

Drydock

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(Redirected from Dry dock)

A **drydock** (also commonly **dry dock**) is a narrow basin or vessel that can be flooded to allow a load to be floated in, then drained to allow that load to come to rest on a dry platform. Drydocks are used for the construction, maintenance, and repair of ships, boats, and other watercraft.



U.S. Navy submarine USS *Greenville* in dry dock following collision with the Ehime Maru.

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History

Greco-Roman world

According to the ancient Greek author Athenaeus of Naucratis (V 204c-d), the drydock was invented in Ptolemaic Egypt, some time after the death of Ptolemy IV Philopator (reigned 221-204 BC):

But after that (the reign of Ptolemy IV Philopator) a Phoenician devised a new method of launching it (a ship), having dug a deep trench under it, equal to the ship itself in length, which he dug close to the harbour. And in the trench he built props of solid stone five cubits deep, and across them he laid beams crosswise, running the whole width of the trench, at four cubits' distance from one another; and then making a channel from the sea he filled all the space which he had excavated with water, out of which he easily brought the ship by the aid of whatever men happened to be at hand; then closing the entrance which had been originally made, he drained the water off again by means of engines (organois); and when this had been done the vessel rested securely on the before-mentioned cross-beams.^[1]

Since Athenaeus recorded the event 400 years later (around 200 AD), there is sufficient reason to believe that drydocks had been known throughout classical antiquity. The Roman shipyard at Narni, Italy, which is still being studied, may have served as a dry dock.

China

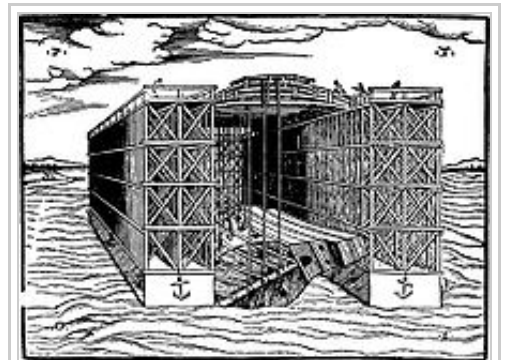
The use of drydocks in China goes at least as far back the 10th century A.D.^[2] In 1088, Song Dynasty scientist and statesman Shen Kuo (1031–1095) wrote in his *Dream Pool Essays*:

At the beginning of the dynasty (c. +965) the two Che provinces (now Chekiang and southern Chiangsu) presented (to the throne) two dragon ships each more than 200 ft. in length. The upper works included several decks with palatial cabins and saloons, containing thrones and couches all ready for imperial tours of inspection. After many years, their hulls decayed and needed repairs, but the work was impossible as long as they were afloat. So in the Hsi-Ning reign period (+1068 to +1077) a palace official Huang Huai-Hsin suggested a plan. A large basin was excavated at the north end of the Chin-ming Lake capable of containing the dragon ships, and in it heavy crosswise beams were laid down upon a foundation of pillars. Then (a breach was made) so that the basin quickly filled with water, after which the ships were towed in above the beams. The (breach now being closed) the water was pumped out by wheels so that the ships rested quite in the air. When the repairs were complete, the water was let in again, so that the ships were afloat once more (and could leave the dock). Finally the beams and pillars were taken away, and the whole basin covered over with a great roof so as to form a hangar in which the ships could be protected from the elements and avoid the damage caused by undue exposure. (Wade-Giles spelling.)^[3]

Renaissance Europe

The first early modern European^[4] and oldest surviving drydock still in use was commissioned by Henry VII of England at HMNB Portsmouth in 1495 (see Tudor navy). This drydock currently holds the world's oldest commissioned warship, HMS Victory.

Possibly the earliest description of a floating dock comes from a small Italian book printed in Venice in 1560, called *Descrittione dell'artifitiosa machina*.^[5] In the booklet, an unknown author asks for the privilege of using a new method for the salvaging of a grounded ship and then proceeds to describe and illustrate his approach. The included woodcut shows a ship flanked by two large floating trestles, forming a roof above the vessel. The ship is pulled in an upright position by a number of ropes attached to the superstructure.



Floating Dock. Woodcut from Venice (1560).

Modern times

The Alfredo da Silva Dry Dock, of the Lisnave Dockyards in Almada, Portugal, was the largest in the world until 2000, when it was closed after the moving of Lisnave operations to Setúbal.^[citation needed]

Currently, Harland and Wolff Heavy Industries in Belfast, Northern Ireland, is the site of the largest drydock in the world. The massive cranes are named after the Biblical figures Samson and Goliath. Goliath stands 96m tall, while Samson is taller at 106m.^[citation needed]

Dry Dock 12 at Newport News Shipbuilding is the largest drydock in the Western Hemisphere.^[6] The Saint-Nazaire's Chantiers de l'Atlantique owns one of the biggest in the world: 1,200 by 60 metres (3,900 ft × 200 ft). The largest graving dock of the Mediterranean as of 2009 is at the Hellenic Shipyards S.A. (HSY S.A., Athens, Greece)^[1] (<http://www.hellenic-shipyards.gr/pg/repairs.htm>). The by far largest roofed dry dock is at the German Meyer Werft Shipyard in Papenburg, Germany, it is 504m long, 125m wide and stands 75m tall.^[7]

Types

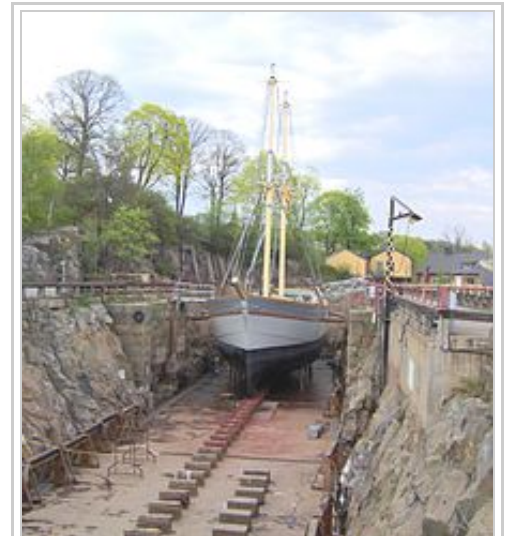
Graving

The classic form of drydock, properly known as graving dock, is a narrow basin, usually made of earthen berms and concrete, closed by gates or by a caisson, into which a vessel may be floated and the water pumped out, leaving the vessel supported on blocks. The keel blocks as well as the bilge block are placed on the floor of the dock in accordance with the "docking plan" of the ship. More routine use of drydocks is for the cleaning (removal of barnacles and rust) and re-painting of ship's hulls.

Some fine-tuning of the ship's position can be done by divers while there is still some water left to manoeuvre it about. It is extremely important that supporting blocks conform to the structural members so that the ship is not damaged when its weight is supported by the blocks. Some anti-submarine warfare warships have protruding sonar domes, requiring that the hull of the ship be supported several metres from the bottom of the drydock.

Once the remainder of the water is pumped out, the ship can be freely inspected or serviced. When work on the ship is finished, water is allowed to re-enter the dry dock and the ship is carefully refloated.

Modern graving docks are box-shaped, to accommodate the newer, boxier ship designs, whereas old drydocks are often shaped like the ships that are planned to be docked there. This shaping was advantageous because such a dock was easier to build, it was easier to side-support the ships, and less water had to be pumped away.



The brig *Stockholm* in one of the historical drydocks on the island Beckholmen in central Stockholm.



U.S. Navy ballistic missile submarine USS *Michigan* inside a flooded drydock.

Drydocks used for building Navy vessels may occasionally be built with a roof. This is done to prevent spy satellites from taking pictures of the drydock and any ships or submarines that may be in it. During World War II, fortified drydocks were used by the Germans to protect their submarines from Allied air raids (see submarine pen); however, their effectiveness in that role diminished towards the end of the war as bombs became available that could penetrate them. Today, covered drydocks are usually used only when servicing or repairing a fleet ballistic missile submarine. Another advantage of covered drydocks is that work can take place independently of the weather; this is frequently used by modern shipyards for construction especially of complex, high-value vessels like cruise ships where delays would incur a high cost.

Floating

A floating drydock is a type of pontoon for dry docking ships, possessing floodable buoyancy chambers and a "U"-shaped cross-section. The walls are used to give the drydock stability when the floor or deck is below the surface of the water. When valves are opened, the chambers fill with water, causing the drydock to float lower in the water. The deck becomes submerged and this allows a ship to be moved into position inside. When the water is pumped out of the chambers, the drydock rises and the ship is lifted out of the water on the rising deck, allowing work to proceed on the ship's hull.

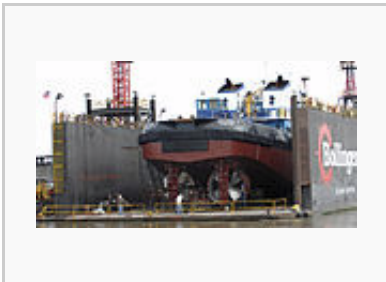


Floating docks, Gdynia, Poland

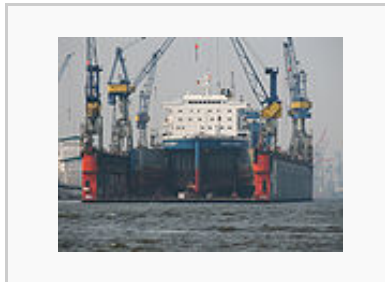
A typical floating drydock involves multiple rectangular sections. These sections can be combined to handle ships of various lengths, and the sections themselves can come in different dimensions. Each section contains its own equipment for emptying the ballast and to provide the required services, and the addition of a bow section can facilitate the towing of the drydock once assembled. For smaller boats, one-piece floating drydocks can be constructed, potentially coming with their own bow and steering mechanism.^[8]

Shipyards operate floating drydocks as one method for hauling or docking vessels. The advantage of floating drydocks is they can be moved to wherever they are needed and can also be sold second-hand. During World War II, the U.S. Navy used such (floating) drydocks extensively to provide maintenance in remote locations. One of these, the 850-foot AFDB-3, an **Advance Base Sectional Dock**, saw action in Guam, was mothballed near Norfolk, Virginia, and was eventually towed to Portland, Maine, to become part of Bath Iron Works' repair facilities.^{[9][10]}

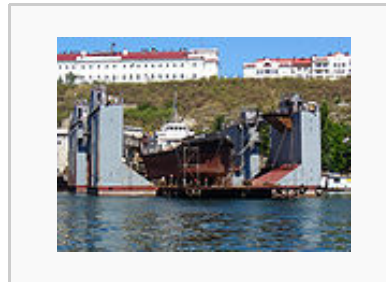
The "Hughes Mining Barge", or HMB-1, is a covered, floating drydock that is also submersible to support the secret transfer of a mechanical lifting device underneath the *Glomar Explorer* ship, as well as the development of the *Sea Shadow* stealth ship.



The towboat Dolphin I in a floating drydock on the Mississippi River in Algiers, New Orleans, Louisiana.



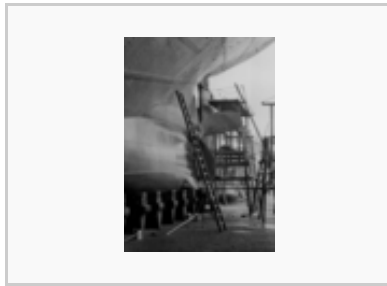
Blohm + Voss Dock 10, at the Port of Hamburg.



Floating drydock located in Sevastopol.



A floating drydock (or boat lift) in a private marina, used to keep small boats out of the water while not in use.



Stern of a cargo ship in the floating drydock of Bremer Vulkan shipyard, on keel blocks overlooking Oertz rudder and propeller

Alternative drydock systems

Apart from graving docks and floating drydocks, ships can also be drydocked and launched by:

- Marine railway — For repair of larger ships up to about 3000 tons ship weight
- Shiplift — For repair as well as for newbuilding. From 800 to 25000 ton shipweight
- Slipway, patent slip — For repair of smaller boats and the newbuilding launch of larger vessels

Uses other than for ships

Some drydocks are used during the construction of bridges, dams, and other large objects. For example, the drydock on the artificial island of Neeltje-Jans was used for the construction of the Oosterscheldekering, a large dam in the Netherlands that consists of 65 concrete pillars weighing 18,000 tonnes each. The pillars were constructed in a drydock and towed to their final place on the seabed.

A drydock may also be used for the prefabrication of the elements of an immersed tube tunnel, before they are floated into position, as was done with Boston's Silver Line.

See also

- Semi-submersible
- Space dock
- St. Nazaire Raid — an attack on a drydock during World War II.

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 9. ^ Photos of USS *Samuel B. Roberts* on blocks in AFDB-3 in 1988 (<http://www.navybook.com/nohigherhonor/pic-ffg58repair.shtml>)
 10. ^ "Sea Going Navy Yard Follows The Fleet", November 1945, *Popular Science* (http://books.google.com/books?id=bCEDAAAAMBAJ&pg=PA121&dq=popular+science+July+1946&hl=en&ei=hc3oTO6dCYvonQfQu5iaDQ&sa=X&oi=book_result&ct=book-thumbnail&resnum=10&ved=0CE4Q6wEwCTgU#v=onepage&q&f=true)

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External links

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- Carnival Liberty Cruise Ship in Dry Dock in Freeport, Grand Bahamas (<http://www.picable.com/Places/Fair/Carnival-Liberty-Cruise-Ship-in-Dry-Dock.1279993>)
- "Docks's Life". (<http://docklife.ucoz.ru>) All about floating docks of shipbuilding firm "Almaz". St.-Petersburg. Russia.

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Categories: Coastal construction | Drydocks | Hellenistic engineering

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