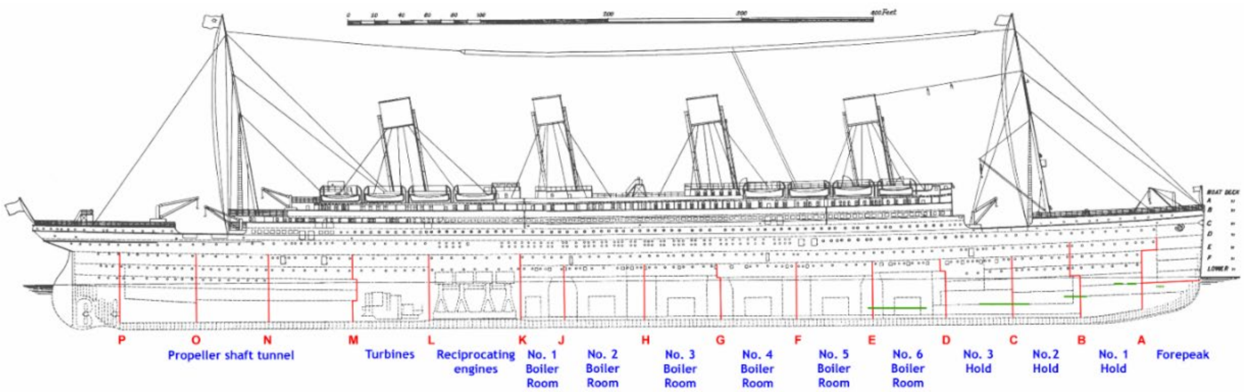
A QUIET SEA

RMS TITANIC

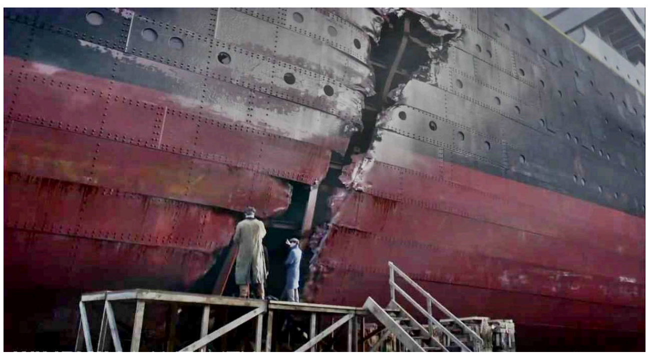


BULKHEADS

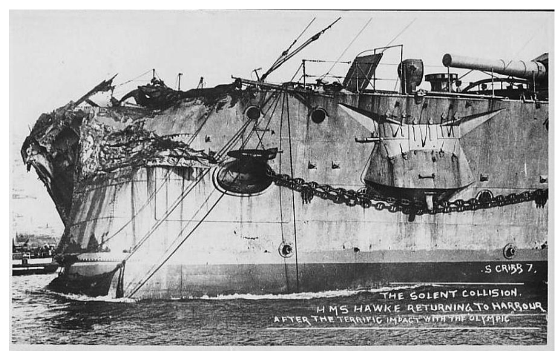
TITANIC BULKHEADS

“The captain can, by simply moving an electric switch, instantly close the doors throughout and make the vessel practically unsinkable.” This confident statement appeared in a 1911 British publication, *The Shipbuilder*. The midsummer issue was exclusively dedicated to the new White Star superliners Olympic and Titanic.

Not long after Olympic began service in June 1911, she collided with the Royal Navy cruiser HMS Hawke. Olympic was outbound to New York from Southampton and encountered Hawke in the Solent, a 20-mile strait between the Isle of Wight and Great Britain. Both vessels were on converging courses and shaping up for the seabound channel. Hawke, either through loss of steering or suction from Olympic’s large hull, was uncontrollably drawn into the liner and rammed her in the starboard aft quarter, just forward of the stern. Hawke’s bow crumpled, her fore deck buckled and she lost her ram bow.



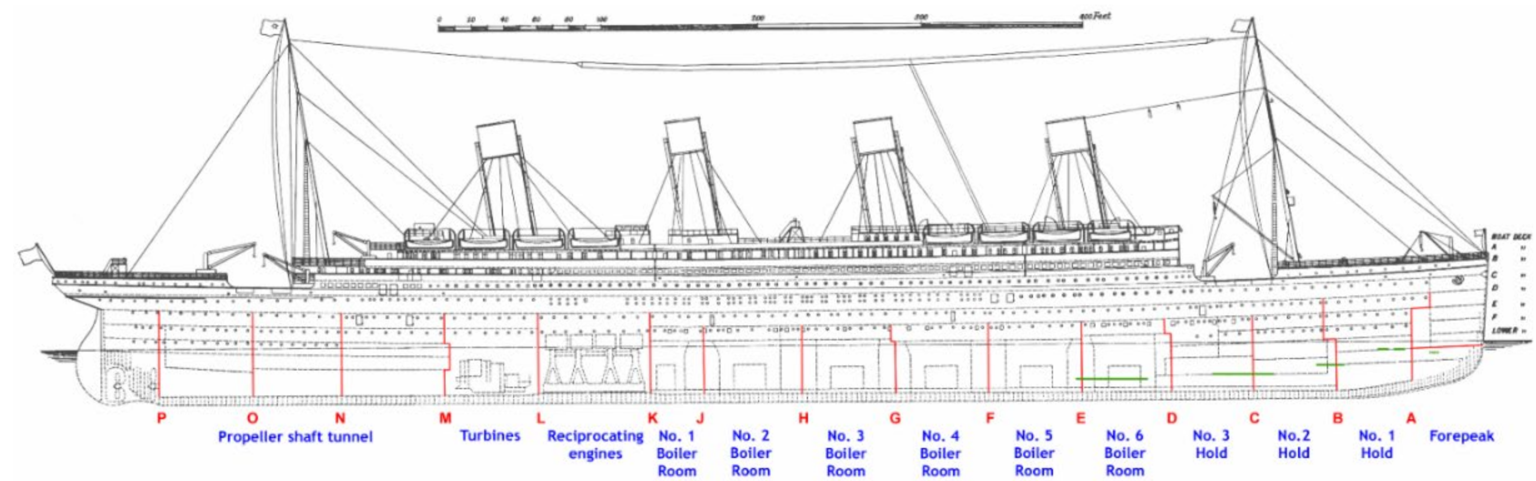
Olympic collision damage
Photo credit: Pinterest



Hawke bow damage
Photo credit: Reddit

Olympic also sustained serious injury. She suffered two flooded compartments and damaged her starboard propeller. Accommodations and electrical systems in the collision area were destroyed. When the turning starboard propeller came into contact with Hawke, the propeller slowed, possibly straining the engine and raising concerns among the engineers. Olympic anchored after the collision and was towed to her builders, Harland & Wolff, for repairs. Though badly damaged, Olympic was in little danger of sinking, proof to many of the invincibility of this class of liner.

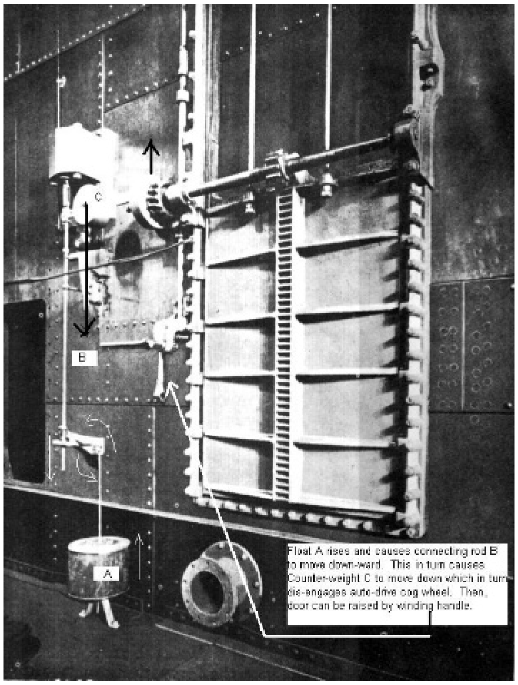
During one of Titanic’s post-sinking inquiries, Edward Wilding, one of the naval architects responsible for the design, estimated the initial rate of flooding to be about 250 tons of water per minute. Naval architects try to determine how a ship will respond to flooding using what is known as the floodable length curve. A ship is designed to sustain flooding for an allowable portion of her length and remain afloat. The floodable length curve specifies this value and determines the number and spacing of the bulkheads. Also included in these computations is the margin line. The margin line is calculated to be several inches below (hence the margin) the tops of the bulkheads, or watertight deck, if one is fitted. It represents the lowest level to which the ship can sink yet remain afloat. Bulkheads also perform the vital function of structurally joining together the bottom, sides and decks of a ship.



Titanic subdivision (Olympic shown, bulkheads in red)
Credit: Titanic-Titanic, com

Titanic was provided with 15 watertight bulkheads and could safely remain afloat with any two compartments flooded, meaning that one ruptured bulkhead wouldn't drastically impair the ship's floatation. Titanic's 16 compartments were from 50 to 70 feet long, so the anticipated worst-case scenario would flood about 120 feet of the ship's length. Titanic could also remain afloat with her first four compartments flooded, about 200 feet of her length, from the stem to the bridge. But collision with the iceberg opened seams and plates for 300 feet, rendering the first five compartments open to the sea. It is also important to note that, although the flooding was fatal, Titanic retained sufficient stability and didn't capsize. Remaining upright was vital for launching the lifeboats.

Titanic was privately funded by the White Star Line and wasn't designed for naval service. She was therefore built without a watertight deck, a feature found in warships and merchant vessels built with British government subsidies and meant to serve as auxiliary cruisers in time of war. As Titanic's bow sank deeper, the bulkheads were overtopped and flooding progressed unabated. The bulkheads were fitted with watertight doors to provide easy access between the compartments and close the bulkheads in the event of an accident. Watertight doors in the bottom of the compartments operated vertically by gravity, while those above operated laterally and were cranked closed manually by stewards assigned to the task.



Vertical acting watertight door
Credit: Encyclopedia Titanica

Lateral acting watertight door
Credit: Titanic Honor and Glory

In 1914, 13 countries attended the first International Conference on Safety of Life at Sea (SOLAS) in London. It raised standards for lifesaving appliances, manning requirements, and lifeboat drills and incorporated the United States 1912 Radio Act, which required a 24-hour radio watch. SOLAS emphasized the importance of keeping a sharp lookout and reducing speed at night in questionable visibility, including the moonless and unusually clear conditions that Titanic encountered. The first conference outlined general rules; only nominal consideration was given to improving watertight subdivision.

Subsequent conferences in 1929 and later addressed raising subdivision standards. However, additional costs for new construction or retrofitting existing ships meant that new subdivision rules came incrementally. Initially, it seemed reasonable to simply increase the number of bulkheads, spacing them more closely. This was counter-productive, as closely spaced bulkheads added cost and weight and could be easily damaged, negating their value. Bulkhead spacing was finally determined by wartime experience with torpedo damage, and positioning bulkheads 40-45 feet apart offered the best compromise. Watertight decks were useful but presented stability problems if water was confined on top of the deck. Titanic was a seaworthy ship but carelessly operated and overwhelmed by the extreme situation she encountered.

Sources: SNAME Transactions 1935
Shipbuilder Special 1911 Edition
NEEC: Laura K. Alford, PhD