CROSSING SYDNEY HARBOUR

Sydney was formed around Sydney Cove, and, as the population grew, it developed around the Harbour and its tributaries to the north, west and south. European settlement on the northern side of the Harbour began in earnest after 1814, following a land grant to ex-convict Billy Blue, who began the first ferry service across the Harbour soon after. Watermen continued to provide passage to the north shore until the 1840s, when Sydney's first vehicular ferry service was established between Dawes Point and Milsons Point. Vehicular and passenger ferries continued to be an important form of public transport for the remainder of the 19th century.

Until the construction of the Bridge, there were two ways of crossing the harbour with a vehicle. One was to go inland to Bedlam Point, near Gladesville, where there was a punt, the other was to catch the horse ferry. There were several horse ferries operating in this vicinity, but only two wharves on the southern side of the harbour. The first was built at Bennelong Point in 1883, where the Opera House now stands, and it had two docks. The Dawes Point horse ferry wharf was constructed c1900 and the route operated to Blue's Point.

Picture: Blues Point vehicular ferry dock

“Princess” was the first vehicular ferry in Australia, coming into operation in 1842, it left from the western side of Dawes Point, but she was plagued with problems and only lasted a few months. The distance between the shorelines and the amount of increasing shipping made cable punts unworkable. The next vessels were steam operated paddle punts, the first was “Benelon” 1886 (until 1932), her sister ship “Barangaroo” 1890 (until 1932).

Picture: “Barangaroo” 1890

Both these vessels were large enough to still be useful when large trucks and buses took over from horses and carts and operated until the opening of the Bridge. Smaller vessels such as the “Warrane” built 1883 (until 1921) were superseded in the 1920s as they could not cope with the increasing size and weight of motorized vehicles. Steam-operated vessels gradually replaced the smaller steam-paddlers, one of the most distinctive was the “Kamilaroi” built 1901 (until 1930) this vessel became the first propeller-driven punt.

The original North Shore railway line opened in 1890 from Hornsby to St Leonards. From there, a horse bus conveyed passengers to the ferry at Milsons Point. The rail extension to Milsons Point came into service in 1893. To permit construction of the Bridge, the station and wharf were relocated to Lavender Bay in 1924. Milsons Point (Lavender Bay) station was the terminus for steam trains from Hornsby until electric trains began operating in late 1928.

Picture: Milsons Point ferry terminal 1900s
The “Kooroongaba”, 1921 (until 1932) came into service to replace the “Warrane”. Built by Hawthorns and Co Ltd, of Leith, Scotland and launched in 1924, “Koondooloo”, sailed out to Sydney under her own steam, arriving for service on the Sydney Harbour crossing in July 1924. Steel hulled and screw propelled, she was powered by a 114hp triple expansion steam engine with two gunboat-type boilers providing a working pressure of 180psi.

Picture: “Koondooloo” at Jeffrey Street 1920s

“Koondooloo’s” sister vessels, “Kalang” and “Kara Kara”, came out to join her two years later. The most famous of the car ferries was the “Kalang” which was constructed in England in 1926 and took 90 days to steam to Sydney. She became one of the Sydney Showboats used to take people on pleasure cruises around the harbour in the 1940s. All three stayed in service until the Harbour Bridge was opened in 1932.

Picture: Vehicular ferry “Koondooloo” 1924

Even with four vehicle ferries operating at peak times, the vehicles still banked up in long lines. In 1928, the vehicle ferries carried: 378,500 vehicles, 43,800 horsemen and 5,000,000 people. The use of ferries, generally, reached a peak in 1927, by then carrying 47 million passengers annually.

Picture: Jeffrey Street car ferry dock.

There were plans to build a bridge across the Harbour throughout the 19th century, but none were realised. This was chiefly because it was costly and technically difficult to build bridges over large, tidal expanses of water such as Sydney Harbour. Throughout the 19th century, timber had been the most prevalent material for bridge construction in NSW, with masonry and cast iron bridges reserved for the railways, as they were expensive to build in terms of skilled labour and cost of materials.

Picture: “Kalang” & “Koondooloo” 1930s
In the 1920s Sydney Ferries Ltd needed bigger boats to service the Milsons Point to Circular Quay route. Peak hour ferries were leaving either side of the harbour at the rate of one fully loaded vessel every six minutes. An order was placed for two very large steel hulled high capacity ferries - "Koompartoo" and "Kuttabul". These were the largest inner harbour ferries. They could carry nearly 500 more passengers than the Manly vessels.

John Bradfield's involvement with the construction of the Sydney Harbour Bridge began in 1903. Bradfield was steadily promoted within the Department of Public Works and by 1912 he had responsibility for the Sydney Harbour Bridge branch and for the electrification of the suburban railway. Bradfield's dual responsibilities suggest that the Bridge and Sydney's public transport system were to be integrally linked. Bradfield continuously reworked the design of the Sydney Harbour Bridge from 1912 to 1929, despite the disruptions of World War I.

By 1922 he had settled on a two-hinged steel arch as the ideal bridge for the Harbour, primarily because of its durability. The Sydney Harbour Bridge Act was passed in 1922. Tenders were called to construct a bridge between Dawes and Milsons Point. The winning tenderer was the British engineering firm of Dorman, Long and Co. The contractors set up two workshops at Milsons Point, and fabricated the steel into the girders and other required parts.

Some 250 Australian, Scottish, and Italian stonemasons and their families relocated to a temporary settlement at Moruya, where they quarried around 18,000 m³ of granite for the bridge pylons. The stonemasons cut, dressed, and numbered the blocks, which were then transported to Sydney on three ships built specifically for this purpose.
CONSTRUCTING THE SYDNEY HARBOUR BRIDGE

The Bridge took eight years to build, from 1925 to 1932. Over 2,000 people were employed, including engineers, boilermakers, ironworkers and stonemasons. Although overwhelmingly Australian, skilled labourers, such as stonemasons and ironworkers, were brought from overseas. Sixteen men died, and accidents were frequent.

Picture: Creeper cranes on the arch. 1929

The job of the rivet cooker involved throwing red-hot rivets to the rivet catchers, who caught the rivets in buckets and then hammered them into place. The bridge is held together by six million Australian-made hand-driven rivets. The rivets were heated red-hot and inserted into the plates; the headless end was immediately rounded over with a large pneumatic rivet gun. The practice of riveting large steel structures, rather than welding, was, at the time, a proven construction technique, whilst structural welding had not been adequately developed for use on the bridge.

Picture: Workmen on top of the arch.

The arch is composed of two 28-panel arch trusses; their heights vary from 18 m at the centre of the arch to 57 m at the ends next to the pylons. The arch has a span of 504 m and its summit is 134 m above mean sea level; however, expansion of the steel structure on hot days can increase the height of the arch by as much as 18 cm. Large steel pins (or bearings) support each end of the arch, allowing it to rotate to accommodate expansion and contraction caused by changes of temperature, and avoiding stresses that would otherwise cause damage.

Picture: Archway nearing completion 1930
The cantilevered arches were supported by steel cables buried underground. In September 1930, the painstaking work to position the prefabricated grids, girders and plates into place paid off when the arch was neatly joined and the cables released. The road deck was laid soon after, and work began on building the pylons. The pylons were faced with granite, as a nod to more traditional bridge design.

Picture: Re-located ferry base at Blues Point and roadway hangers commencing. 1930

By February 1932, the Bridge was completed. That month, the strength of the deck was tested with ninety-six locomotives laid end to end along the railway tracks on the Bridge. The Sydney Harbour Bridge was a massive undertaking, in terms of both engineering ingenuity and financial outlay. Its completion in 1932 represented international advances in bridge technology in the early 20th century. The total weight of the steelwork, including the arch and approach spans, is 52,800 tonnes, with the arch itself weighing 39,000 tonnes. About 79% of the steel was imported from England, with the rest being sourced from Newcastle.

The Construction of Sydney Harbour Bridge  https://www.youtube.com/watch?v=JPQ7CzVHdMs
The NSW Premier, Jack Lang, officially opened the Sydney Harbour Bridge on 19 March 1932. The ceremony was famously disrupted when Francis De Groot, a member of the fascist, anti-Lang New Guard, rode across the Bridge on horseback and slashed the ribbon with a sword. After De Groot was taken away by the police the ceremonial ribbon was held in place and Lang cut it. Celebrations were restrained as it was the middle of the Depression. Yet the public were enthusiastic, with over 750,000 people lining the streets and Harbour to watch the opening and subsequent pageantry.

The construction of the Sydney Harbour Bridge caused the near-evaporation of the world's largest ferry fleet. After the Sydney Harbour Bridge opened on 19 March 1932, ferry patronage dropped almost overnight, decreasing from 30 to 13 million passengers per year. Casualties of the Sydney Harbour Bridge, in 1935 18 ferries were looking for a buyer. Many went to the ship breakers in the same year.

A second vehicular crossing, the Sydney Harbour Tunnel, was completed in 1992. It has two lanes in each direction and carries around 90,000 vehicles/day. The tunnel is made up of three sections: twin 900m land tunnels on the north shore, twin 400m land tunnels on the south shore and a 960m immersed tube (IMT) structure. The tunnel is 25m below sea level. The IMT structure consists of eight precast concrete units. The units were constructed in a casting basin at Port Kembla and then towed to Sydney. A trench was dredged and then the IMTs were lowered by a system of pontoons. The trenches were backfilled and then a rock armour was placed over the top to protect against marine hazards, such as anchors or sinking vessels. The cost was $554 million, and was designed to withstand the impact of earthquakes and sinking ships. 