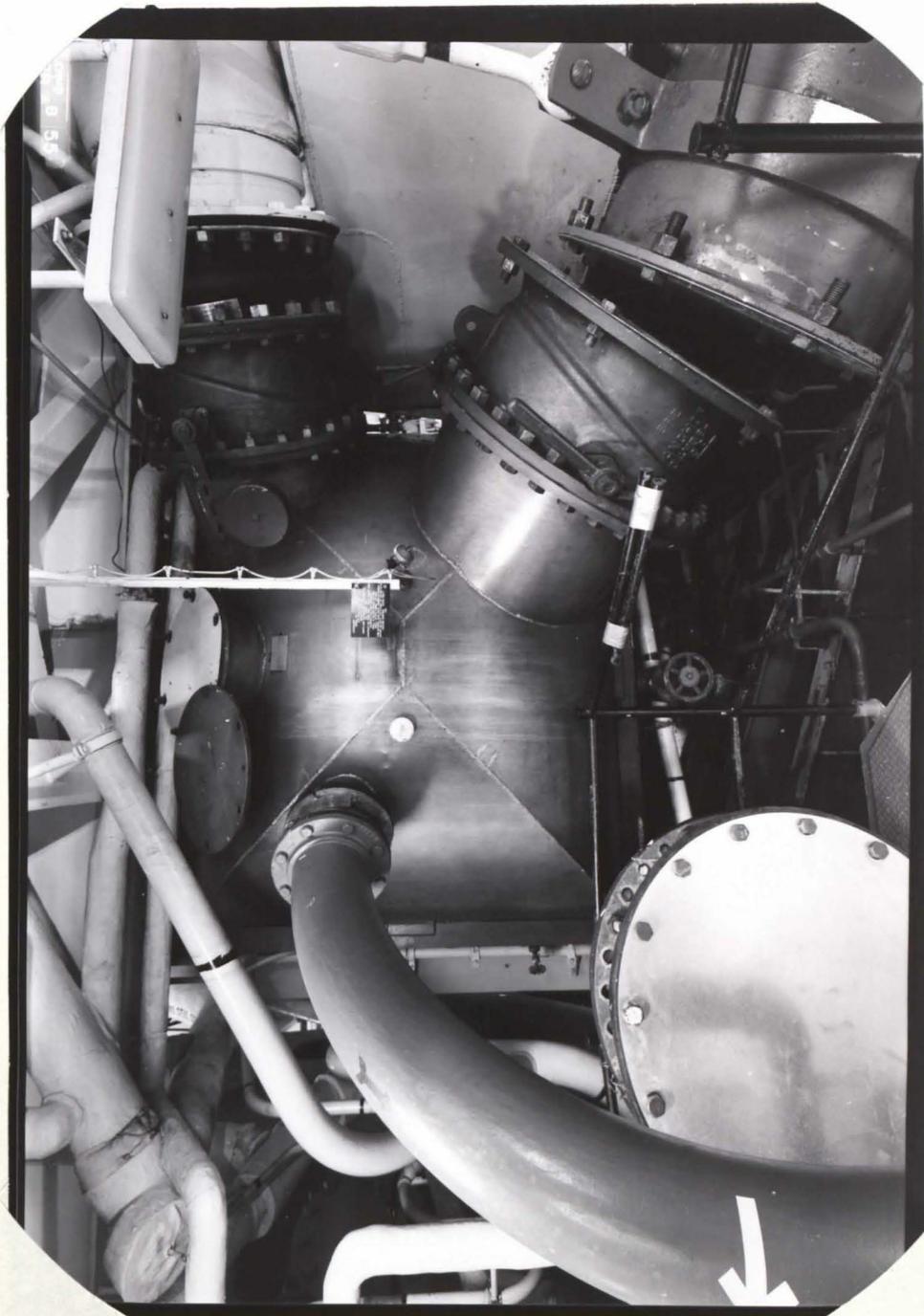
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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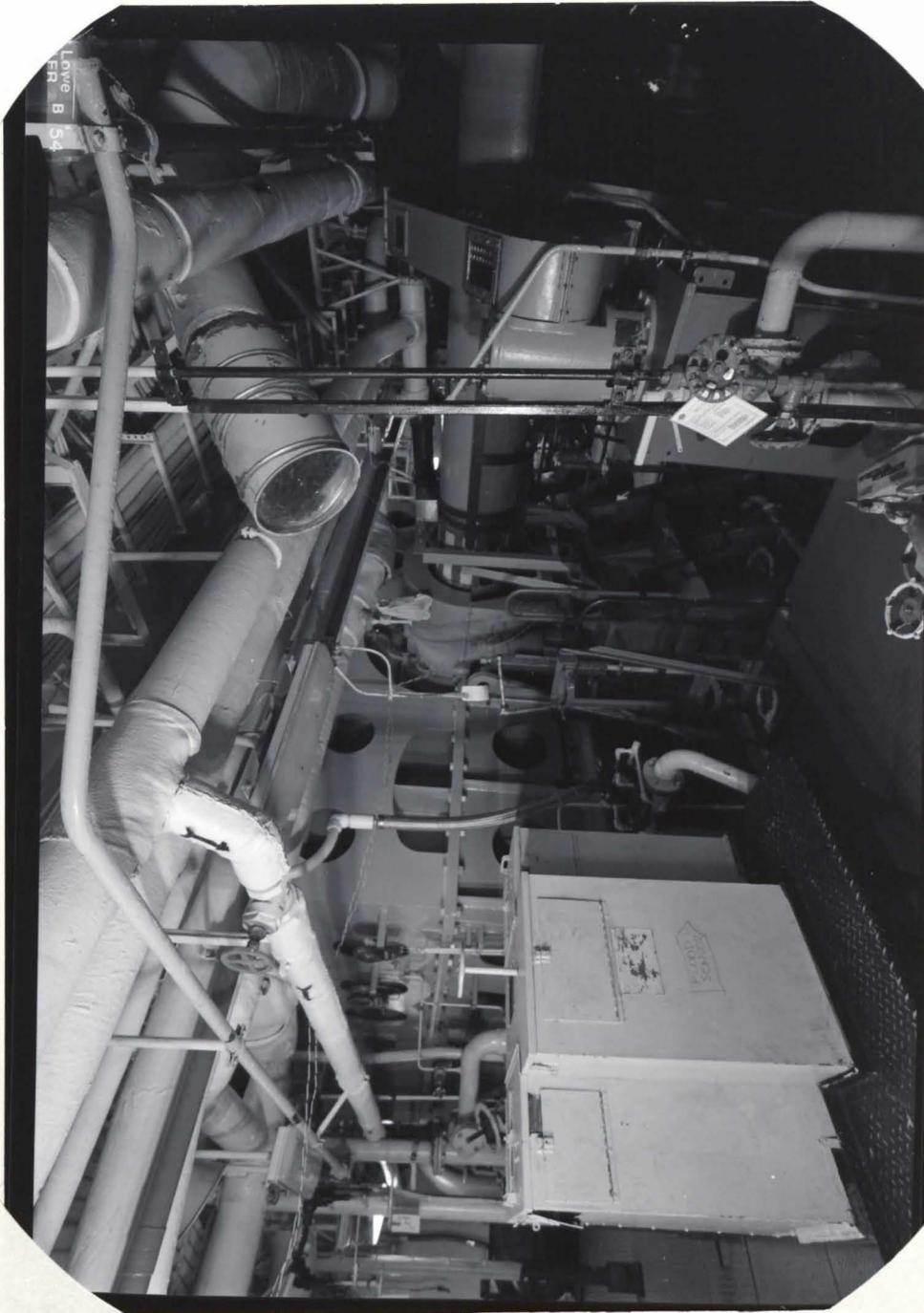
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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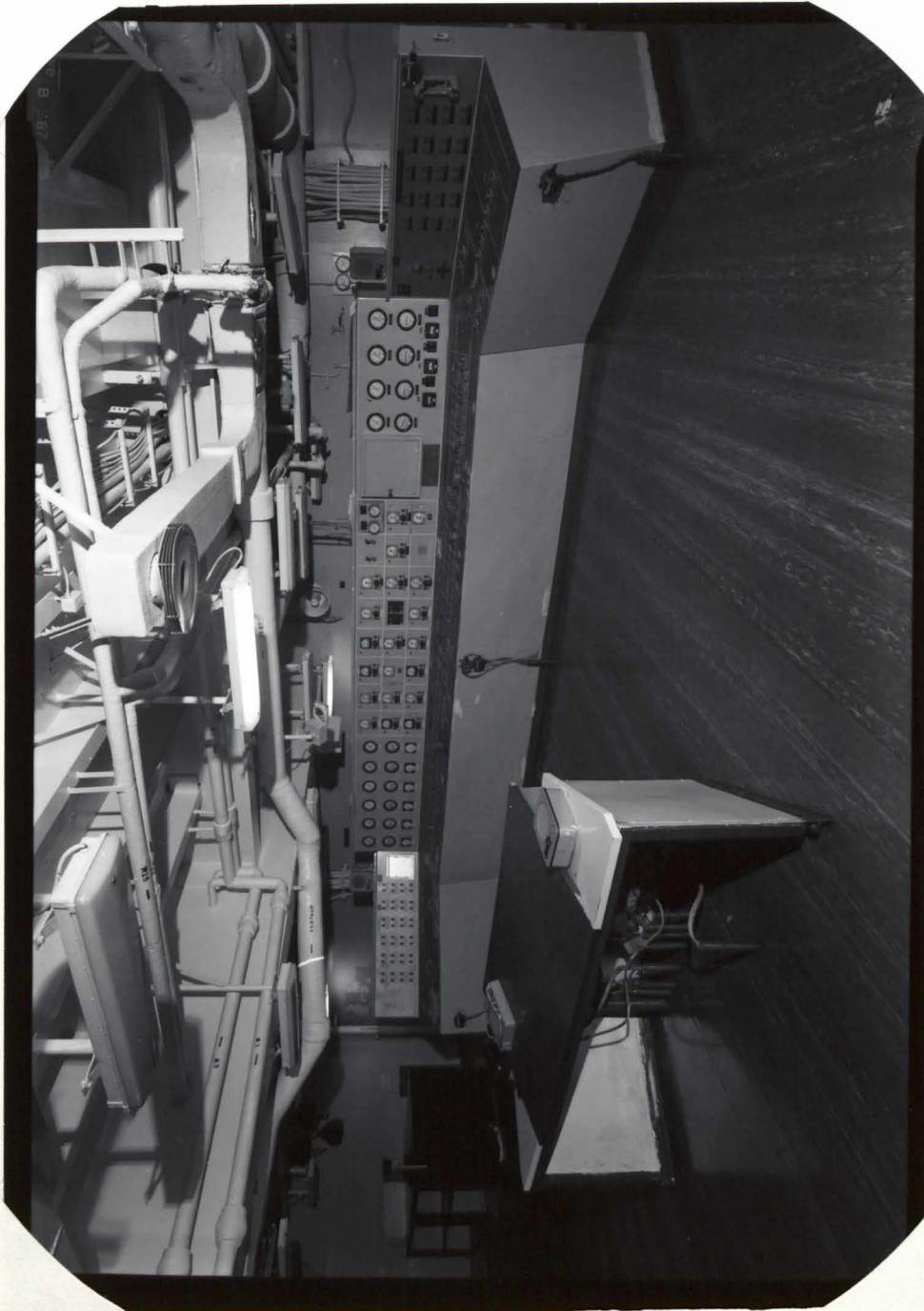
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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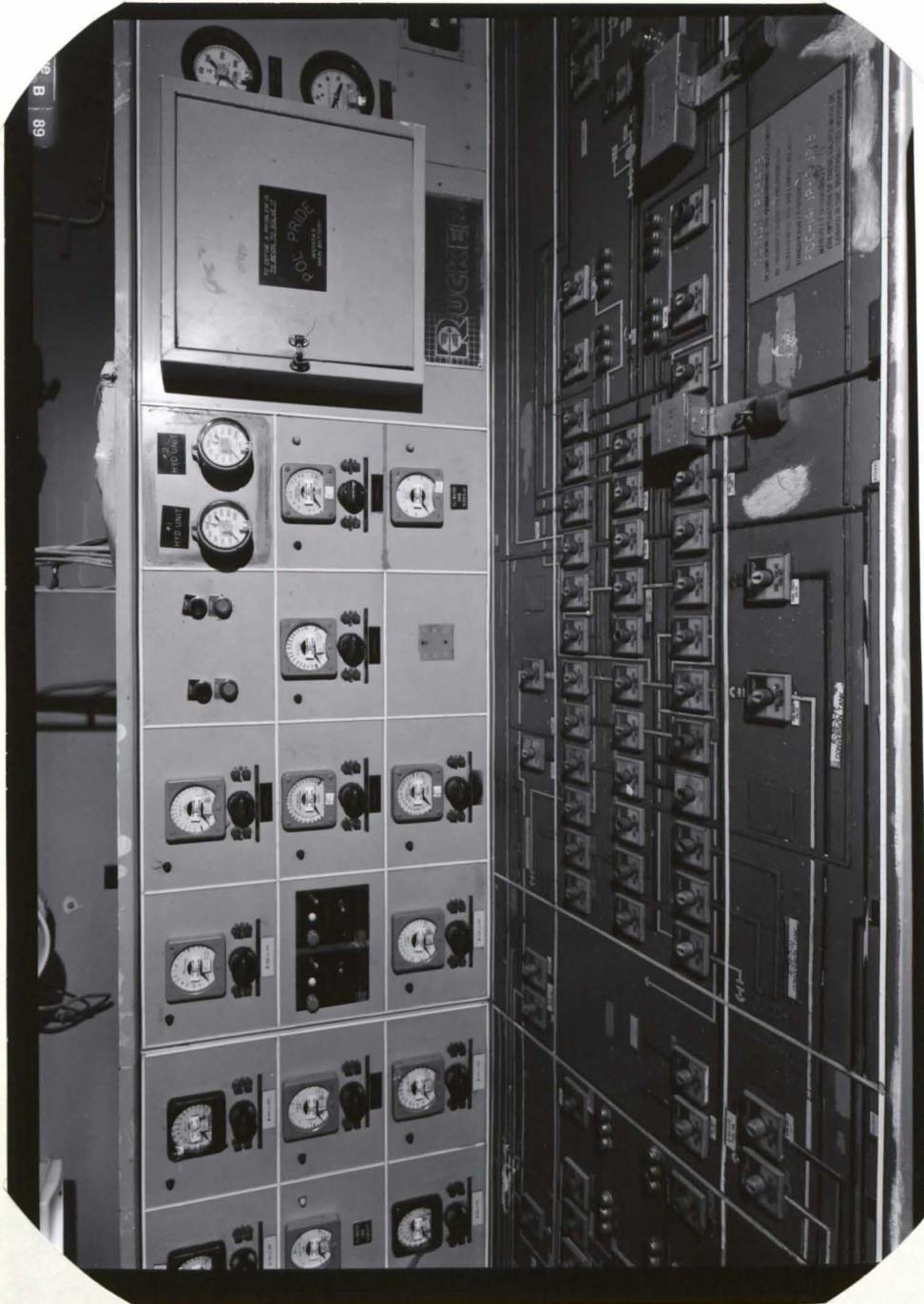
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-26



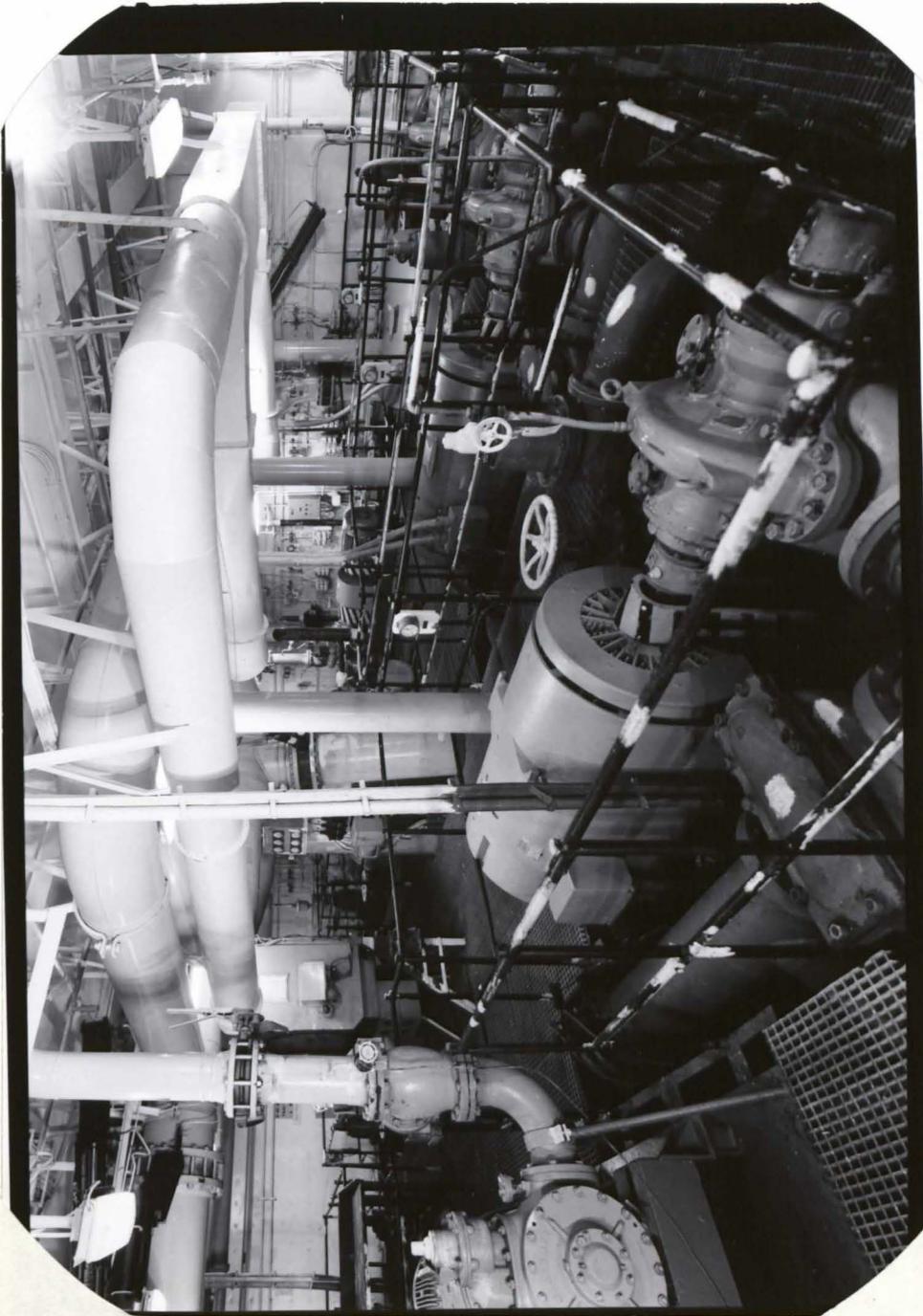
HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-27



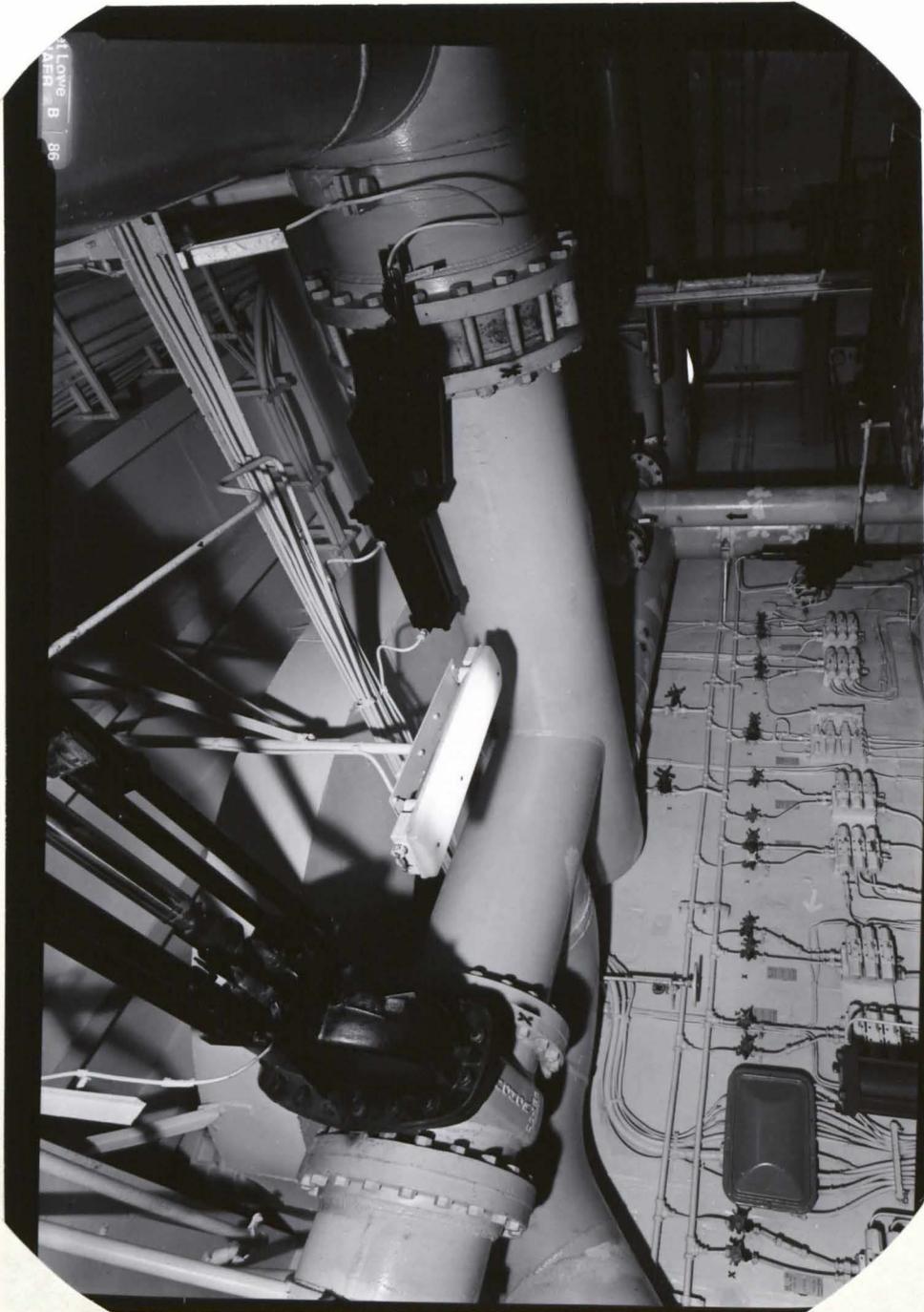
HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-28



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-29



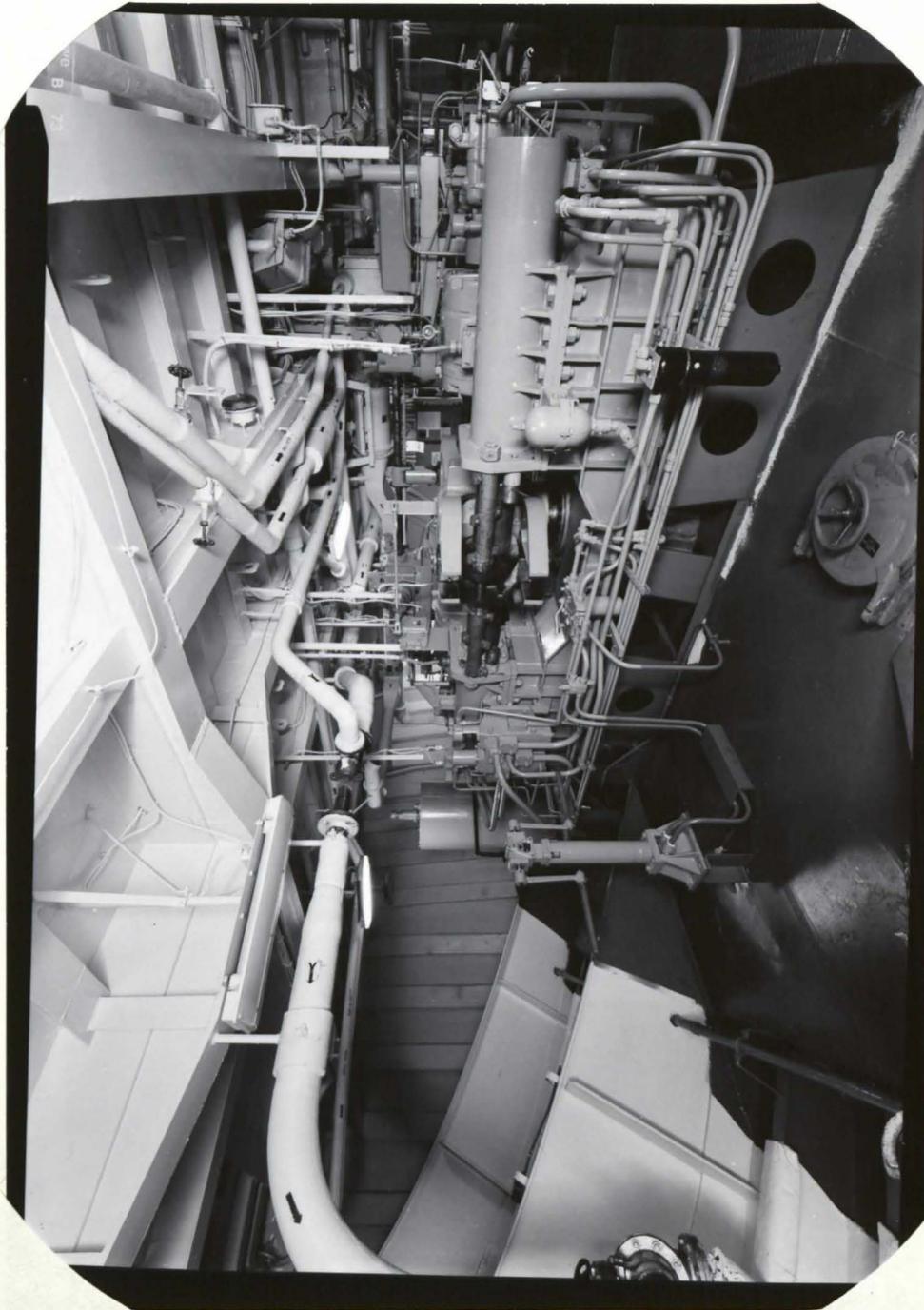
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-30



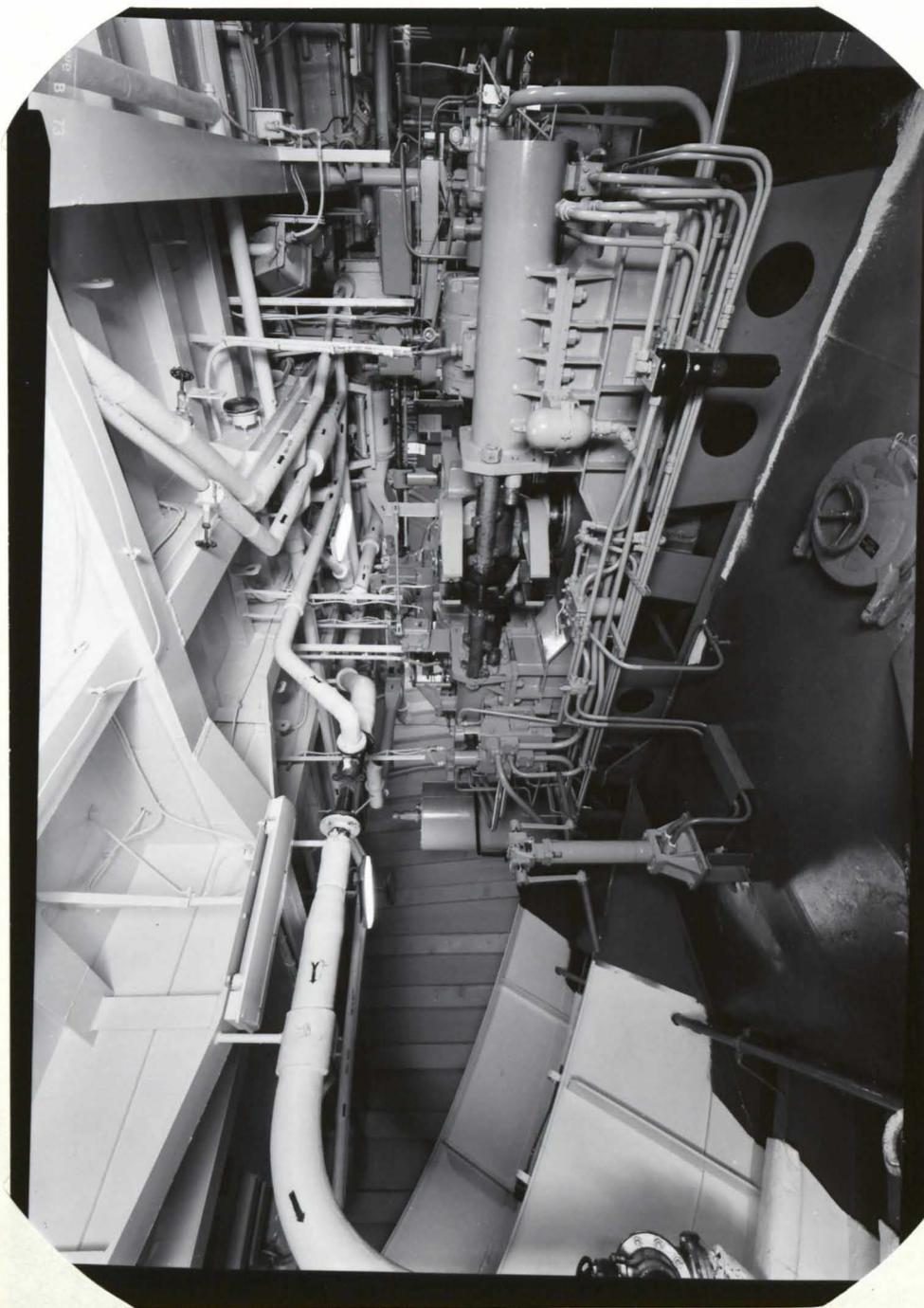
HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-31



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-31



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-32



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-33



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-34



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-35



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-36



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-37



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-38



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-39



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. EA-356-40



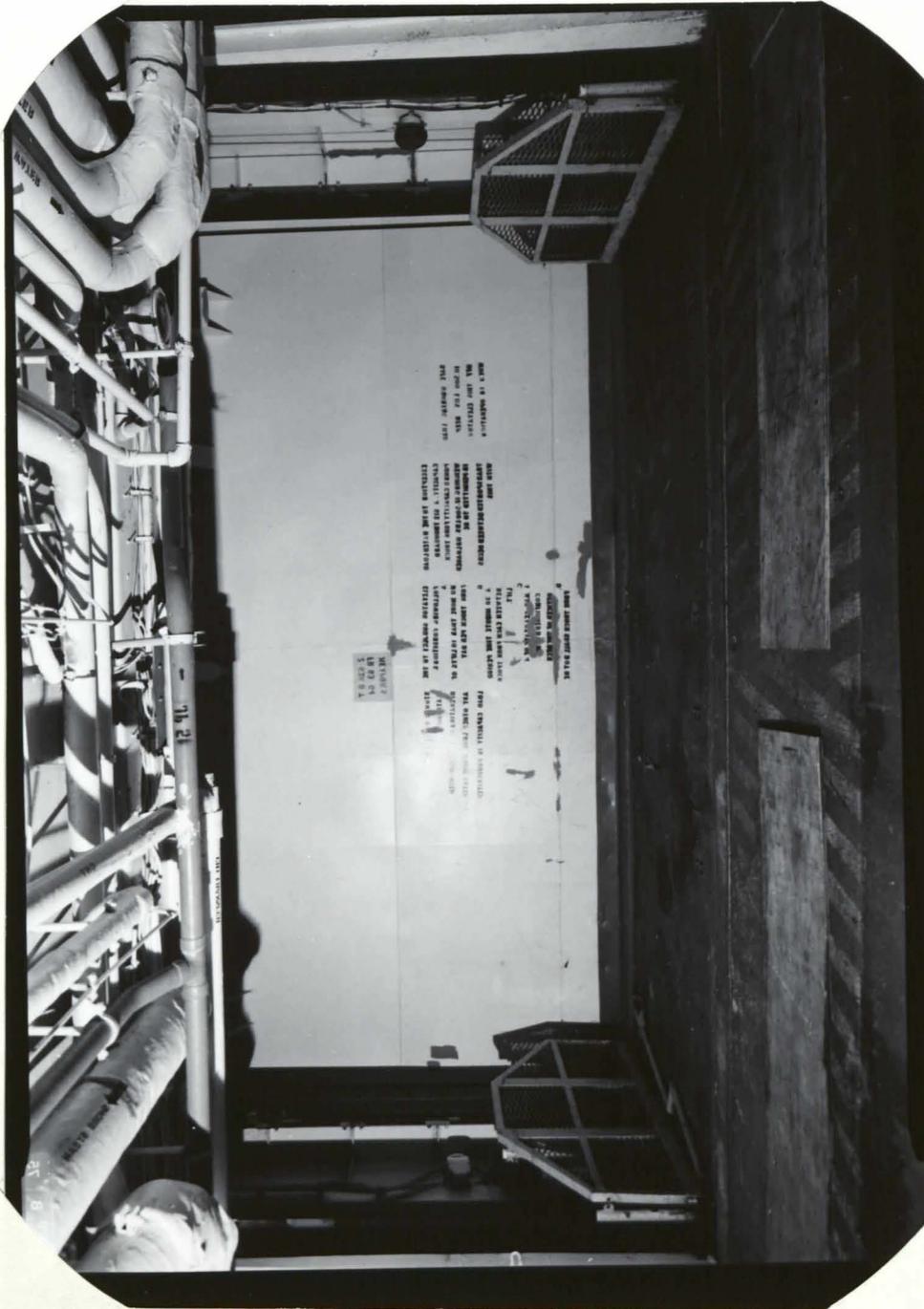
HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-41



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-42



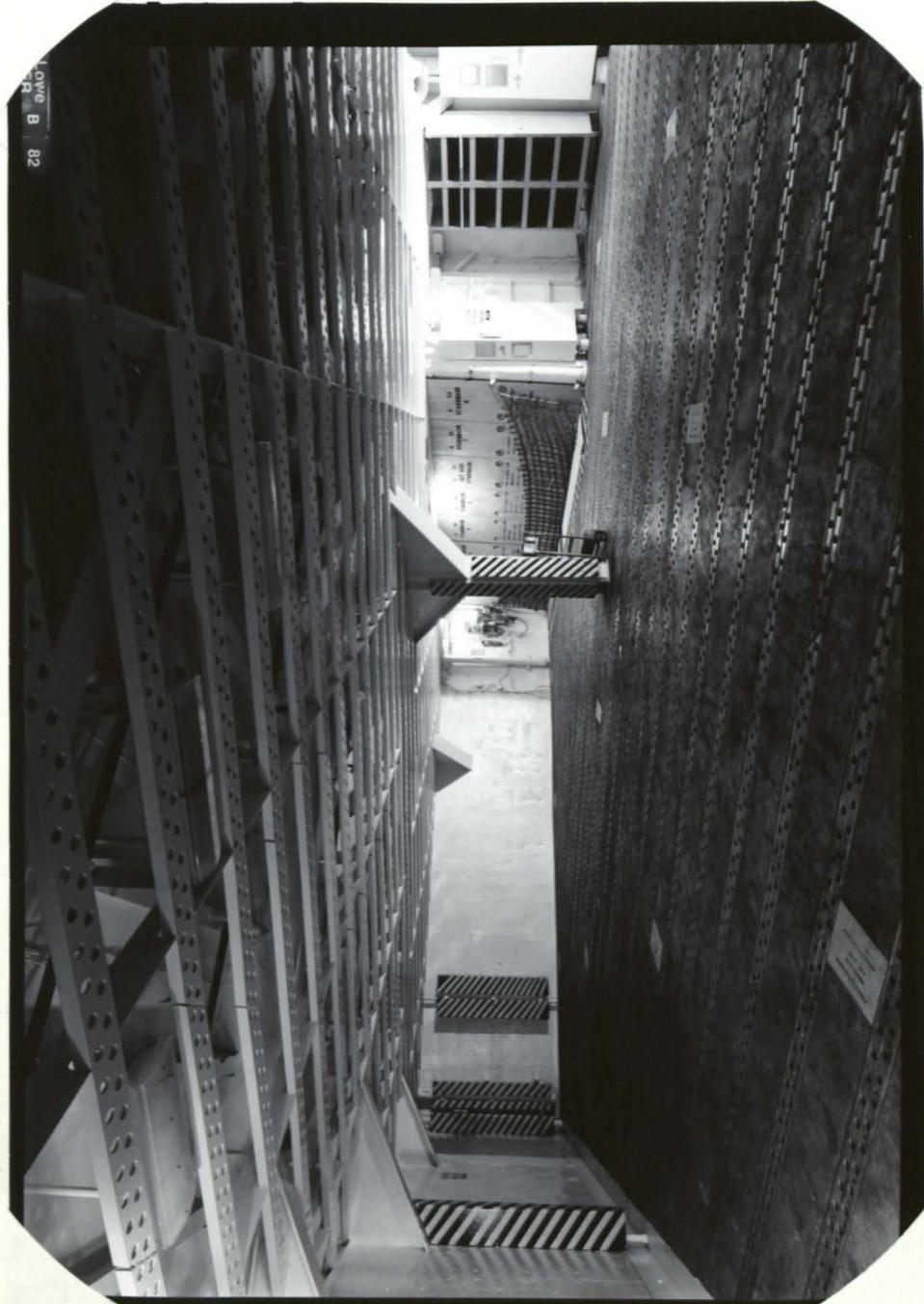
HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-43



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-44



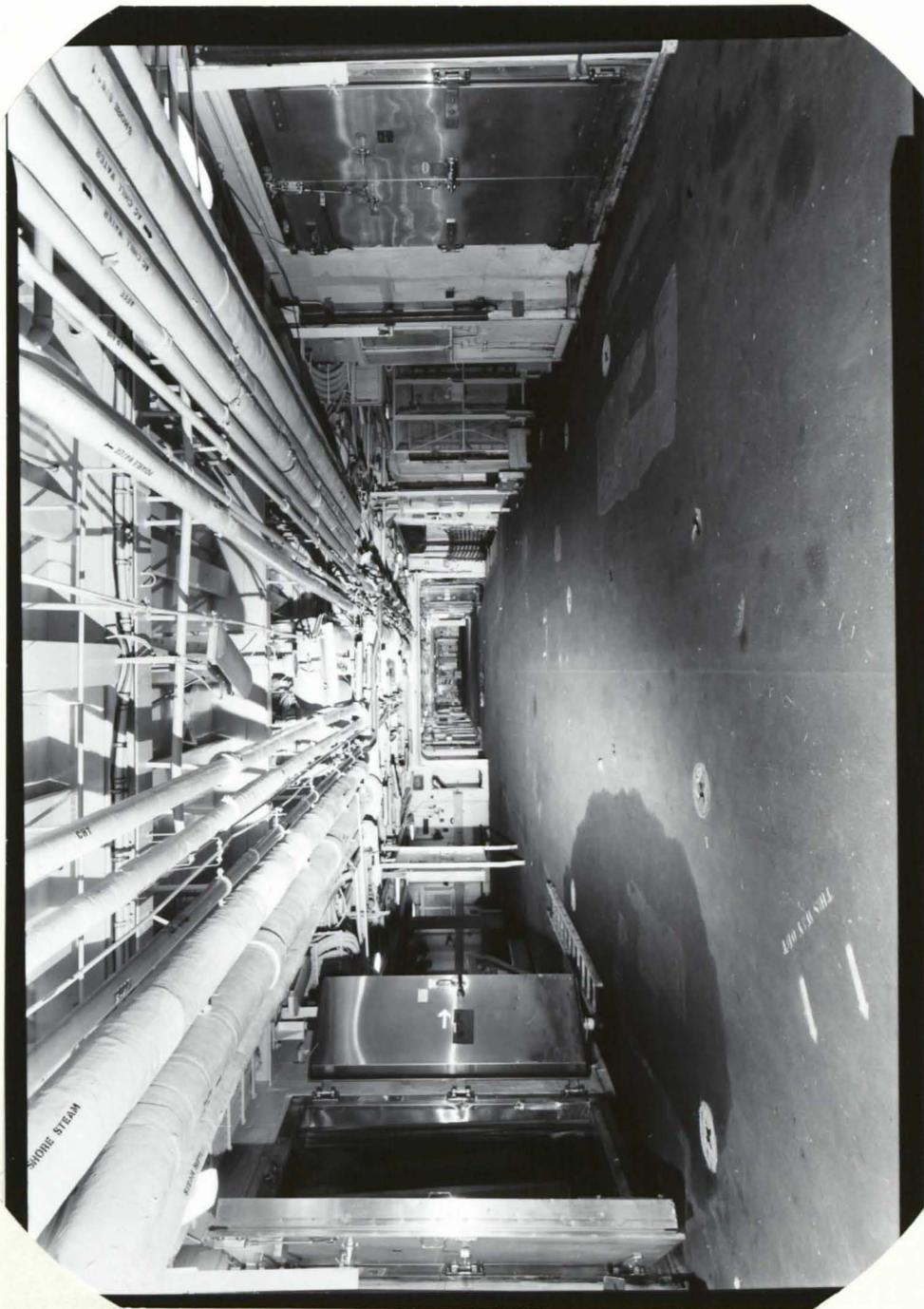
HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-45



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-46



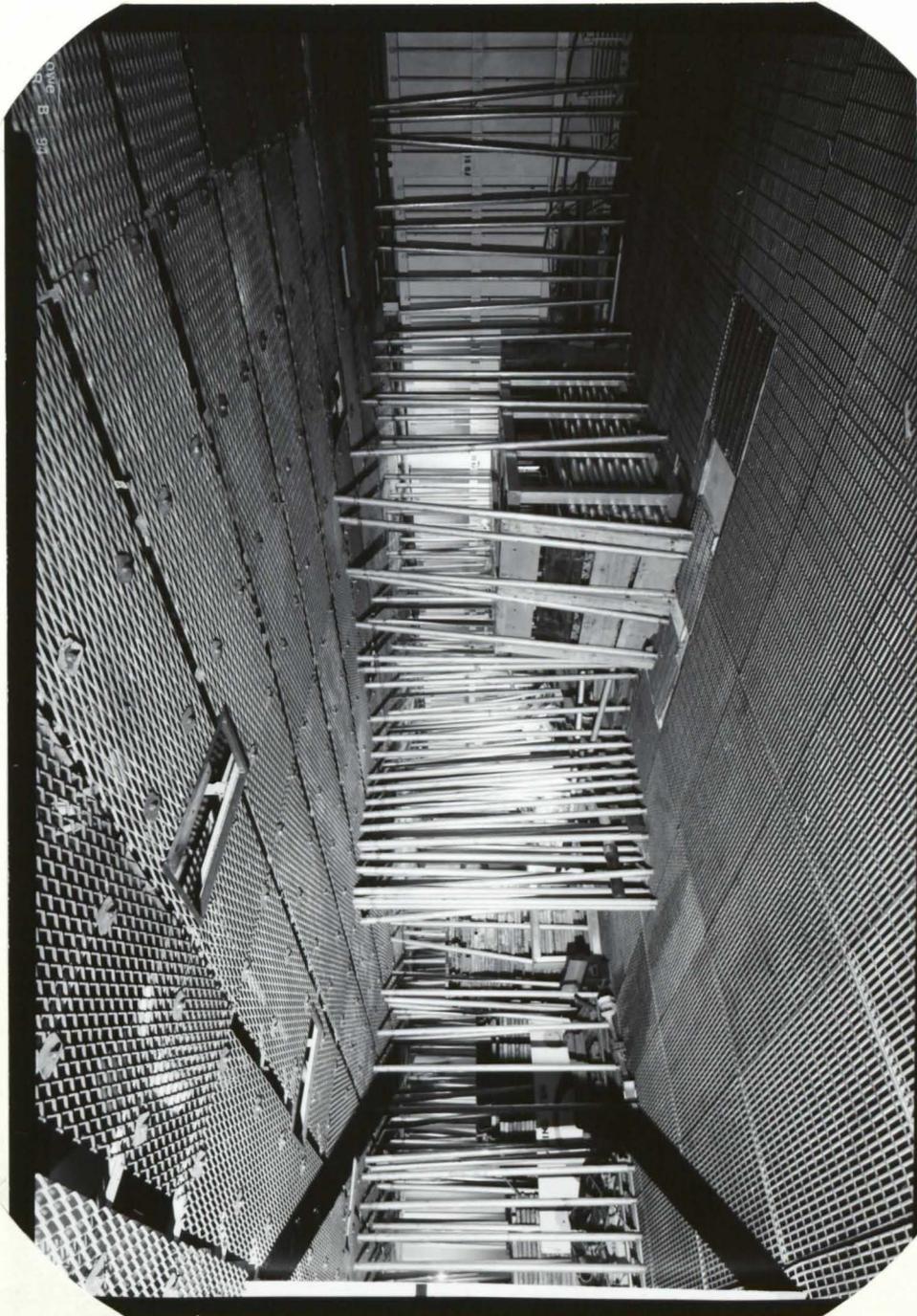
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

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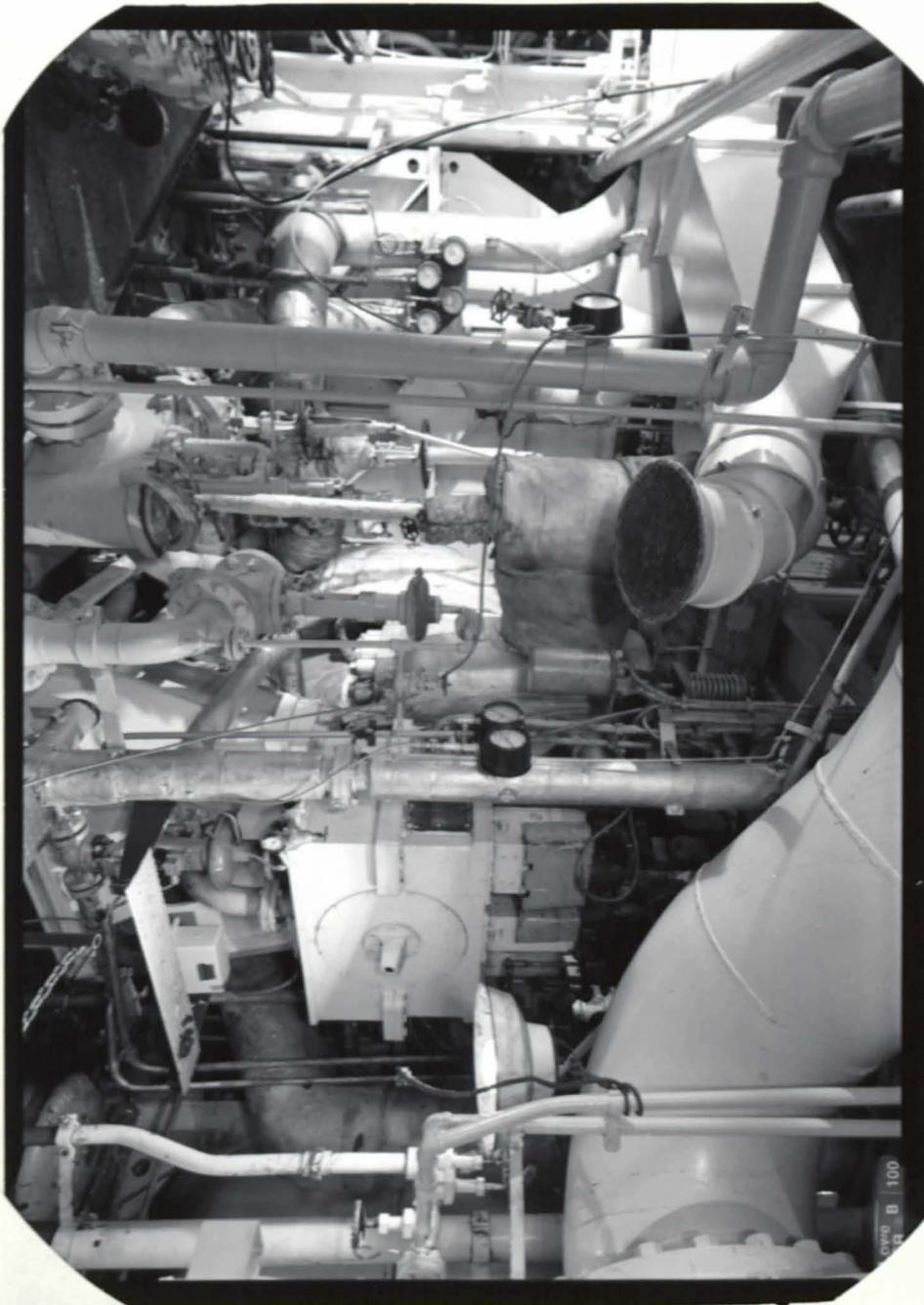
HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-48



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-49



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-50



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

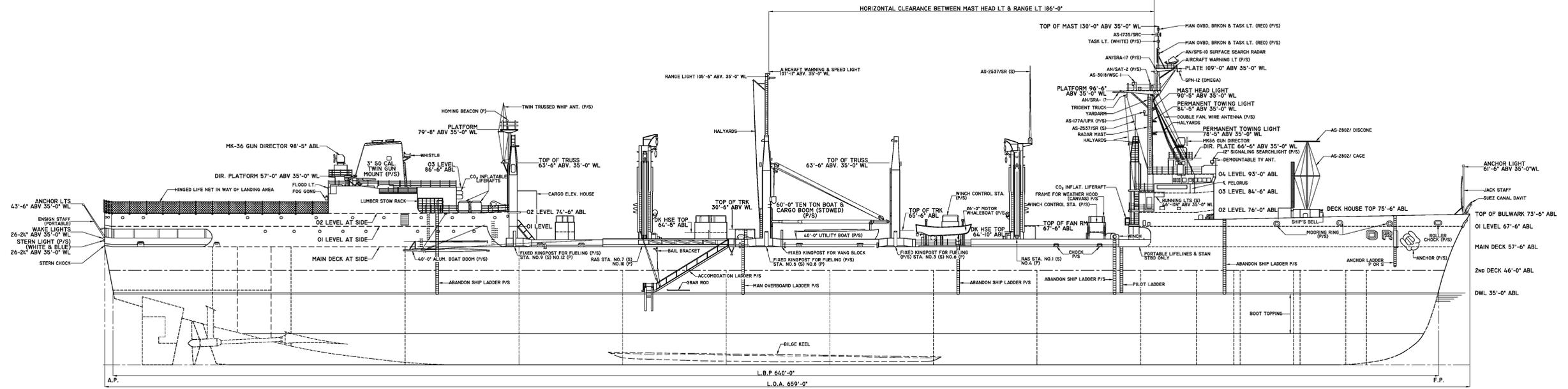
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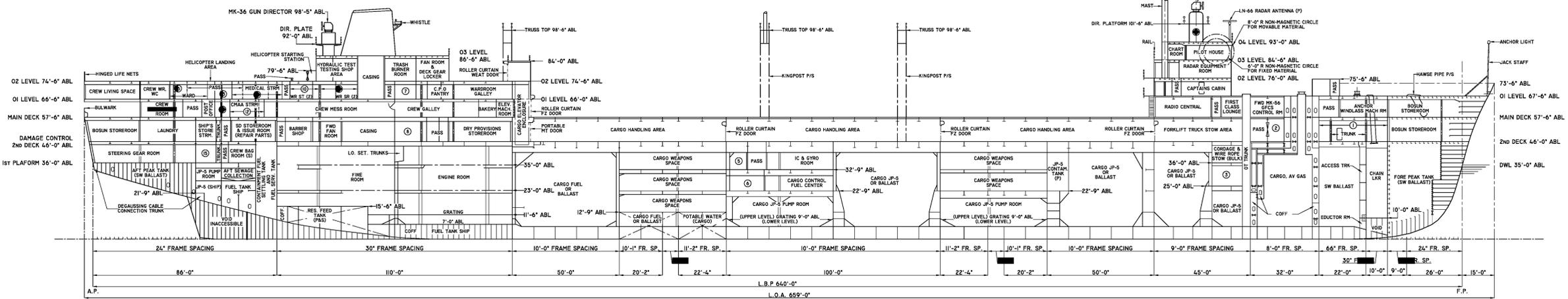
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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. CA-356-52



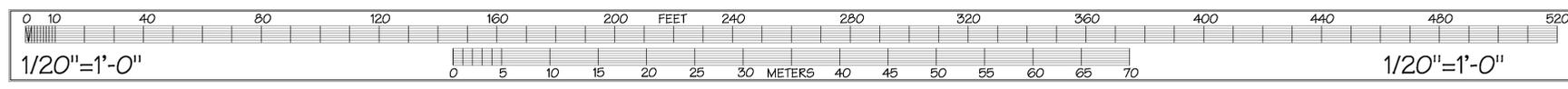


OUTBOARD PROFILE



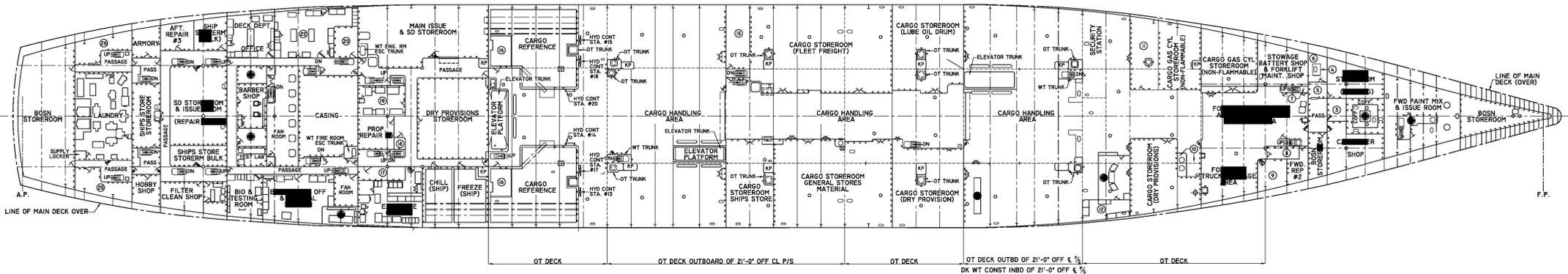
INBOARD PROFILE

SCHEDULE OF ROOMS AND FEATURES OF VESSEL					
1	FWD PAINT MIX AND ISSUE ROOM	5	TANK CLEANING EQUIPMENT ROOM	9	AFT. MK 56 FLS. CONTROL ROOM
2	UNREP. MSL. & GEN. ORD. HAND EQUIPMENT	6	CARGO PUMP MOTOR CONTROLLER ROOM	10	UNASSIGNED
3	REST FOR FUTURE INST. OF WEAPONS OT SYSTEM	7	UNASSIGNED FAN ROOM	11	OPERATING AND SURGERY DRESSING RM
4	SIGNAL MAN'S SHELTER	8	SUPPORT CENTER PROPELLER REPAIR	12	CREW SCULLERY
				13	STER. AND REPAIR ROOM
				14	SHIPS STOREROOM
				15	MEDICAL STOREROOM SMALL STORES STRM
				16	X-RAY ROOM

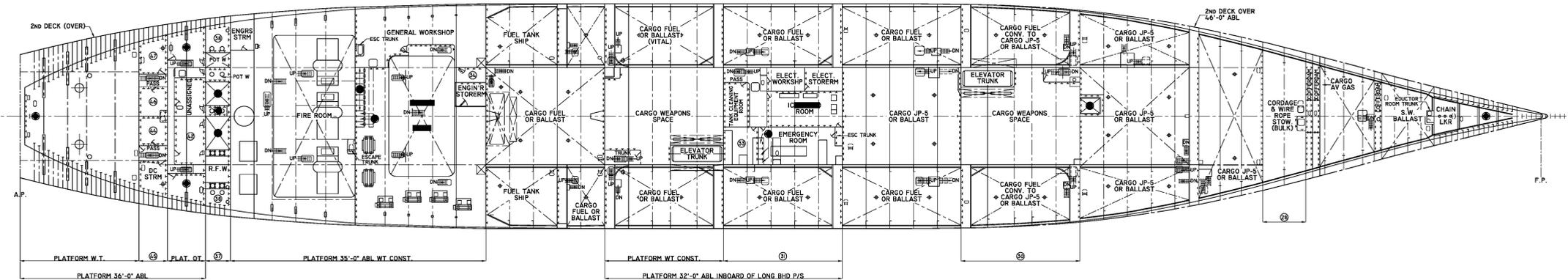


NOTE: DRAWINGS WERE TRACED FROM SCANS OF ORIGINAL DRAWINGS LOCATED AT THE NATIONAL ARCHIVES AND RECORDS ADMINISTRATION. DESIGN DRAWING No. AOR-1-845-2522019. MEASUREMENTS WERE NOT VERIFIED IN THE FIELD.

Navy Replenishment Oiler *Wichita* (AOR-1)



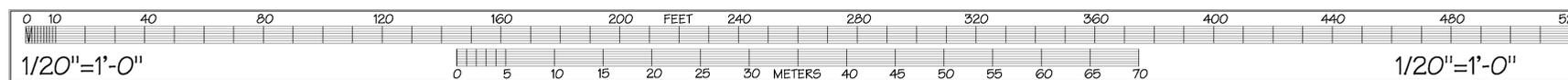
OI LEVEL



MAIN DECK

SCHEDULE OF ROOMS AND FEATURES OF VESSEL

1	AV GAS PUMP MOTOR ROOM	8	TOP OF FAN ROOM (P/S) CONT. FOR CARGO BOOM WINCHES P/S	15	RAIN CLOTH LOCKER	22	SHIP'S ENTERTAINMENT AND EQUIPMENT ROOM	29	SW DECONTAMINATION STATION	36	18" DIA FIXED FUELING KP (STBD) ONLY	43	WINCH CONT. STA. P/S FOR "FAST" REPLENISHING	
2	3"/50 CALIBER TWIN GUN MOUNT (REST FOR FUTURE INST. P/S)	9	PLATFORM FOR WINCH CONTROL RAS STATION NO.10	16	MK 56 GFCS AMPLIDYNE ROOM	23	DIET PANTRY	30	FIRST CLASS LOUNGE	37	WINCH CNTRL STA. (OVER) STA. NO.4 (P) & NO.1 (S) FOR RAS P/S	44	RECESS FOR ACCOMMODATION LADDER STOW P/S	
3	BATH I- SHOWER	I- W.C. I- LAVATORY	10	PLATFORM FOR WINCH CONTROL RAS STATION NO.7	17	BACTERIA LAB AND PHARMACY	24	X-RAY DARK ROOM	31	SECURE TELETYPE/ MESSAGE PROCESS ROOM	38	"KEEP CLEAR" PASS AREA FOR FORK LIFT TRUCKS	45	SINCH CONT. STA. (OVER) FOR FUELING STATION NO.12
4	OFFICER S.R.		11	STEWARDS MESS ROOM	18	STEERING & APPAR. ROOM	25	CLOSED CIRCUIT TV CONTROL ROOM	32	LIGHT TRAP P/S	39	WINCH CONTROL STA. (OVER) FOR FUELING P/S	46	CREW WR, WC & SHR. FRESH & SW DECONTAMINATION STATION
5	URG'S AND CAPTAIN'S GALLEY		12	WARDROOM, MESS ROOM AND LOUNGE	19	DOCTOR'S OFFICE AND CONSULTATION ROOM	26	FWD. MK56 GFCS CONTROL ROOM	33	FUEL OUTTRIGGER OVER	40	FLWI ELEVATION HATCH-HINGED OVER	47	GARBAGE DISPOSAL ROOM
6	OPERATING OFFICER S.R.		13	W.R. STOREROOM	20	MEDICAL DEPARTMENT RECORD OFFICE	27	MK 56 GFCS AMPLIDYNE ROOM (FWD)	34	FIXED FUELING KP (P) ONLY	41	14" CLOSED CHOCK	48	MEAT THAW ROOM
7	C.G. LOCKER REG'D PUB. OFFICE		14	EXECUTIVE OFFICERS OFFICE	21	MOTION PICTURE EQUIPMENT ROOM	28	ELECTRIC WORKSHOP	35	WALKWAY OVER OI LEVEL	42	26'-0" PERSONNEL BOAT P/S		



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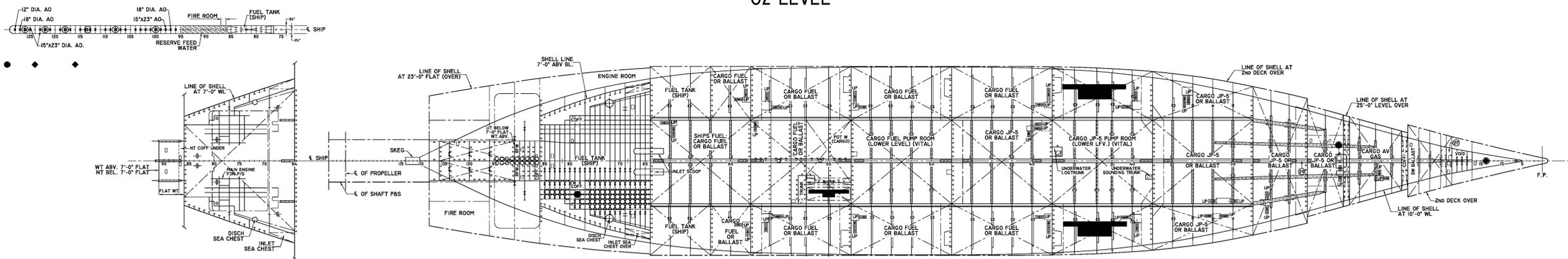
Navy Replenishment Oiler *Wichita* (AOR-1)



OI LEVEL



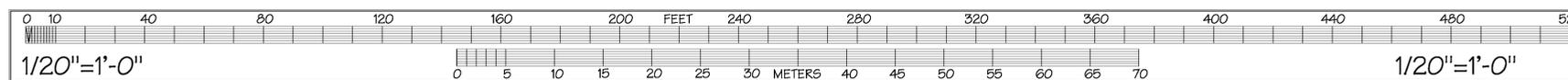
O2 LEVEL



HOLD

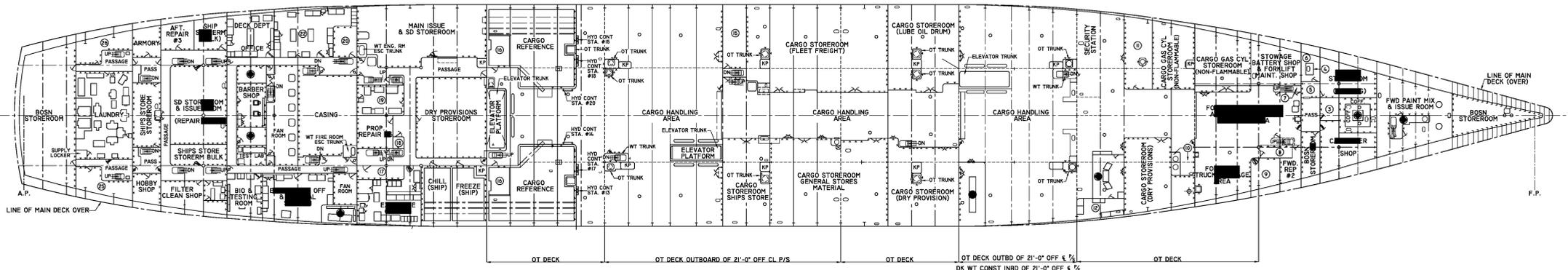
SCHEDULE OF ROOMS AND FEATURES OF VESSEL

1	OPEN CONNING STATION P/S	6	W.T. SLOPING BHD	11	C.G. LOCKER	16	REPAIR 3B	21	HELICOPTER CRASH RESCUE LOCKER	26	FORE PEAK TANK (SW BALLAST)	31	VOID INACCESSIBLE
2	SIGNAL MAN SHELTER	7	TOP OF AV GAS PUMP MOTOR ROOM AND PASS 75.6° ABL	12	RAIN CLOTHES LOCKER	17	READY SERVICE ROOM	22	HELICOPTER FLY CONTROL EQUIPMENT LOCKER	27	EDUCTOR ROOM		
3	SKY LOOKOUT P/S	8	CAPTAIN'S SEA CABIN	13	WET ROLLER CURTAIN DOOR	18	PLATFORM 7'-0" BELOW 03 LEVEL	23	HYDROGEN TESTING SHOP	28	DEGAUSSING CABLE TRUNK		
4	CHART ROOM	9	NAV. DEPARTMENT OFFICE	14	CO ₂ INFLATABLE LIFERAFTER P/S	19	3"/50 CALIBER MOUNT POWER ROOM	24	HELICOPTER FUEL STATION	29	KEEL RIDER PLATE		
5	SIDLIGHT PLATFORM SIDLIGHT UNDER	10	DECK W.R. AND W.C.	15	PACKING CONVERTER TRUNK	20	DECK GEAR LOCKER	25	HELICOPTER STARTING STATION	30	SUMP BOTTOM OT 60° ABL P/S		

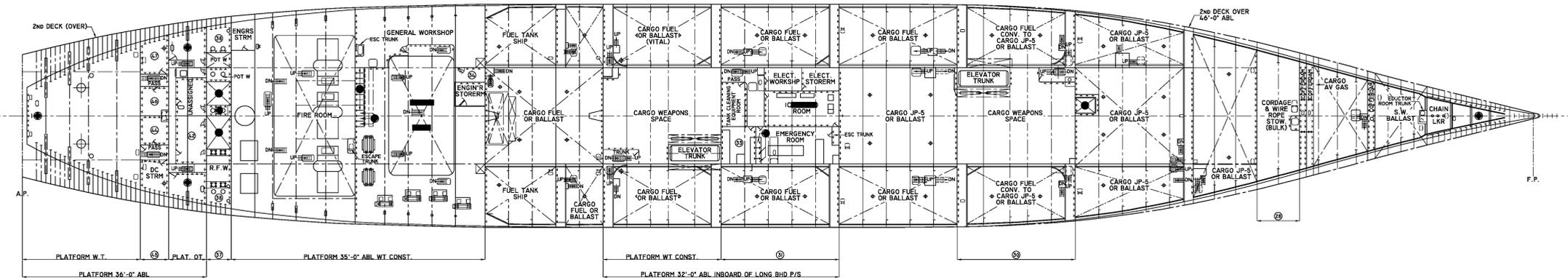


NOTE: DRAWINGS WERE TRACED FROM SCANS OF ORIGINAL DRAWINGS LOCATED AT THE NATIONAL ARCHIVES AND RECORDS ADMINISTRATION. DESIGN DRAWING No. AOR-I-845-2522019. MEASUREMENTS WERE NOT VERIFIED IN THE FIELD.

Navy Replenishment Oiler *Wichita* (AOR-1)



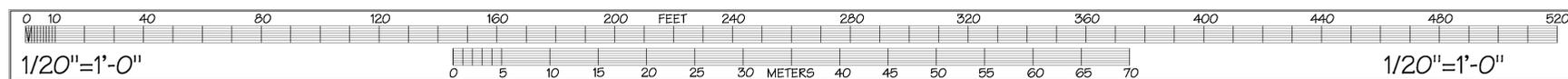
DAMAGE CONTROL DECK



FIRST PLATFORM

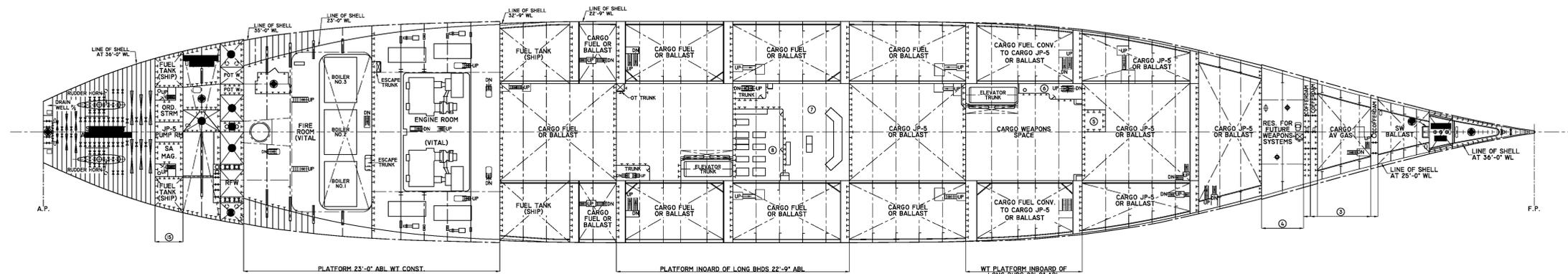
SCHEDULE OF ROOMS AND FEATURES OF VESSEL

1	AT TRUNK	8	FWD ELECT LOAD CENTER	15	AMID DECK MACHINE ELECTRICAL CONTROL CENTER	22	S.D. OFF (COMMISSIONARY STORES & DISBURSING)	29	JP-5 CONTAMINATION TANK	36	L.O. STOWAGE TANKS	43	SPEC. CLOTHING STOREROOM
2	OT CARGO AND AV GAS TRUNK	9	FAS GEAR STOW MAINTENANCE ROOM	16	DIFFUSER ROOM	23	PMS OFFICE & AFT ELECTRICAL LOAD CENTER	30	PLATFORM 32'-9" ABL INBD OF LONG BHD P/S W.T. CONST.	37	FLAT SLOPING 35'-0" TO 36'-0" ABL PLATFORM NT	44	SMALL STORES STOREROOM
3	UNREP MISSILE & GEN. ORD HAND EQUIPMENT ROOM	10	OT TRUNK AND AFF STATION	17	AFT DECK MACHINERY ELECTRICAL CONTROL CENTER	24	AFT AFF STATION	31	PLATFORM WT EXCEPTION IN WAY OF COMPT 4-53-2-T BELOW PLATFORM WILL BE WT CONST.	38	POT W (CARGO)	45	PLATFORM OT OUTBD OF 19'-0" OFF CL WT CONST IN WAY OF COMPT BELOW & WT SEWER
4	FWD SEW. CLOTHING TRUNK	11	GAS CYLINDER STOREROOM (FLAMMABLE)	18	W.T. PACKING CONV.	25	SHIP STOREROOM (BULK)	32	JP-5 TANK LO TANK CONTAMINATION LO TANK	39	FUEL SERVICE TANK	46	MEDICAL STOREROOM
5	VESTIBULE	12	SWU OFFICE	19	SUPPLY CUPPORT CENTER	26	AFT PAINT MIXING AND ISSUE ROOM	33	MOTOR REWIND WORKSHOP	40	CONTAMINATED FUEL SETTLING TANK	47	SHIPS STORE STOREROOM
6	FWD SEWAGE PUMP ROOM	13	CARGO CONTROL CENTER	20	DEGAUSSING CONT. ROOM	27	FOREPEAK TANK (S.W. BALLAST)	34	TOOL ISSUE ROOM	41	OFFICER & CPO BAGGAGE ROOM	48	STEERING GEAR ROOM
7	BATTLE DRESSING STOREROOM	14	FWD DECK MACHINERY ELECTRICAL CONTROL CENTER	21	ENGINEERING TECHNICAL LIBRARY	28	W.T. PLATFORM 36'-0" ABL	35	L.O. SETTLING TANKS	42	CREW'S BAGGAGE ROOM		

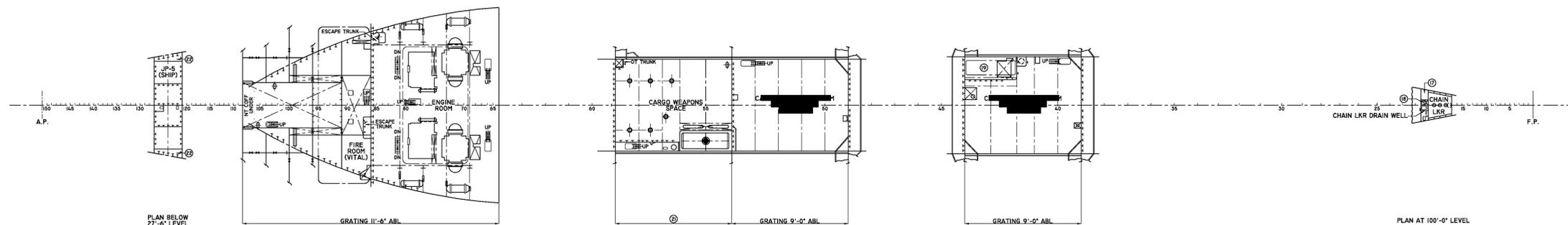


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Navy Replenishment Oiler *Wichita* (AOR-1)



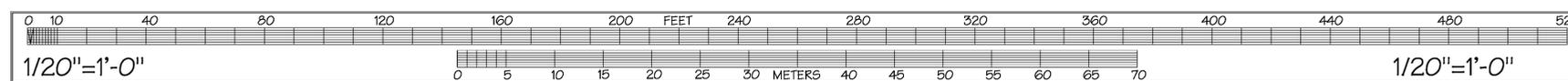
SECOND PLATFORM



THIRD PLATFORM

SCHEDULE OF ROOMS AND FEATURES OF VESSEL

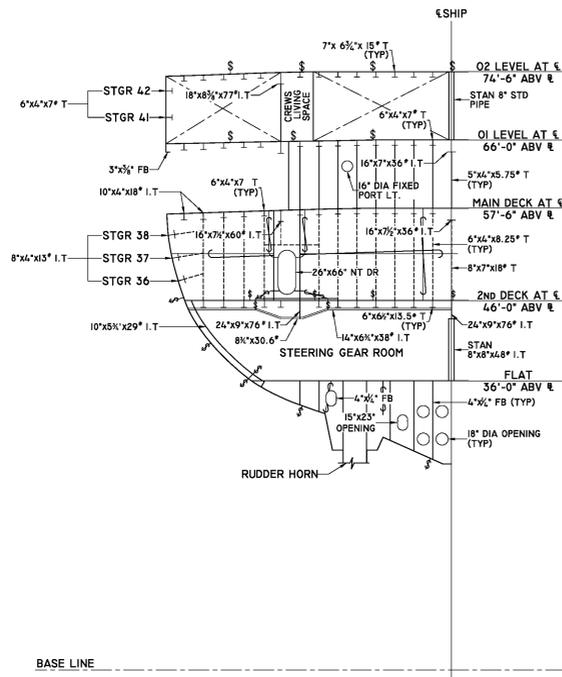
1	FOREPEAK TANK (S.W. BALLAST)	5	JP-5 CONTAMINATION TANK	9	FUEL SERVICE PROTECTIVE ENCLOSURE	13	AFT SEWAGE COLLECTION TANK	17	TOP OF EDUCATOR ROOM 10'-0" ABL- W.T.	21	3RD PLATFORM 12'-9" ABL PLATFORM WT FWD FR 56 & OT AFT FR 56
2	EDUCTOR ROOM TRUNK	6	SECURITY STATION TRUNK (VITAL)	10	POT W (CARGO)	14	AFT SEWAGE PUMP ROOM	18	EDUCTOR ROOM TRUNK	22	FUEL TANK (SHIP)
3	NT FLATS INLINE WITH LONG #26	7	CARGO FUEL CONTROL CENTER	11	FUEL SERVICE TANK	15	FLAT OT 27'-6" ABL INBOARD OF OUTBOARD LONG BHDS	19	ELEVATOR MACHINERY ROOM		
4	OT PLATFORM 25'-0" ABL	8	CARGO PUMP MOTOR CONTROL ROOM	12	CONTAMINATED FUEL SETTLING TANK	16	DEGAUSSING CABLE CONNECTION TRUNK	20	ELEVATOR TRUNK ELEVATOR PLATFORM		



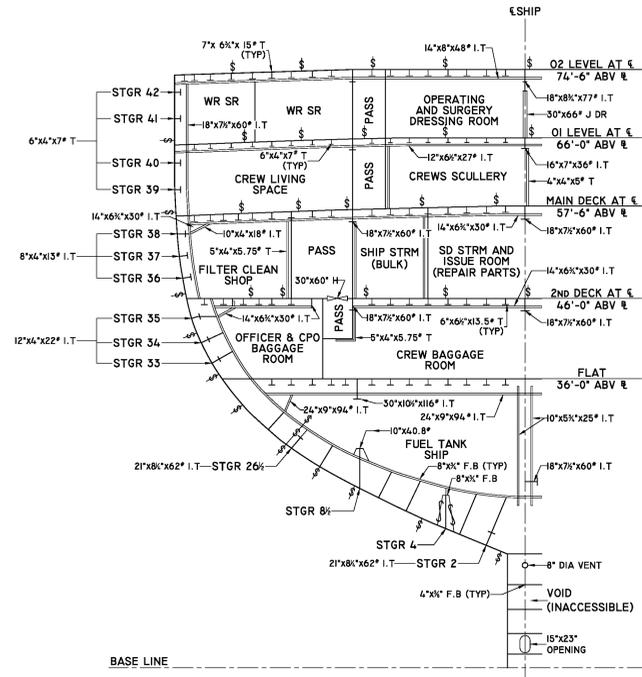
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Navy Replenishment Oiler *Wichita* (AOR-1)

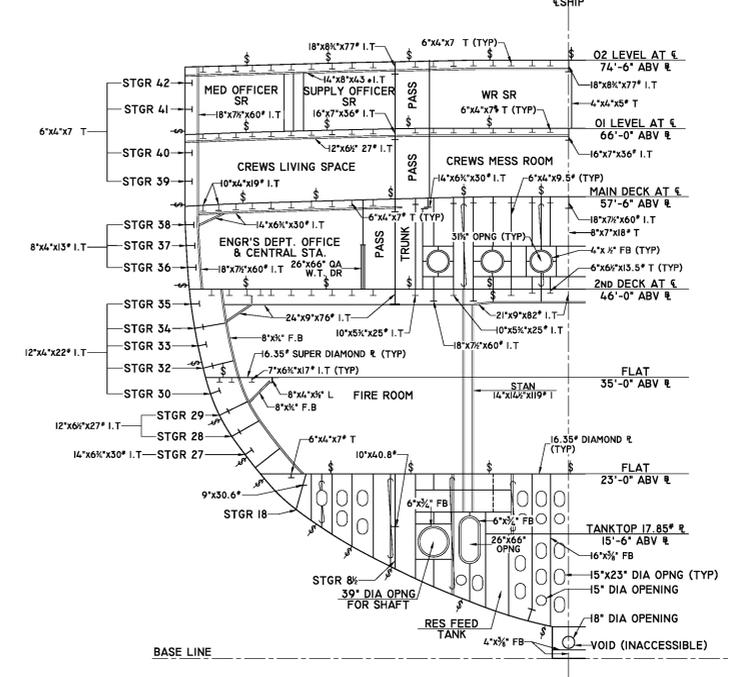
Cross Section Drawings



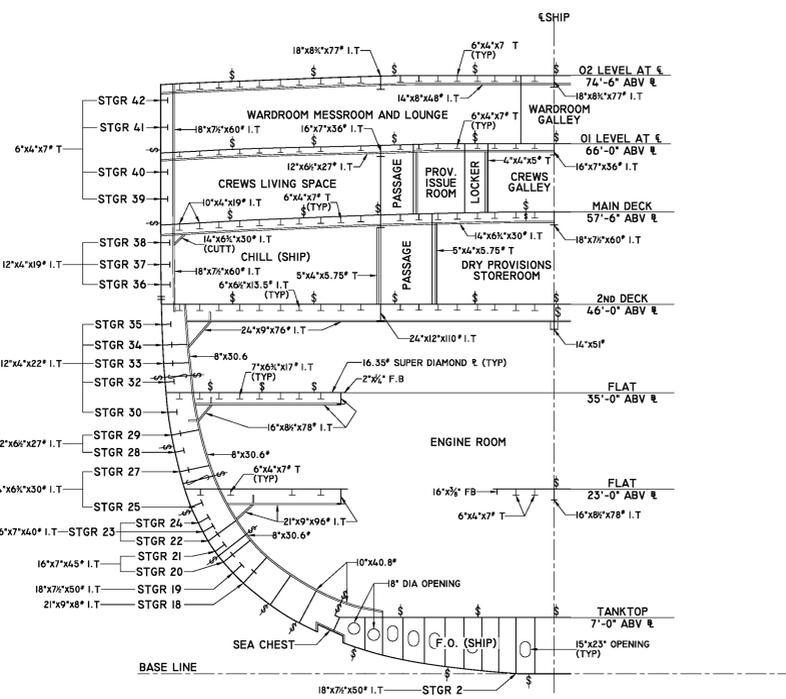
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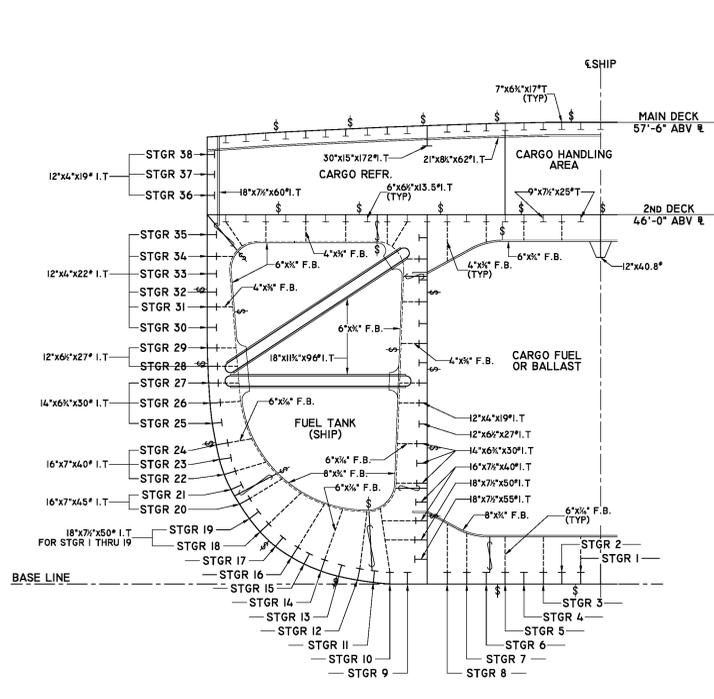
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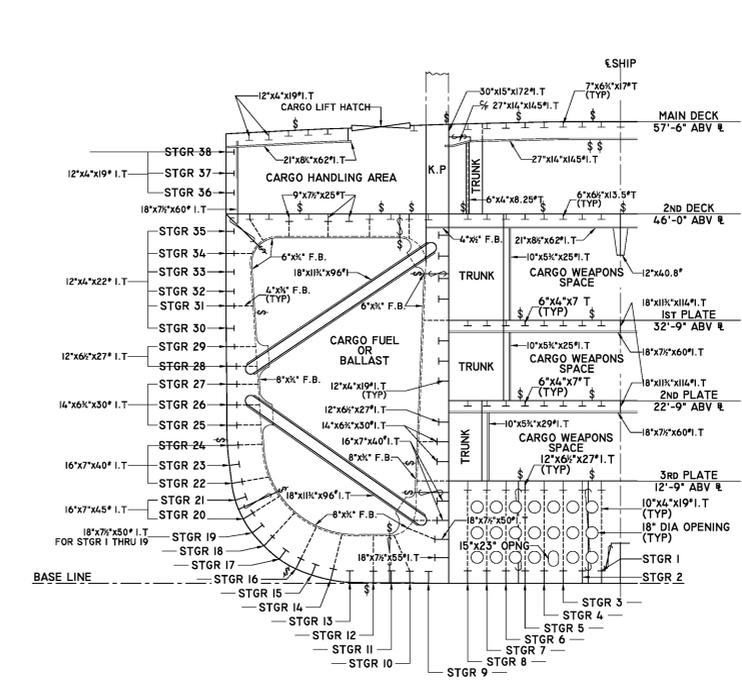
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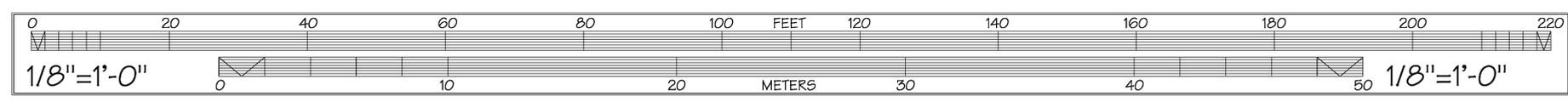
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FRAME 62
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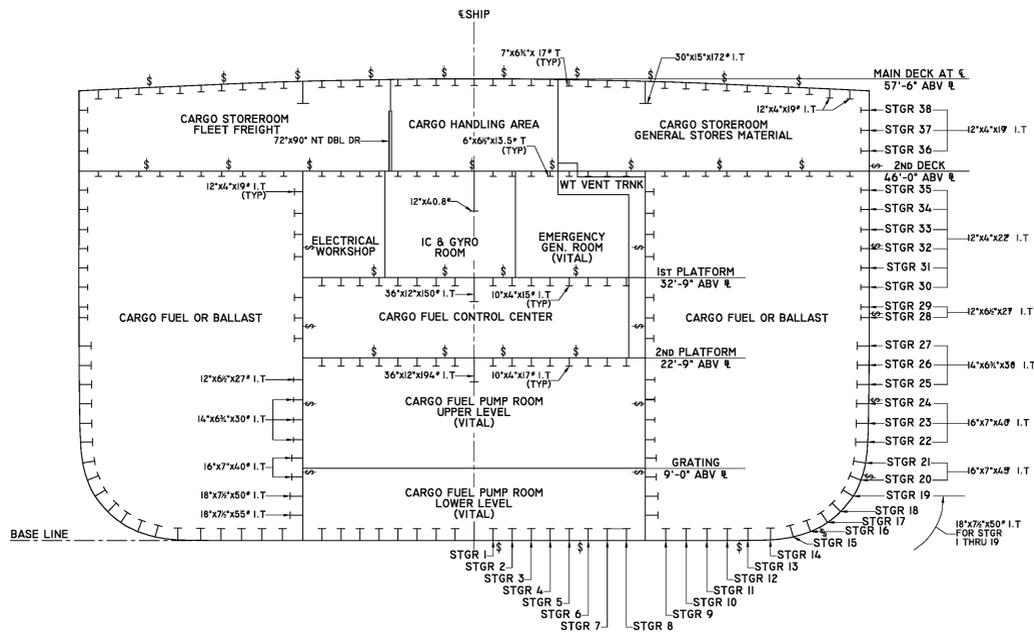
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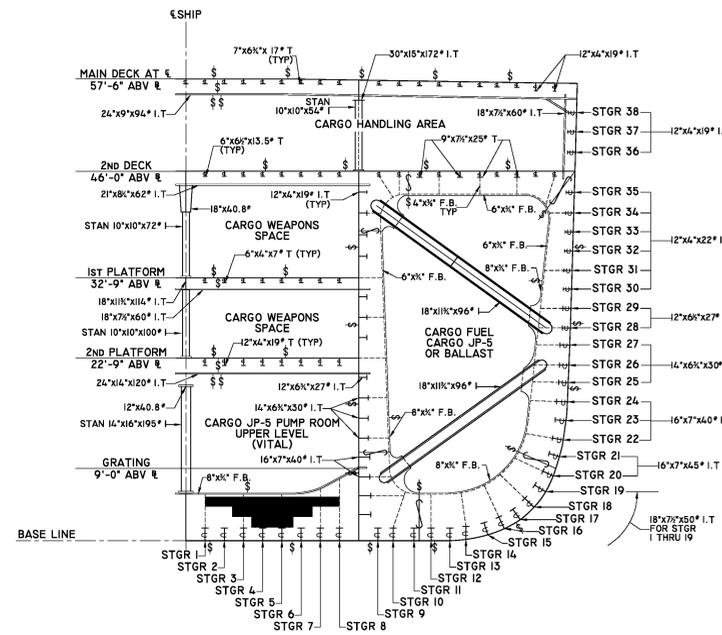
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Navy Replenishment Oiler *Wichita* (AOR-1)

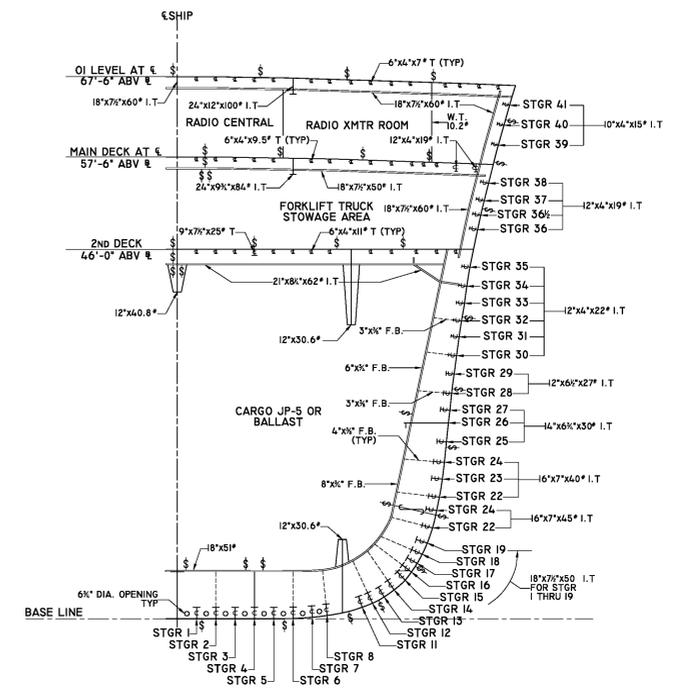
Cross Section Drawings



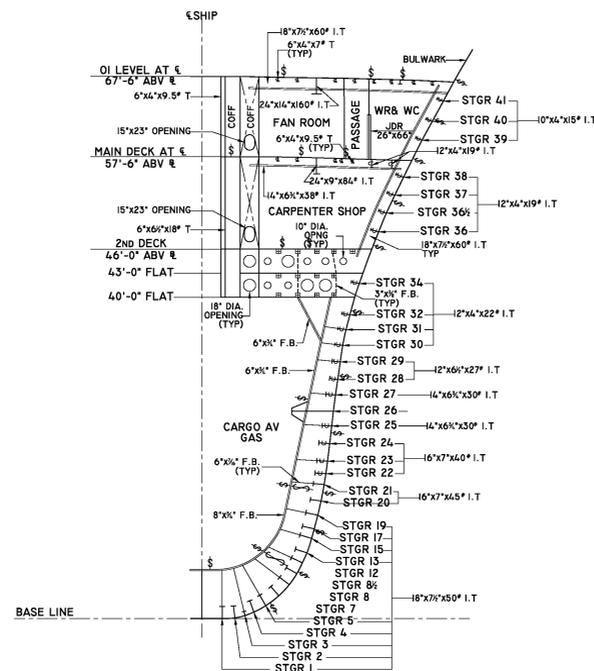
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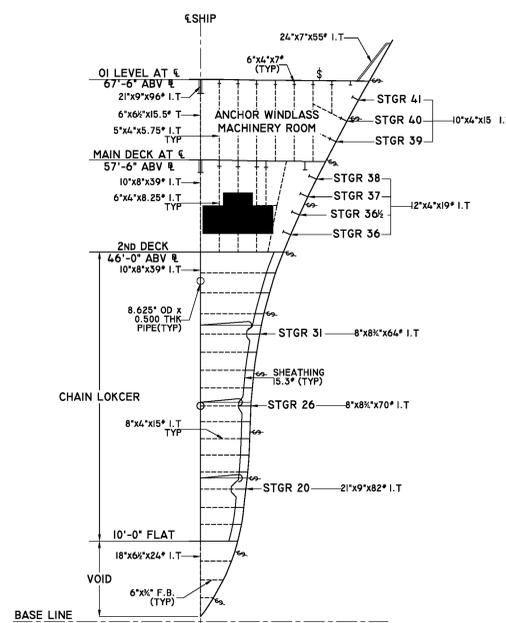
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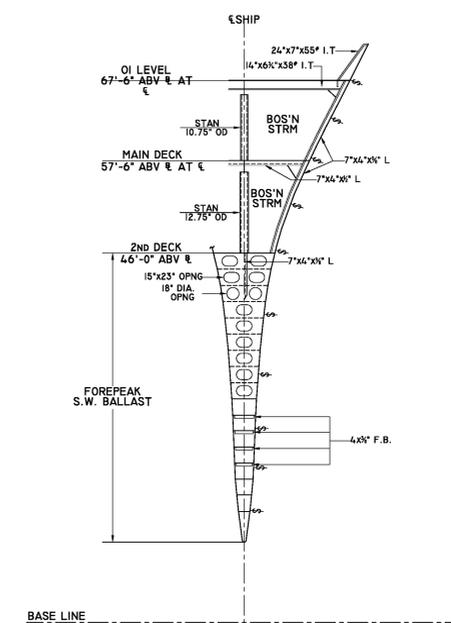
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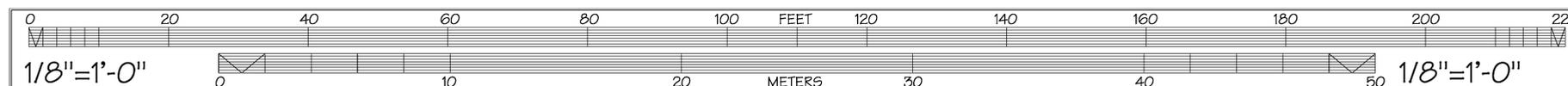
FRAME 78
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FRAME 62
LOOKING AFT



FRAME 58
LOOKING AFT



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