

## Transport Engineers Walk - Activity Guide

**Purpose:** To understand that engineers use their skills to design and make everything from complex machinery to large structures.

**Time:** Approximately 60 minutes

**Distance:** Approximately 3/4 mile

**Location:** From High Peak Junction to Aqueduct Cottage and back, walking up one side of the canal and returning on the other.

**Resources:** Engineers guides, map of site, 'How to brace a square' kit (5 pieces of wood and associated nuts and bolts) camera or tablets from school

### **Teaching notes:**

There is so much to see and discuss along this short section of canal. The time you spend at each point of interest will be a balance between your pupils' observations, questions and interest, how quickly they can walk between stops and the overall time you have to complete the activity.

Before you start your walk ask your class to explain what transport and engineer means.

**Transport:** a way of transporting goods or people from one place to another. For example, roads, railways, canals, rivers, foot paths.

**Engineer:** a person who designs, builds, or maintains engines, machines, or structures. For example, you could be a mechanical, structural, civil or electrical engineer to name just a few. Engineers can design buildings, roller coasters, space shuttles, special effects for movies, new toys, invent new food or create state-of-the-art sports equipment.

Tell your class they are going to look for things designed by engineers and linked to transport. What kind of things should they be looking out for? - bridges, railway, canal, aqueduct, etc.

To help you guide your class there is an 'Engineers Guide' which shows various photos, either historic or current, of what your children might see, along with information about the different places. This guide can be used in conjunction with the map of the site, with each location marked on with a number.

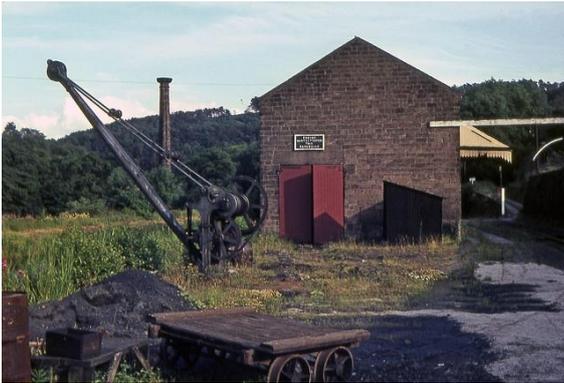
Start your walk at the High Peak Junction Workshops (Location 1) walk up to the old wharf shed (8), with its crane base and loading gauge, cross over the Aqueduct (10) where Cromford Canal crosses the River Derwent, then cross the canal using the old swing bridge(11) to bring you to Aqueduct Cottage (12) Take a small diversion down the old 'Lea Wood arm' of the canal, after 5 minutes you can stand on a footbridge going over the railway and look into a railway tunnel, from here you can also see the railway as it crosses the River Derwent (14). Return to Aqueduct Cottage (12) and walk back down the canal towards High Peak Junction, where you will pass Leawood Pumphouse (13). At Leawood Pumphouse you can do the 3D perspective drawing activity. Then carry on the canal back to High Peak Junction then use another 'swing bridge' to cross the canal to get back to where you started (1).

At each place stop the class and encourage the children to try to work out what they are looking at, what is it, why is it there, how does it work, what would it be like if it wasn't there etc.

Children could record their findings digitally with cameras or tablets.

# Transport Engineers Guide

Photo taken 1964: [https://churcher.crml.org/Diary/Diary\\_1964-07.html](https://churcher.crml.org/Diary/Diary_1964-07.html)



## (Location 8) Wharf shed, base of a crane and loading gauge

The wharf shed is where goods were stored and transported from Cromford Canal and the Cromford and High Peak Railway.

This is the base of a crane that would lift heavy loads off the canal boats and onto the railway carriages to be carried along the Cromford and High Peak Railway.

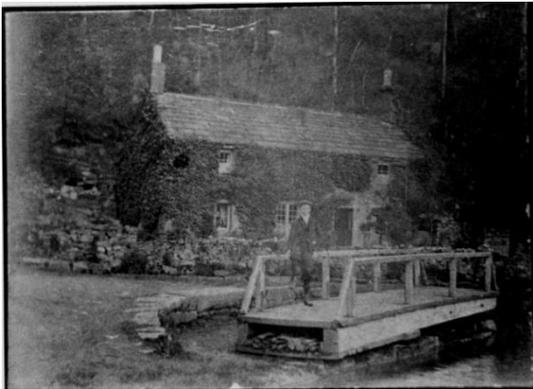
Hanging above the path near the Wharf Shed building is a 'loading gauge' which checked the height of the wagons to ensure they would pass under bridges and tunnels.



## (Location 10) Derwent Aqueduct – Cromford Canal crossing the River Derwent

The Aqueduct is a three span masonry aqueduct first constructed in the early 1790s. The aqueduct carries the Cromford canal over the River Derwent. By September 1793 serious cracks had appeared. William Jessop, the engineer who had supervised the building work, accepted liability and offered to re-build it at his own expense. He claimed the fault lay with the Crich lime he had used as mortar which did not set. It is one of the major engineering feats on the Cromford Canal. The total length of the construction is 200 yards.

Photo taken 1902: <https://www.aqueduct-cottage.com/blog/gallery/>



## (Location 11) Swing bridge

What is special about this type of bridge?

They were built to enable pedestrians to cross from one side of the canal to another. However, when canal boats need to pass they can be 'swung' out of the way.

Photo taken 1930: <https://www.aqueduct-cottage.com/blog/gallery/>



## (Location 12) 'Aqueduct Cottage'

Built in 1802 by Peter Nightingale (Florence's great great uncle), to house the lock keeper who looked after the Lea Wood Arm, a branch canal that went to factories and lead works at Lea Bridge and Lea Wharf. It was a condition of the construction of the Lea Wood Arm that the water level should be maintained at least 12" above that of the Cromford Canal to ensure that no water was taken from the Cromford Canal to supply the new Lea Wood Arm. To achieve this, it was necessary to have a stop-lock at the entrance to the arm.



#### **(Location 14) Railway bridge over the River Derwent**

What is the bridge made from? Why is this chosen? What shapes can they see in the bridge structure?

Triangles are a really strong structure and can often be seen in structural engineering and bridge design. You can use the 'brace a square' demonstration at this point.

#### **How to Brace a Square**

- Using pupil volunteers, use the nuts and bolts to make a square shape out of the 4 equal pieces of wood. Ask the children to make sure that they have tightened the bolts as much as they can.
- Ask for a volunteer to see how 'strong' the shape is by giving it a squeeze. It should be possible to squish the square, so it totally loses its shape.
- Ask the children if they have any idea what they could do to strengthen / brace the square shape?
- Show them the additional longer piece of wood if they need a clue.
- Ask a couple of children to remake the square this time with the additional longer piece of wood going from corner to corner, turning the square into 2 triangles.
- Ask for the 'strongest' child to have a go at changing the shape of the square by squeezing the shape now. It should not move at all, thus demonstrating the superior strength of a triangular structure.

Can they see any debris (grass etc) on the bridge, if so, how did it get there? – In 2020 the River Derwent flooded, and the water got so high it actually went over the railway bridge and trains had to be stopped until the water had gone down, and it was safe to cross.



#### **(Location 13) Leewood Pumphouse**

The pumphouse was built in 1849 to top up the canal with water from the River Derwent following a water shortage in 1844.

The restored steam engine is capable of lifting 4 tons of water each minute, up to a height of 30 feet.

At this point you may have chosen to draw the pumphouse, see the 'How to sketch Leewood Pumphouse' activity guide for more information about this activity.

The pump is open to the public for special 'in steam' days. See [www.derbyshire.gov.uk](http://www.derbyshire.gov.uk) for details.

## Map of the Site

Items shown in blue indicate significant and original features of Cromford Canal and Cromford and High Peak Railway

