SALVAGE OF THE BATTLESHIP USS OKLAHOMA FOLLOWING THE ATTACK ON PEARL HARBOR 1942-46
The USS Oklahoma was our first battleship equipped with 14-inch rifle main battery. Second unit of the Nevada Class, built at Camden, New Jersey in 1914-16. Commissioned in May 1916.
The Oklahoma was 583 feet long with a maximum beam of 95 feet. She had a maximum displacement of 27,500 Tons. This shows gunnery training in 1917, during World War I.
The Oklahoma was extensively modernized in 1927-29 to make her less vulnerable to air and torpedo attack. In July 1936, she was dispatched to Europe to evacuate US citizens during the Spanish Civil War.
Japanese torpedo exploding against hull of the Oklahoma
The Oklahoma’s berth provided the clearest approach path for Japanese torpedo bombers along battleship row.
The *Oklahoma* was hit by 9 torpedoes because of her position opposite the inner harbor, which allowed Japanese bombers a clear approach path.
Each torpedo struck the Oklahoma’s port side at higher levels because the ship began listing soon after the first torpedo detonated. This plot was assembled by John F. DeVirgilio (1991).
Capsized hull of the Oklahoma outboard of the battleship Maryland, which received almost no damage
Damage Assessment: Aerial view of battleship row, showing capsized hull of Oklahoma (arrow)
The Oklahoma had her bilge inspection covers removed for a scheduled inspection the following day (Dec 8th). This precluded counter flooding to prevent her from capsizing. Although 32 sailors were saved after 3 days, 415 of her crewmen perished.
Situation when salvage began-1942

Salvage efforts concentrated on the least damaged ships first, the *Oklahoma* and *Utah* were the last ships to receive serious attention.
The Navy contracted with Pacific Bridge Company of San Francisco

- Refloating Methods Considered
  - Sealing the holes
  - Pontoons
  - Counterweight
  - Floating Dry Docks
  - Power winches on shore and rigging direct to the ship; This technique was previously employed to recover an overturned 19,000 ton caisson during construction of the Mid-Hudson suspension bridge at Poughkeepsie, NY in 1930-31
Final design of A-frame attachments to the overturned hulls

Soil from this area had to be progressively removed to allow final righting.
21 Compound pulleys
429 ton capacity each
Winch motors taken from Honolulu streetcars
Motors had to respond precisely to individual control
Operator stationed at each winch
Variable-voltage drives
3\" cable between the sheaves and the ship
1\" steel cable on the winches
Successful Righting of the Oklahoma

First Pull configuration began 8 March 1943
Final Pull configuration from 20 May 1943
74 days used to turn ship over

A-frames dropped out around 70 degrees
Preparing the hull for refloating

Placing the first cofferdam patch over torpedo damaged hull’s port side. Each patch was custom made to fit a certain portion of the deformed hull.

The ship was about 10 feet below water level after righting operations were completed.
Captain Homer N. Wallin, USN Naval Academy Class of 1917 Served initially on battleships Post graduate degree in Naval Architecture from MIT Prior to Pearl Harbor attack he was the Material Officer on staff of the Commander, Battle Force – Pacific ADM Nimitz promoted him to Captain and made him the Fleet Salvage Officer and Salvage Superintendent
Salvage Problems

- Refloating of the sunken hull required all hull leaks to be patched
- Gaping torpedo holes were covered with enormous timber cofferdams
- Concrete patches used beneath the cofferdams
- Biggest challenge was gaps between hull plates because frame was distorted by capsizing and salvage roll over
- Divers stuffed kapok into gaps between hull plates as water was pumped from hull. This eventually worked
Mk V Deep Sea Diver rig was used in much of the underwater salvage work. Many of the salvage techniques used today were developed by these divers during World War II, who spent 2 to 3 years at Pearl Harbor; such things as arc welding underwater with 440 amps and using hydraulic jets to excavate tunnels beneath sunken hulls.
In the salvage of the *Oklahoma* alone divers made 1,848 dives involving 10,279 man hours under pressure. There were only five diving supervisors.
All the diving and decompression on the Oklahoma never killed a military diver, but a civilian diver from the Pacific Bridge Company was killed when his air hoses became severed. The Navy divers had a better safety record.
Salvage workers entered the ship through airlocks into the pressurized hull. Note the mask, tank suit, gloves, boots, and camera. He is sitting on one of the timber frames. The safety wear is because of the decomposition of bodies, fuel and supplies. Pacific Bridge Company, Shipyard workers and naval personnel were working side-by-side to construct the giant winch system at right. Photo taken in January 1943.
Righting of the Oklahoma begins
Cables pulling the Oklahoma’s sunken hull out of Pearl Harbor on March 8, 1943
Cable pull 7,200 tons

Harbor surface

Mud line

Cg = 23,800 tons
By late March 1943, the A-frames were removed and the cables attached to the ship’s main deck to complete the roll-over.
The Oklahoma was eventually floated using twenty 10,000 gallon per minute pumps during an 11 hour period on November 3, 1943.
Caved in hull of Oklahoma as revealed after chipping away temporary concrete patches. The torpedoes ripped holes as wide as 40 feet. Taken in January 1944
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