

## **DEFINITION OF OVERHEAD LINE EQUIPMENT (OLE)**

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An arrangement of wires suspended over the railway line, for supplying electricity to electric trains, together with associated fittings, insulators and other attachments including feeders, overhead line switches, jumpers and return conductors. This equipment together with its structures, foundations, line side switching stations etc. is described collectively as the Overhead Line Equipment.

## **DESCRIPTION OF THE ELECTRIFICATION SYSTEM**

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The Electrification system is the use of overhead structures and conductors to carry 25,000 volts (ac). The electricity is supplied to Network Rail Feeder Stations by the National Grid Electricity Supply by means of transformers connected to its high voltage distribution network. From the Feeder Station the electrical supply is delivered through circuit breakers to the overhead line equipment through bare overhead feeders or insulated cables.

The current is collected from the OLE by the train pantograph and taken to the train equipment. The current passes through the axles and wheels of the traction unit to the running rails. The current is returned to the feeder station by the return running rail and the return conductor wires.

## **ELECTRICAL CONTROL ROOMS (ECR)**

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Apparatus for the remote control of the electrical equipment in the Feeder Stations known as SCADA are in Electrical Control Rooms which are continuously staffed by Electrical Control Operators (ECO) who have control of the power supply and who are responsible for all switching operations and isolations of the electrical equipment.

## **OVERHEAD LINE ELECTRIFICATION CONSTRUCTION (OLEC)**

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This is the term used for newly constructed overhead line systems on Network Rail Managed Infrastructure also including renewals to existing OLE systems along with modification, adjustment and amendments. The Principle Contractor is responsible for designating and controlling OLE construction sites and for communicating the location of sites as early as possible in the planning process. An OLE construction site may be a defined area or exclusion zone within a larger work site.

Any individual accessing or undertaking work within a defined OLE construction site who could be at risk from the OLE construction activities or who may import additional risk to those activities must hold as a minimum the OLEC 1 competence, or be escorted by an OLEC competence holder.

## OLEC-1 ACCESS OLE CONSTRUCTION SITES

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This is an initial competence for an individual who are new to OLE and whose work involves accessing an OLE construction site. The aim of this competence is for familiarisation and basic knowledge of the OLE system, its components and the working methods associated with construction, renewal, enhancement and modification of OLE assets.

## OLE DISCIPLINES/ OPERATIONS

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### **1. Excavation and Foundations**

There are two main types of foundations to support the OLE Structures these being **concrete and piled foundations**. Excavations are carried out and concrete is poured to create foundations which can be bolted base or planted side bearing type also a gravity type of foundation may be constructed in difficult ground areas where the required excavation depth can't be achieved. Piled foundations are Tubular Steel Piles which are mechanically pile driven into the ground.

Various plant and machines are used for excavations along with concrete mixers for concrete foundations, pile driving rigs and units are used for the piled foundations. Majority of the machines used are rail mounted therefore movements along with the operation of the machines do pose a danger on site.

### **2. Steelwork and Structures**

The steelwork/structures come in many different forms and sizes due to various factors such as the load it needs to carry, track configuration, layout, geometry, and existing infrastructure structures. On a 2-track railway, you get the standard mast for **cantilevers** which support the wires over a single track on both lines. On 3 or 4 track systems, a bigger mast is needed to support a **headspan** for wires over multiple tracks. Other structures include **Portals, Twin Track Cantilevers and Double Channels**. Lifting equipment such as cranes which will be rail mounted are used for erecting the steelwork along with assistance from MEWP and Scissor Lift rail mounted plant.

**A Structure location number plate is located on the mast which gives a unique number identifying its location and kilometre/mileage.**

### **3. Small Part Steel (SPS)**

SPS is the components installed on the masts such as cantilever tubes, insulators and registration arms in preparation for the wire runs to be installed. Rail mounted MEWPS and Scissor Lifts will be used for this operation.

### **4. Wiring**

There are several wires within the overhead line system the main ones being the Catenary Wire, the Contact Wire and the Return Conductor Wire (Along Track Conductor).

# ACCESS OVERHEAD LINE CONSTRUCTION SITES

## OLEC-1 Handout



**The Catenary Wire** is the uppermost wire of the OLE which feeds and supports the contact wire, it is a stranded metal of aluminium.

**The contact wire** is of a hard copper which contacts the train's pantograph it is suspended from the catenary by means of aluminium dropper wires.

In some of the older systems of OLE there is an **auxiliary wire** which is supported between the catenary and contact wires.

These wires are tensioned at anchor points at the ends of the wire runs at a predetermined force.

**The Return Conductor** is a wire that provides a current return path to the feeder station and is suspended on the structures.

In some areas, there is an **aerial earth wire** that connects the steelwork where the structures have not been independently bonded.

Running out the wires is carried out by various on track plant including wire trains drum carriers, MEWPS and scissor lifts (RMMM Rail Mounted Maintenance Machines).

### **5. Insulation**

There are many different types of Insulators within the OLE which are installed within SPS and span wires to separate live parts from each. There are also **section insulators** in crossovers and overlap areas also **neutral section insulators** at neutral sections/feeder stations.

### **6. Registration**

Registration is the **final adjustment of the OLE** once all the wiring and insulation has been installed. The final adjustments include setting the **correct height and stagger** of the wires. This is carried out by linesmen working from baskets and platforms of rail mounted vehicles such as MEWPS and Scissor Lifts (RMMM).

### **7. Bonding**

Bonds are electrical connections to or in the traction return rail there are several different types of bond for various functions.

**Structure to Rail bonds** which connect steelwork to the return rail

**Continuity bonds** which ensures the path of the return current through breathers (adjustment switches) in the return rails.

**Transposition bonds** which transfers the return current where the traction return rail changes from one side of the track to the other.

**Red Bond is a bond that provides a vital part of the traction return circuit and if broken or disconnected could result in a dangerous voltage arising. This is classed as an emergency and must be reported immediately to the person in charge or the ECO you must remain at least 2.75 metres (9ft) away.**

## OLEC SITE ACCESS/ INFORMATION

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It is important that you understand the site access requirements for an OLEC Site which will include **site inductions briefings** on the relevant information including safety arrangements and hazards associated with the site and operations. Always ensure you receive a brief and sign in with the **Site Access Controller/Site of Work** and familiarise yourself with information on the **site notice boards**. A Site Induction Card should be issued which will accompany your Sentinel Card (PTS/OLEC) PTS may not be a requirement on a Green Field Site if electrically and physically separated from Network Rail operational infrastructure.

Familiarisation of publications such as the **Green Book NR/SP/ELP/29987 Working on or About 25 KV A.C. Electrified Lines**, the Rule Book Module AC Electrified Lines and Hand book 16 AC Electrified Lines would give additional information and details of the requirements when working on or about the overhead line equipment.

## HAZARDS ASSOCIATED WORKING WITHIN OLEC SITE

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### 1) Hazards associated with Plant and Machinery

- Movements of Works Trains, On Track Machines and On Track Plant within the worksite
- Limited Clearances
- Lifting activities
- Exclusion Zones

### 2) Hazards associated with working at height

- Objects falling from height
- Persons falling from height
- Tensioned Equipment including Radial Loads

### 3) Hazards associated with OLEC ground work

- Open excavations/cavities
- Bonding cables causing tripping
- SPS on ground ready for erection tripping hazards
- Rail grinding/generators.

## OLEC COMPETENCE UNITS

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- OLEC 1** is the competence required to access OLE Construction Sites only.
- OLEC 2** is the competence required to undertake basic OLE construction activities under direction.
- OLEC 3** is the competence required to renew, enhance and modify OLE in accordance with design drawings and specifications.
- OLEC 4** is the competence required to control and supervise OLE construction, renewal and enhancement activities in line with specification.
- OLEC 5** is the competence required to confirm the OLE is safe for operational purposes between construction activities.