

The Falkirk Wheel

- A. The world's one and only rotating boat lift, The Falkirk Wheel, was opened in 2002 in Scotland. It was an ambitious £84.5m Millennium Link project constructed to restore navigation across Scotland by bringing together the historic waterways of the Forth & Clyde and Union Canals.
- B. The biggest challenge of the project is the fact that the Forth & Clyde Canal is situated 35 metres below the level of the Union Canal. Historically, the two canals were linked near Falkirk by a series of 11 locks that stepped down over 1.5 kilometres. The link was cut when this was removed in 1933. When the project was begun in 1994 the British Waterways authority wanted to build a stunning 21st century monument that would not only be a worthy memorial of the Millennium, but also a long lasting evidence of the region's economic revival.
- C. Many ideas and concepts like rolling eggs to tilting tanks, from giant seesaws to overhead monorails were submitted for the project. A concept for the massive spinning steel boat lift that would become The Falkirk Wheel was eventually chosen as the winner. The structure's shape is said to have been influenced by many man-made and natural elements, including a Celtic double-headed axe, as well as a ship's massive propeller, whale ribcage, and fish spine.
- D. The components of The Falkirk Wheel were constructed at Butterley Engineering's Steelworks in Derbyshire and assembled, like one giant toy building set, 400 km from Falkirk. A team assembled the 1,200 tonnes of steel there, carefully putting the components together to a precision of 10 mm to assure a proper final fit. The structure was then dismantled and brought to Falkirk in 35 lorries during the summer of 2001, before being bolted back together on the ground and raised into place in 5 big pieces by crane. To make the structure more robust, the steel components were bolted together rather than welded together. Over 45,000 bolt holes were hand-matched to their corresponding bolts, and each bolt was tightened using the hand.
- E. The Falkirk Wheel has 2 sets of opposing axe-shaped arms, at about 25 metres apart to a fixed central spine.
- F. Two water-filled 'gondolas', each diametrically opposed and having a capacity of 360,000 litres, are fitted between the ends of the arms. Whether or not they're hauling boats, these gondolas always weigh the same. Floating objects displace their own weight in water, according to Archimedes' principle of displacement. As a result, when a boat enters a gondola, the volume of water exiting the gondola is equal to the weight of the boat. This maintains the Wheel's balance, allowing it to rotate through 180 degrees in 5.5 minutes while consuming relatively less energy. The Wheel rotates with only 1.5 kWh (5.4 MJ) of energy, which is about equivalent to boiling eight small home kettles of water.
- G. Boats requiring lifting enter the canal basin at the level of the Forth & Clyde Canal, then the Wheel's lower gondola. 2 hydraulic steel gates are raised to isolate the gondola from the canal basin's water. After that, the water between the gates is pumped out. A hydraulic clamp that stops the Wheel's arms from moving while docked is released, allowing the Wheel to turn. The central axle is then rotated by a 10-motor array in the central machine room. The axle links to the Wheel's outer arms, which begin rotating at 1/8 of a revolution each minute. A simple gearing arrangement keeps the gondolas upright as the wheel turns. Two 8-metre-wide cogs orbit a fixed inner cog of the same width, which is connected by two smaller cogs that go in the opposite direction as the outer cogs, ensuring that the gondolas are constantly level. The boat passes directly onto the aqueduct, which is 24 metres above the canal basin, when the gondola has reached the top.

- H. A pair of locks provide the final 11 metres of elevation required to access the Union Canal. Because of the presence of the historically significant Antonine Wall, which was built by the Romans in the second century AD, the Wheel could not be built to elevate boats over the entire 35-metre distance between the 2 canals. Boats pass through a tunnel beneath the wall, through the locks, and onto the Union Canal.

The Falkirk Wheel IELTS reading questions

IELTS Reading Note Completion Questions 1-5

Complete the notes below.

*Write **NO MORE THAN TWO WORDS AND/ OR A NUMBER** from the passage for each answer.*

- 1 The Falkirk Wheel is the world's one and only rotating _____.
- 2 Forth & Clyde Canal is situated 35 metres below the level of the _____
- 3 Celtic _____ axe influenced The Falkirk Wheel.
- 4 The Falkirk Wheel has 2 sets of opposing _____ arms
- 5 Floating objects displace their own _____ in water

IELTS Reading Locating Information Questions 6-10

*This reading passage has eight paragraphs, **A-H**.*

Which paragraph contains the following information?

*Write the correct letter, **A-H**, as your answer to each question.*

Note: *You may use any letter more than once.*

- 6 The Falkirk Wheel is an ambitious £84.5m Millennium Link project constructed to restore navigation across Scotland.
- 7 The Falkirk Wheel was influenced by many man-made and natural elements.
- 8 The Wheel rotates with only 1.5 kWh (5.4 MJ) of energy.
- 9 Antonine Wall was built by the Romans in the second century AD
- 10 The components of The Falkirk Wheel were constructed at Butterley Engineering's Steelworks

IELTS Reading Short Answer Questions 11-14

Answer the questions below.

Choose **NO MORE THAN THREE WORDS** from the passage for each answer.

11 When was The Falkirk Wheel opened?

12 How many arms does the Falkirk Wheel have?

13 What is the capacity of the gondolas?

14 When did the Falkirk Wheel project start?