

# South Wales Mainline Electrification *Piling FAQ*

Network Rail is electrifying the line between London and Cardiff – a major part of our Railway Upgrade Plan. In Wales, this will involve work to the South Wales Mainline – an important rail route linking towns and cities across the region. Electrifying this key stretch of railway will mean faster, greener and more reliable journeys for thousands of passengers and a quieter environment for lineside neighbours.

The railway line will be electrified by overhead posts and wires, the foundations for which are created using the method of piling. An extensive night time piling programme is required to install these foundations and will be undertaken along the length of the Mainline.

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## What work is required to electrify the line?

In order to electrify the railway, we need to complete a vast amount of design and preparation work. We need to upgrade bridges and tunnels, carry out safety improvement work to bridge parapets, undertake work to strengthen railway embankments, assess all footpath and level crossings and clear overgrown vegetation running alongside the rail.

We also need to undertake the piling works required to install foundations which will support Overhead Line Equipment (OLE). We will then install the trackside posts and overhead wires.

Work started in Wales in 2015.



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## What is Overhead Line Equipment?

Overhead Line Equipment (OLE) will be installed alongside and above the existing track and will power the new trains.

It will consist of overhead wires and supporting steel posts that distribute electricity at 25,000 volts. The steel posts will be mounted upon foundations spaced between 40 – 70 metres apart along the length of the track and will be approximately 4.7 metres in height. Overhead wires will run between the posts.

Two types of posts will be used: twin-track gantries (spanning two lines) and four-track gantries (spanning four lines).

In order to install the OLE, we first need to create the foundations required to carry the posts. These foundations will be installed by two methods of piling.





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## What does piling involve?

Piling involves the driving of cylindrical steel piles deep into the ground. These hollow metal structures are between 610 millimetres and 765 millimetres wide and vary from 3.5 metres to 6.5 metres in length.

Piling is undertaken using road-rail vehicles (RRVs) that have an arm attachment. This arm grips the steel pile and either vibrates or hits it until it is fully in the ground. Dependent on ground conditions, an average pile takes between 20 and 60 minutes and is often complete on a single occasion. Once complete, work will then progress in another pile location.

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## What is the difference between the two piling methods?

The majority of piles are driven into the ground using the vibration method. This sees the RRV attachment grip the steel tube and then vibrate it, whilst pushing it into the ground.

However, in instances where this proves difficult, a hydraulically driven hammer will take over and hit the steel tube until it reaches the required depth.

If the ground is soft, or 'easy', the pile is picked up and driven / hammered in. However, if the ground is harder and more difficult, the ground is broken first with an auger. The auger attachment works like a corkscrew, removing soil leaving a narrow hole in the ground – which is filled with reinforced steel and then concrete.



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## How do you determine which method is required and where to install a pile?

The conditions of the ground at each pile location plays a key role in helping to determine the most appropriate pile location, design, foundation type / depth and most appropriate installation method. As conditions vary along the length of the Mainline, each pile must be individually designed.

In order to design a pile, extensive ground investigation work is first undertaken. These results are then used by the designers to determine the ground condition and to calculate the length of the pile or type of foundation required for that location.

We will aim to utilise the vibrating method unless presented with extremely difficult ground conditions, for which we will be required to use the hammer also.

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## Will piling be noisy?

Piling by its nature is a very noisy activity, with noise levels dependent on the distance from the piling location and local topography.

We are working closely with local authority environmental health departments to undertake noise monitoring in each new railway area in which we are piling. Where piling is expected to be very noisy, we will aim to mitigate the noise as much as possible. This may involve installing noise reduction fencing around pile sites and / or an integrated curtain around the hammer – both can help toward reducing noise levels.

However, it is important to note that whilst both methods can slightly reduce the level of noise created, it does not help to reduce the distance the noise travels particularly in more open, rural areas.

The noisiest element of piling is the hydraulic hammer, which, as explained above, is used for piles installed in particularly difficult ground conditions. We will aim to use the piling hammer only when absolutely necessary.

Please be assured that we will make every effort to minimise any unnecessary noise – such as verbal noise – and will work to complete each pile as quickly as possible.



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## What equipment is needed for piling?

In Wales, piling will be undertaken using RRVs – road vehicles with rail wheels attached which allow the vehicles to convert from running on the road to running on the railway. They can be driven on roads to the railway access point (gated entries to the railways) and then convert to rail vehicle for the final journey to the trackside worksite. Materials are also delivered to the access point then moved down the track by RRV.

These machines can tow trailers, carry materials and act as a small crane. They also have attachments that can grip the piles, pick them up and vibrate / hammer them into the ground. They are driven by one person and directed by others on the ground. There are usually another eight people on site to assist the piling process.

These access points are also used by members of railway staff to gain entry to the track.



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## How far apart are the pile locations?

Works are of a transient nature with foundations spaced at 40 – 70 metres apart along the length of the track.

We can usually complete an individual pile on one occasion, however, if conditions are particularly difficult we may need to return and attempt a different piling method (see question 4).

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## Will an OLE post be placed near my property?

An extensive construction programme is required to electrify the railway to make it suitable for a 21st century Wales. This programme will result, visually, in a very different railway with overhead line equipment installed along the length of the route between London and Swansea.

There are a number of points we consider when installing new equipment on our network. Safety is our number one priority and we aim to place new equipment in a suitable location where access can be gained in the event of a failure.

The structure spacings are dependent on various design factors including line speed and the alignment of the track. Their positioning is critical to the safety and operation of the railway. Structures may also vary in complexity depending on what they are required to support within the overall system; anchor structures are considerably larger than standard intermediate spans.

With around 5 million homes either backing onto or facing the railway in Great Britain, we are unable to consider individual requests from our lineside neighbours regarding the placement of trackside posts.

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## When will the piling work be undertaken?

Piling is predominantly a night-time activity, with work undertaken on both weekdays and weekends. In a small number of locations, we will undertake day time piling work on weekends.

Safety is our number one priority and for this reason work of this type must be carried out while trains are not running. Under our licence conditions we are contractually obliged to work at times that cause the least disruption to train services; this means carrying out a lot of our work during the night and at weekends.

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## When will you be piling near me?

In planning the electrification work, the South Wales Mainline has been divided up into 'sections' of approximately 6-8 miles of track. Piling is planned section-by-section with work in each section taking anywhere between three and eight months to complete.

At various points in 2017/2018 piling will be undertaken along sections of the railway between Severn Tunnel and Cardiff Central Station. The work is planned on a rolling monthly basis we are in some areas working only Saturday nights and other areas we may be working mid-week nights,

We will aim to keep local residents informed of our piling work by writing to those living close to the railway and, where relevant, we will hold public information sessions to discuss the project with the communities. Information will also be displayed on our website – [www.networkrail.co.uk/WalesPiling](http://www.networkrail.co.uk/WalesPiling)





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## What is a typical height of overhead power lines?

The standard height for the contact wire is 4.7 metres – just a little taller than the trains. At locations where there are level crossings this increases to 5.8 metres to allow for clearance of vehicles crossing the infrastructure.

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## Why does Network Rail need to remove lineside vegetation?

Network Rail needs to clear all woody vegetation up to 6.6 metres of the outside running rail on both sides of the track (within our railway land boundary). Once cleared, this area will be maintained to avoid vegetation encroachment.

This work is vital if we are to deliver a safer and more reliable railway.

Largely, the work is required to ensure safe operation of the OLE system by removing the potential for vegetation to touch or fall on to it and ‘short out’ the live parts of the system. This could have the potential to cause mass disruption to the service.

However, lineside vegetation can also obscure signals, damage overhead power lines or fall on the tracks and into the path of an oncoming train, risking a derailment.

In some locations, rampant lineside vegetation and trees have become a serious safety and performance risk for the railway and its four million daily users. We feel we must take action to reduce this threat, to protect our people and the public we serve.



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## Once piling is finished, what's next?

Following the completion of piling work, we will return at a later date to erect the supporting posts and string the wire between them, before ultimately commissioning the system ready for electric trains.

Electrification between London Paddington to Cardiff is planned to be completed by 2019. Electrification beyond Cardiff to Swansea is planned to be completed within the railway period Control Period 6 (2019-2024).

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## Would you like to know more?

**Please visit:**

[www.networkrail.co.uk/great-western-route-modernisation/](http://www.networkrail.co.uk/great-western-route-modernisation/)

**Or download our complete project FAQ at:**

[www.networkrail.co.uk/improvements/south-wales-electrification.pdf](http://www.networkrail.co.uk/improvements/south-wales-electrification.pdf)

We also operate a dedicated 24-hour National Helpline which can be reached on 03457 11 41 41 or you can email us at [CRWales@networkrail.co.uk](mailto:CRWales@networkrail.co.uk)