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# Number 1 Ship Tank, Haslar Marine Technology Park (former Admiralty Experiment Works)

## Official list entry

Heritage Category: **Listed Building**

Grade: **II**

List Entry Number: **1479229**

Date first listed: **26-Aug-2022**

Statutory Address 1: **Building 23, Haslar Marine Technology Park, Haslar Road, Gosport, Hampshire, PO12 2AG**

This List entry helps identify the building designated at this address for its special architectural or historic interest.

Unless the List entry states otherwise, it includes both the structure itself and any object or structure fixed to it (whether inside or outside) as well as any object or structure within the curtilage of the building.

For these purposes, to be included within the curtilage of the building, the object or structure must have formed part of the land since before 1st July 1948.

**[Understanding list entries](https://historicengland.org.uk/listing/the-list/understanding-list-entries/)** (<https://historicengland.org.uk/listing/the-list/understanding-list-entries/>)

**[Corrections and minor amendments](https://historicengland.org.uk/listing/the-list/minor-amendments/)** (<https://historicengland.org.uk/listing/the-list/minor-amendments/>)

## Location

Statutory Address: **Building 23, Haslar Marine Technology Park, Haslar Road, Gosport, Hampshire, PO12 2AG**

The building or site itself may lie within the boundary of more than one authority.

County: **Hampshire**

District: Gosport (District Authority)  
Parish: Non Civil Parish

National Grid Reference: SZ6133998688

## Summary

A covered ship model testing tank, constructed in 1886 and extended in 1957 for the Admiralty to designs by the engineer R E Froude.

## Reasons for Designation

Number 1 Ship Tank, built in 1886 and extended in 1957 at the former Admiralty Experiment Works (AEW) Haslar, is listed at Grade II for the following principal reasons:

Historic interest:

\* as an exceptionally rare surviving example of a late-C19 ship model testing tank and research facility, the direct descendant of the first ship model testing tank constructed by William Froude in Torquay; \* for its considerable influence in the field of hydronamic research; \* for its huge contribution to the development of the Royal Navy's surface and submarine fleets.

Architectural interest:

\* as a ship model testing building that survives well, retaining its original external character and interior features of interest including the testing tank, roof trusses, and cast iron columns; \* for its influence as an exemplar for other ship model testing tanks constructed around the world in the late C19 and early C20.

Group value:

\* with the Grade II-listed Number 2 Ship Tank, Number 2 Cavitation Tunnel, and Manoeuvring Tank on the site. In addition, with the adjacent Grade II\*-listed watchtowers, gates and boundary walls of the Victorian gunboat yard, Grade I-listed gunboat sheds, Grade II-listed gunboat yard engine house, scheduled gunboat traverser system, and listed buildings of the Royal Hospital Haslar set within a Grade II-registered landscape.

## History

The former Admiralty Experiment Works (AEW) Haslar is situated on the northern side of Haslar Peninsular, to the west of Portsmouth Harbour. Prior to its establishment in 1886 the site had been remote and relatively inaccessible. Since its construction and throughout its expansion in the C20, AEW Haslar has been a site of national and international significance for its scientific contributions to the empirical study and development of ship hulls and propulsion systems. This has had a profound impact on the development of many vessels in the Royal Navy surface and submarine fleets and on commercial high-performance craft used to set world water speed records. Experiments undertaken at AEW Haslar directly influenced the design of every class of warship operated by the Royal Navy in the late C19 and C20.

Sites devoted to the empirical study of ship hull performance and propulsion systems in England date from 1870, when pioneering engineer William Froude (1810-1879) constructed the first experimental tank for model ships adjacent to his home in Torquay. Having begun to conduct water resistance experiments on ships in the 1850s, Froude attracted the attention of the Admiralty by demonstrating that it was possible to obtain accurate ship hull

resistance data from model tests. In 1868 the Admiralty granted Froude £2000 for the construction of a test tank to undertake rolling and resistance tests at Torquay. The site became known as the Admiralty Experiment Works (Torquay) from 1872. William Froude's third son, Robert Edmund Froude, continued the programme of experimentation after his father's death in 1879, and in 1882 he was invited to design a new facility to replace the Torquay tank. After considering a number of potential sites in the 1880s, the AEW settled on Haslar due to the sufficient open space it provided for R E Froude's new ship tank design and its proximity to other naval facilities, including: a gunboat yard, Royal Hospital, and a Royal Naval cemetery. Following the closure of AEW Torquay, new facilities began to be established at Haslar from February 1886. The first experiments measuring the effects of water resistance on model ship hulls were conducted in the newly-constructed Number 1 Ship Tank in 1887, towing the models using an overhead wooden towing carriage.

The Naval Defence Act of 1889 saw a huge increase in the Royal Navy's shipbuilding programme, and the testing facilities at AEW Haslar had a huge impact on the hull designs of the expanding British surface fleet in the period leading up to the First World War. By 1918 more than 500 different warship models had been tested at Haslar. A 1917 plan shows a number of temporary huts built along the shoreline of Haslar Lake to provide accommodation for military personnel during the war. Most of these temporary structures remained on site until after the Second World War when they were gradually removed to make way for new test facilities.

The development of both the surface and submarine fleets in the First World War necessitated the expansion of test facilities at AEW Haslar. By 1927 plans for a second, larger ship tank had been drawn up; Number 2 Ship Tank was completed in 1930. In the 1930s AEW expanded into testing for the private sector, most notably for Sir Malcolm Campbell's Bluebird K3 and Bluebird K4 craft, in which he broke the world water speed records in 1936 and 1939 respectively. Both craft were extensively model tested in Number 2 Ship Tank. Plans to construct new facilities for propeller research began in 1937. The first of these new buildings, Number 1 Cavitation Tunnel, was completed in 1941. Cavitation is the sudden formation and collapse of bubbles, which can be caused by a propeller in water. This water-filled tunnel was therefore used for testing the efficiency of model propellers and hulls in relation to propulsion, wake, vibration and/or noise. A much larger cavitation tunnel was constructed by a German company in Hamburg during the Second World War. Following the end of the war, the Royal Navy shipped the German tunnel to Haslar and reassembled it between 1947 and 1949. Post-war financial restrictions prevented construction of the building to house the new Number 2 Cavitation Tunnel until 1952, and the tunnel was not fully operational until 1958. Number 2 Cavitation Tunnel was listed Grade II in 2013.

The post-war period saw considerable expansion of the test facilities at Haslar, as the AEW realised that a far greater range of experimentation was required to improve the manoeuvrability of ships in response to the fast-paced naval warfare of the Second World War. Several ancillary facilities were constructed between 1945 and 1960 including a propeller laboratory and a photography laboratory, and Number 1 Ship Tank was extended in 1957. Steering and manoeuvring experiments began on nearby Horsea Lake in the 1950s and a large covered Manoeuvring Tank was completed at Haslar in 1959.

Operations at Haslar began to be streamlined in the 1990s. This followed the amalgamation of AEW into the Admiralty Marine Technology Establishment (AMTE, 1977-1984), the Admiralty Research Establishment (ARE, 1984-1991), and ultimately the newly-formed Defence Research Agency in 1991 (subsequently subsumed into the Defence Evaluation and Research Agency in 1995). The Number 1 Ship Tank building was converted to office use in 1993. Several post-war buildings and Number 1 Cavitation Tunnel were demolished between 1993 and 1995 to make way for new buildings and car parks. Experimental research has continued under the auspices of one of AEW's successor bodies, QinetiQ, since 2001.

Construction of Number 1 Ship Tank began in early 1886 according to R E Froude's 1882 specification, comprising a single range housing the tank and a double-gabled range adjoining to the south east housing the model-making workshop, boiler room and offices. The south-west elevation of the single range was built incorporating the boundary wall of the Gunboat Yard (Grade II\*) of 1856 in order to reduce the cost of the building. Following the expiration of the lease on the AEW Torquay site on 3 February 1886, the Torquay tank was dismantled and equipment began to be transported to Haslar. By 15 May 1886, Number 1 Ship Tank was ready to be filled with water. The filling process took fifteen days and indicated leaks which necessitated the draining of the tank and repairs carried out in August 1886.

The first experiment in the completed tank was carried out on a model of HMS Vulcan on 22 April 1887. Froude christened the tank with a few drops from a flask of water he had retained from the earlier Torquay tank. Models of all the large ships which made up the Royal Navy's surface fleet in the First World War were tested in Number 1 Ship Tank, as were the very first British-designed A-class submarines which were model tested at Haslar prior to their construction between 1902 and 1905. During the Second World War, a purpose-built steel tank for experimenting on model anchors was installed above the boiler room in the workshop of Number 1 Ship Tank, but was transferred to a separate building in 1948. In 1949, a photographic laboratory was built in a new brick building to the east of Number 1 Ship Tank and joined to it, but was demolished after 1993. Some of the external brick piers where the two buildings joined have since been rebuilt. Number 1 Ship Tank was extended about 46m to the north with an adjoining drawing office between 1956 and 1957 according to a planned extension by R E Froude in his original design. The original wooden towing carriage, which by 1952 had begun to vibrate and cause problems during experiments due to its age and condition, was replaced with an improved steel carriage. By 1993 experiments in Number 1 Ship Tank had ceased and the tank was covered over with an inserted floor and the building converted into offices with additional fenestration to the long elevations and the roof. More than half a million experiments were conducted in Number 1 Ship Tank during its 106 year operational lifetime, making it the longest continuously-serving laboratory in the world by the time of its conversion to offices. The building is currently (2022) known as Building 23 and continues to be used by QinetiQ as office accommodation.

## Details

A covered ship model testing tank, now known as Building 23, constructed in 1886 and extended in 1957 based on designs by the engineer R E Froude.

**MATERIALS:** red stock brick laid in English bond with rubbed brick and concrete window dressings, pitched roofs of Welsh slate, timber roof trusses over the original waterway, and steel trusses in the 1957 extension.

**PLAN:** number 1 Ship Tank has a linear plan form oriented on a north-west to south-east axis. The long south-west elevation borders the south-west boundary of the AEW Haslar site, oriented perpendicular to Haslar Lake to the north and Haslar Road to the south. This elevation was built off the pre-existing boundary wall to the Gunboat Yard (Grade II\*), which was raised and modified to support the roof. The principal, original part of the building is the long single range housing the waterway. A double-gabled range adjoining to the south-east, also constructed in the original phase, previously housed the model-making workshop, boiler house, and offices. These ancillary rooms are oriented parallel to the waterway with direct access through to the waterway range and between each of the offices. The 1957 northern extension increased the length of the waterway from 122m to 168m. A drawing office adjoining to the north-east was also added in 1957.

**EXTERIOR:** all of the ranges are of a single storey and are constructed of red stock brick laid in English bond with pitched roofs of Welsh slate laid over wooden boards, except for the later drawing office at the north end which has stretcher bond brickwork and a flat roof behind a low parapet with concrete coping stones. The double gabled roofs over the south-east part of the building rise slightly higher than that of the waterway and are hipped at their south-east end. 18 pairs of skylights punctuate the pitched roof either side of the ridgeline of the waterway arranged in three groups: a northern group of nine pairs, a central group of three pairs, and a southern group of six closely-spaced pairs. A further row of seven single roof lights occur on the eastern half of the roof. A tall, tapered, rectangular chimney stack with a machicolated brick corbel course at its top rises from the north-east elevation of the boiler house.

The long north-east and south-west elevations of the waterway are divided into regular bays of recessed brick panels with projecting brick piers topped with brick corbel courses. The piers correspond with brick buttresses on the interior walls. These elevations were largely blind originally, with a small number of square single-pane windows that had blinds to control internal lighting levels. Some of these original window openings survive with flat arches of rubbed brick, but most of the blind bays now have modern two-pane windows inserted during the 1990s office conversion. Most of the fenestration appears to be uPVC with concrete sills. Three new entrances were added to the north-east elevation in the 1990s to provide access to the subdivided offices. The entrances are raised above ground level reflecting the inserted office floor and are housed in projecting glazed porches. The main entrance to the

building is on the south-west elevation, with a new opening formed beneath a steel lintel in the 1990s. This entrance has glazed double-doors and is also raised above ground level and accessed by steps.

The double-gabled range to the south-east has the same pattern of brickwork as the waterway to all its elevations. The north-east elevation has tall, two-pane windows with flat arches of rubbed brick in each of the recessed panels. Some of these openings may be original while others were added in the 1990s, and the windows themselves are largely uPVC. Single-pane windows have also been inserted into two bays on the south-west elevation. The south-east elevation is partly obscured by several modern lean-to structures built between the principal building and the adjacent Gunboat Yard boundary wall, but it retains the pattern of recessed panels and brick piers that continues from the other elevations. The north-west elevation of this range where it projects out from the waterway is blind with a stepped pattern of brick corbels following the roofline. The north-west elevation of the 1957 extension has a pair of three-light windows to the single range and three two-light windows to the drawing office extension.

**INTERIOR:** the main entrance opens into a reception area which provides access to the various office spaces which largely have late C20 or early C21 fixtures and fittings\*. Many of the doors have been replaced and smaller rooms have been formed from inserted partitions\* with suspended ceilings\*. The double-gabled range has been subdivided into offices and meeting rooms. The largest room in this part of the building is a conference room with flexible partitions\* which retains original king post roof trusses of timber supported by cast iron columns. These trusses continue along the length of the original waterway, and they have stencilled numbers which were primarily used by the carriage operators to judge when to apply the brakes during experiments. Buttresses occupy the spaces between each truss and correspond with the brick piers on the external walls. The originally continuous space of the waterway has been subdivided to provide office accommodation, with two lengthy open-plan sections, and a raised floor\* inserted above the test tank. The tank survives underneath and now forms the basement to the offices, although it too has been subdivided and hosts pipes\* and services\*. The tank as originally built was 122m long and was extended to 168m in 1957. It is 6m wide and 2.7m deep and has vertical sides and a flat bottom. A sand and gravel beach added to the north-west end for one of the final experiments also survives beneath the modern floor. The 1957 north-west extension has steel roof trusses of a similar design to the timber originals, and this part of the building has also been subdivided into offices.

**SUBSIDIARY FEATURES:** a square storage building with a hipped roof, originally the Fire Engine House, stands close to the double-gabled range and is now joined to the north-east elevation of the waterway by a semi-glazed link. The building is constructed from red stock brick laid in English bond, with a recessed brick panel to each face and corner buttresses echoing the appearance of the principal building. The roof is covered with Welsh slate. The building has modern double doors to its north-west elevation and a wide window to the north-east, both with cambered arches of rubbed brick. The south-east elevation has a small lean-to extension of brick with a hipped roof.

**EXCLUSIONS** \* Pursuant to s1 (5A) of the Planning (Listed Buildings and Conservation Areas) Act 1990 ('the Act') it is declared that these aforementioned structures and/or features are not of special architectural or historic interest. However, any works to these structures and/or features which have the potential to affect the character of the listed building as a building of special architectural or historic interest may still require Listed Building Consent (LBC) and this is a matter for the Local Planning Authority (LPA) to determine.

## Sources

### Books and journals

Brown, D, *The Way of a Ship in the Midst of the Sea: The Life and Work of William Froude*, (2005)

### Other

Bristow, M, *The Admiralty Experiment Works, Haslar Road, Gosport*, Historic England Research Report Series no. 11-2016, (2016) [Unpublished report]

Historic England Archive, MD95/06480, 1917 plan of AEW Haslar

## Legal

This building is listed under the Planning (Listed Buildings and Conservation Areas) Act 1990 as amended for its special architectural or historic interest.

The listed building(s) is/are shown coloured blue on the attached map. Pursuant to s1 (5A) of the Planning (Listed Buildings and Conservation Areas) Act 1990 ('the Act') structures attached to or within the curtilage of the listed building but not coloured blue on the map, are not to be treated as part of the listed building for the purposes of the Act. However, any works to these structures which have the potential to affect the character of the listed building as a building of special architectural or historic interest may still require Listed Building Consent (LBC) and this is a matter for the Local Planning Authority (LPA) to determine.



## Map

This map is for quick reference purposes only and may not be to scale. This copy shows the entry on 11-Nov-2022 at 12:00:10.

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