SURVEY & REPAIR OF BATTLESHIP U.S.S. NORTH CAROLINA

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Vessel Data

Designers: General Board
Bureau of Construction & Repair (Hull)
Bureau of Ordnance
Bureau of Engineering
Bureau of Yards & Docks

The above bureaus later became the Bureau of Ships

Hull Number: BB 55
Keel Laid: October 27, 1937
Launched: June 13, 1940
Commissioned: April 9, 1941
Decommissioned: June 27, 1947
Length: 728' ⅜" long
Extreme Beam: 108 feet 3 7/8 inches wide
Mean Draught: 31 feet 7 inches normal, 35 feet 6 inches max.
Displacement: 36,600 tons standard, 44,800 tons full load
Frame spacing: 4’ centers
Number of frames between perpendiculars: 178 ½
Tons per inch immersion: 121.5 tons
Area of water plane: 55,080 sq. ft.
Moment to alter trim one inch: 4,200’ tons
Moment to list one degree: 6,138’ tons
Total wetted surface: 98,730 sq. ft.
Range of stability P/S (ship not damaged): 66.9 degrees
Inclination for maximum righting arm (ship not damaged): 34.3 degrees
Complement: 2,339 (144 officers and 2,195 enlisted)
Speed: 28 knots
Armament:
9: 16-inch/45 caliber guns
20: 5-inch/38 caliber guns
60: 40mm/56 caliber guns
48: 20mm/70 caliber guns
Keel laying ceremony, 27 October 1937, Brooklyn Navy Yard.
The progress on the double and triple bottoms can be seen and the bulkheads for machinery space No. 2 have been erected. Framing for the tunnel of the twin skeg stern is also visible.
Installation of boilers in No. 2 Machinery Space, looking to starboard.
Machinery Spaces completed amidships. Construction of 16” turret armored citadels and areas forward being completed.
Brooklyn Navy Yard, NY.

Rudder rolled into place on rudder post. Steel cable on corner of turn table plate ready to turn rudder to 32° outboard angle so that rudder stock and crosshead may be installed as one unit, 19 August 1940.

NARA (National Archives Record Administration)
Brooklyn Navy Yard NY. On building ways three days before launching, 11 June 1940. NARA (National Archives Record Administration).
Sliding down the building ways, as she is launched at the New York Navy Yard, 13 June 1940. Note the slope of her side armor, angled outward 15 degrees to increase its effective thickness against incoming enemy shells. USNHC # NH 44899.
Brooklyn Navy Yard NY.

Right Hand rifle being lifted off dock for Turret #2, 9 Nov 1940.

NARA (National Archives Record Administration)
Site of former battleship launching ways at the Brooklyn Navy Yard; now a large work shed and sewerage treatment facility.
On 6 September 1942, *North Carolina* (BB-55) maneuvered successfully, dodging a torpedo which passed 300 yards off the port beam. Nine days later, sailing with *Hornet* (CV-8), *North Carolina* took a torpedo portside, 20 feet below her waterline, and 6 of her men were killed. But skillful damage control by her crew and the excellence of her construction prevented disaster; a 5.6 degree list was righted in as many minutes, and she maintained her station in a formation at 26 knots. Portside damage from Japanese submarine *I-15* torpedo (21-inch/oxygen propelled). Photo taken 11 Oct. 1942 at Pearl Harbor where permanent repairs were done.
Bow on shot, leaving Pearl Harbor upon completion of repairs.

Notice paravane gear deployed off stem of ship.
Puget Sound, following shipyard period, September 1944.
Post war in the Mothball Fleet, here inboard of sistership battleship U.S.S. WASHINGTON.

Photo taken from topside hamper of battlecruiser U.S.S. GUAM at MOT Bayonne, NJ
The ship is being towed up the Cape Fear River to her final and present day berthing. The actual date of the photo is October, 1961, but it is not listed on the photo. As you can see on the photo, two 40mm quadruple mounts were removed before decommissioning, her catapults are gone. When she was decommissioned, she only carried her port catapult, the starboard one having been landed at her post-war refit at New York Navy Yard. Her aircraft crane at the stern was stored in its lowered position. The two original boat cranes, next to the aft stack, have been removed too. February, 1962 National Geographic Magazine.
Hull Survey

Tasking included:

1.) Inspection of Topside Hamper including masts, weather decks and exterior hull,

2.) Interior spaces from armored citadel to and including all interior decks/spaces, turrets and engineering/machinery spaces.

3.) Tankage, as specified by Surveyor, was opened and vented by the Owner.

4.) Tankage inspected by Marine Chemist to 29 CFR & NFPA standards for ‘Safe Entry’ prior to entry and then retested as required.

5.) Preparation of Survey Report with complete documentation of each space with embedded digital images, List of Recommendations for Repairs, inspection and recommendation of suitability of drydocks within limits of 3 day tow. Developed ROM costs analysis for towing and drydock repairs of vessel. On site repair process ultimately chosen.
Space covered in 1 ½’ of standing lube oil from tankage & overhead crane machinery room.
Ship’s Armor Belt

- **Main Belt Armor:** Extending from Frame 37 to Frame 147 from top of blister to 38’ 10” above M.B.L. Thickness between knuckle & top 12”, thickness at bottom 6.6”

- **S.T.S. Shell Plating:** 30# S.T.S. in back of main belt armor 40# S.T.S. extending from top of main belt armor to maindeck.
Typical arrangement of Class ‘A’ armor fixed/bolted to exterior side shell plating
Typical method for fastening Class ‘A’ armor to side shell of vessel.
Road Map for Ship Repairs

1.) Completed Hull Survey
2.) Analysis of location for ship repairs
3.) Completion of budgetary estimates
4.) LS3P chosen as prime contractor
5.) Preparation of Ship Repair Specifications
6.) Two rounds of RFQ pre-qualification for contractors; Taylor Marine of Beaufort, NC chosen as prime contractor.
7.) Submittal and advertisement of RFP
8.) Opening bids & choosing Contractor
9.) Mobilization & Commencement of Repairs
10.) Complete Repairs & De-mobilize
Repair Methodology

• Leakage from Frame 5 to Frame 37, starboard side,
• Sheet pile cofferdam around bow/vessel immensely expensive; dredging requirements, as determined by over twenty regulatory agencies in Cape Fear River Delta fraught with environmental permit issues.
• Solution determined by Surveyor was to design & build small, portable cofferdam sized 30’ long x 7’ deep x 15’ high.
• JMS Naval Architects & Salvage Engineers contracted to design cofferdam to be fitted against side shell plating after templating for curvature of hull and fitted to a removable flange. Cuts of 10’ high x 20’ long permitted within cofferdam for the ASTM ½” A-36 mild steel plating inserts. No doubler plating allowed.
• Taylor Bros. Marine contracted to build cofferdam & complete repairs.
Ship Repair Plans
Starboard Bow Repairs

U.S.S. NORTH CAROLINA
INBOARD PROFILE
SHELL PLATE REPAIRS

WATERTIGHT BULKHEADS

FR. 37

SHELL PLATE REPAIRS

FR. 26

FR. 16

FR. 5

FR. 10
Shell Plate Repair Sequence, Frames 5 – 37
Redrawn Shell Plate Expansion Plan & Cofferdam Sets
Mark-up on plating for cut/burn operations at juncture of welded/riveted plating strakes for Set #5. Armor belt meets side shell plating and lower blister.
Detail of cofferdam gasket meeting lower hull blister.
Detail of wasted plating, Cofferdam Set #5.
Wasted shell plating and rivet seam, Cofferdam Set #5.
Cutting away armor belt fairing plate, Cofferdam Set #5.
Cofferdam Set #5
Track oxy-acetylene torch cutting away top of blister fairing piece at rivet seam.
• Plating inserted.
• Hull primed & painted.
• New zinc anodes attached.
• Ready for more South Pacific swells.
Project Summary

• Portable Cofferdam very successful for waterline repairs.

• Immense cost savings over dredging & movement of ship to either Norfolk or Charleston for drydocking.

• Installation of sheet pile cofferdam around all of vessel or bow area too costly and time consuming given spawning & no dredge windows.

• Repairs completed ahead of time & on budget by Taylor Brothers Marine of Beaufort, NC 1st week of November 2011.