



# LightRail

Overhead contact lines for urban rail systems,  
tramways and trolley buses

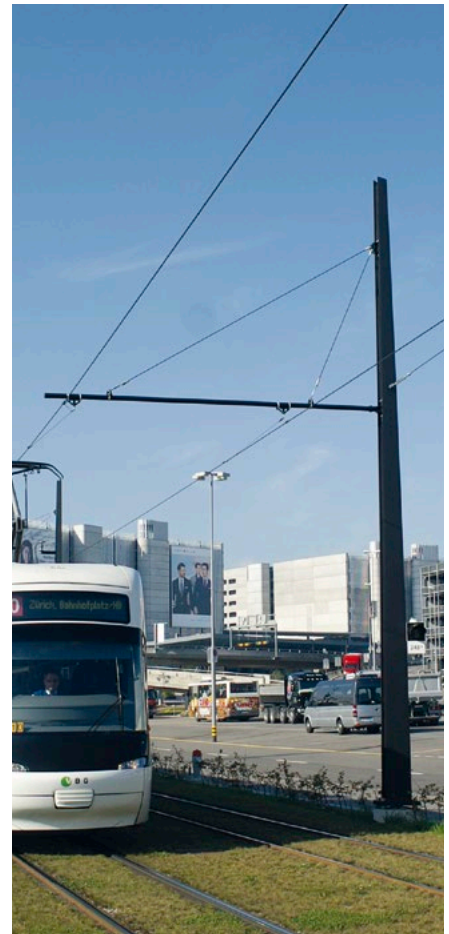
# LightRail

For more than 90 years, Furrer+Frey has been developing, planning and constructing overhead contact line systems for tramways, standard gauge railways and trolley buses. The company was established by Emil Furrer and Arnold Frey and has remained a family concern to this day. It is guided by three fundamental principles: reliability, quality and a clear understanding of what customer service means.

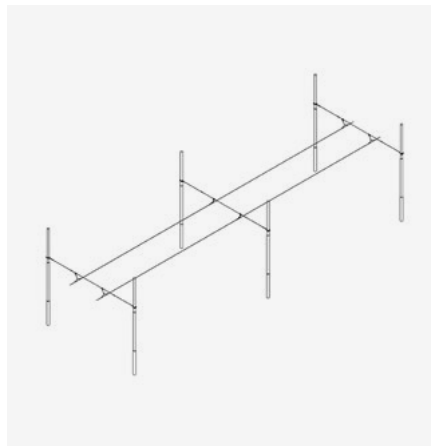
LightRail is an overhead contact line system for urban rail systems, tramways and trolley buses, designed for voltages of up to 1.5 kV DC and for speeds of up to 120 km/h.



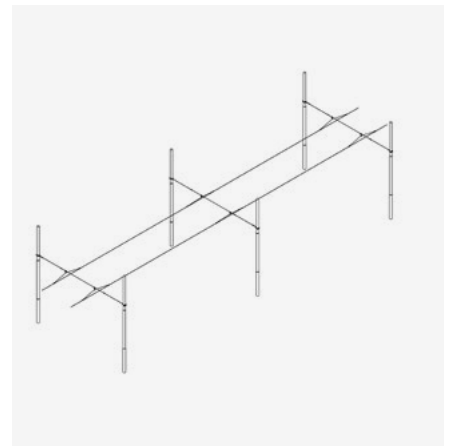
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The LightRail system is a flexible tailor-made solution. It can be used to produce a range of different types of overhead contact line.

### Pendulum overhead contact line

The pendulum overhead contact line is a single contact line, capable of being constructed as either a non-tensioned or a tensioned system. Depending on the project and the application, the support points are designed and constructed either with cross spans or with cantilevers. A feeder line can also be inserted between the contact wires to supplement the system. Feeder lines laid in the ground also provide an option for increasing the cross-section.

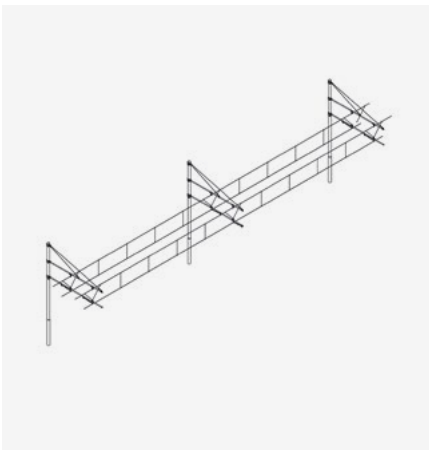
— [1, 2]

### Single contact wire system with sliding suspension

The single contact wire system with sliding suspension is a tensioned single contact line. This system, too, can be designed and constructed with either cross spans or cantilevers as support points.

— [3, 4]

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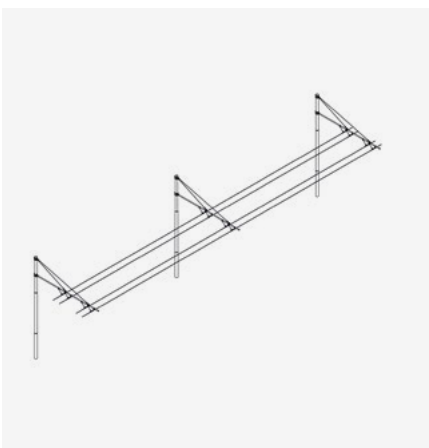


### Catenary

The LightRail catenary system consists, as it does with standard gauge railways, of a contact wire and a catenary wire. The contact wire is tensioned. The catenary wire can, be need not be, tensioned. Cross spans or cantilevers act as support points.

— [5, 6]

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### Trolley bus

The trolley bus contact line can be constructed as either a non-tensioned or a tensioned system. Both the feed and return conductors are kept as single contact lines. Depending on the project and the application, the support points are designed and constructed either with cross spans or with cantilevers.

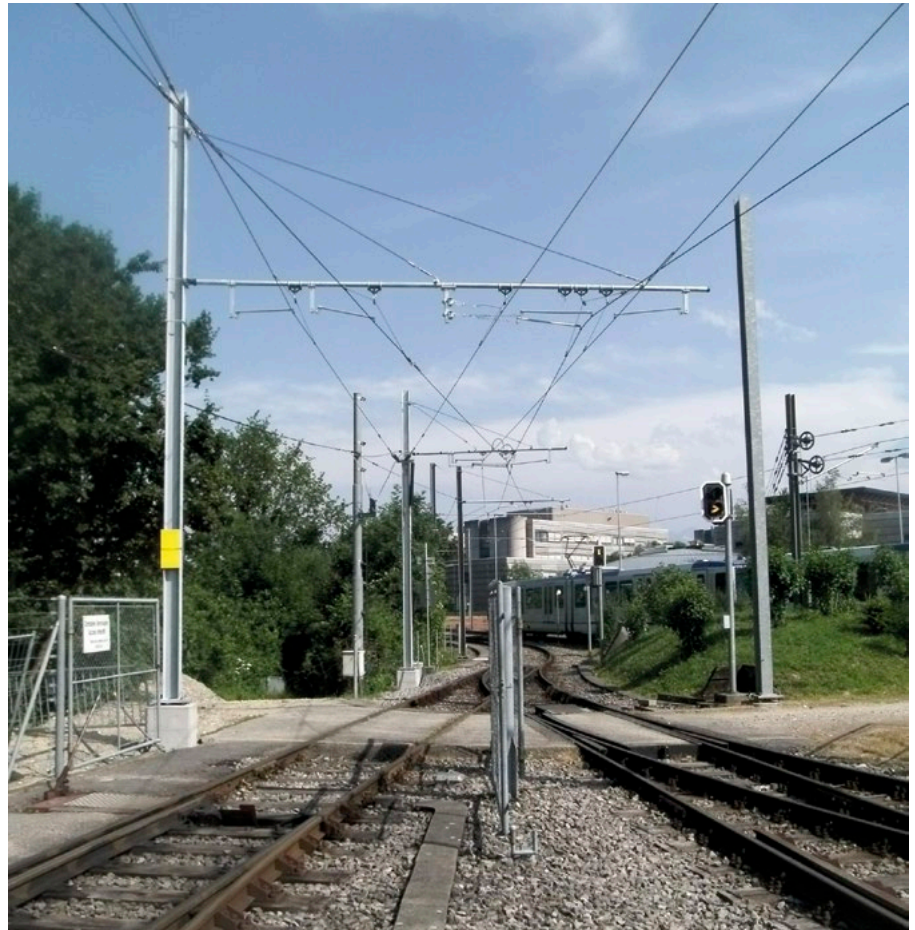
— [7, 8]



# Material



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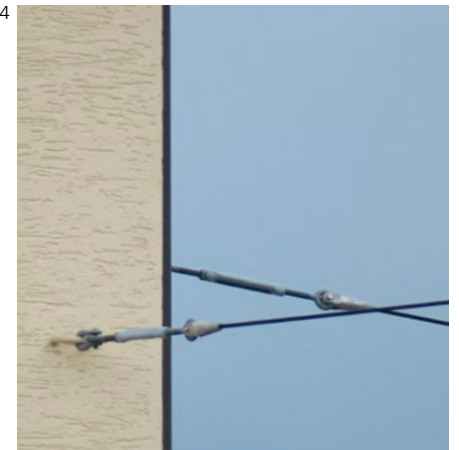


## Masts / wall anchors

There is no limit to the choice of masts or wall anchors for use with the LightRail system. The range of possible masts extends from H-profiles, via 3-section tubular masts and conical circular masts to specially designed masts.

— [1, 2, 3, 4, 5]

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## Support points

### Cantilevers

The cantilevers can be made either of treated or stainless steel, of aluminium or of synthetic tubes. Depending on the application, the diameter of the cantilever tubes may be 55 or 70 millimetres.

— [1, 2, 3]

### Cross spans and pull-offs

Cross spans offer great flexibility when producing support points. They are designed and constructed as partially-insulated cables.

— [4, 5, 6]

### Tunnel support structures

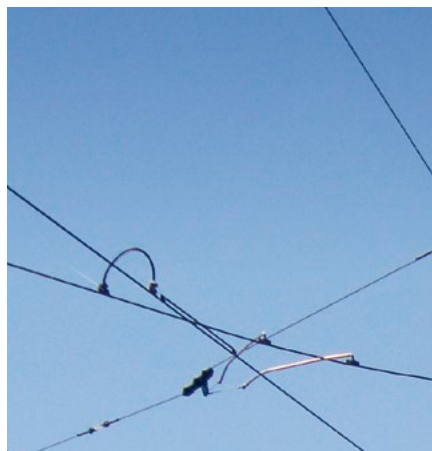
Lightly sprung and height-adjustable support structures are used in tunnels or underpasses.

— [7]

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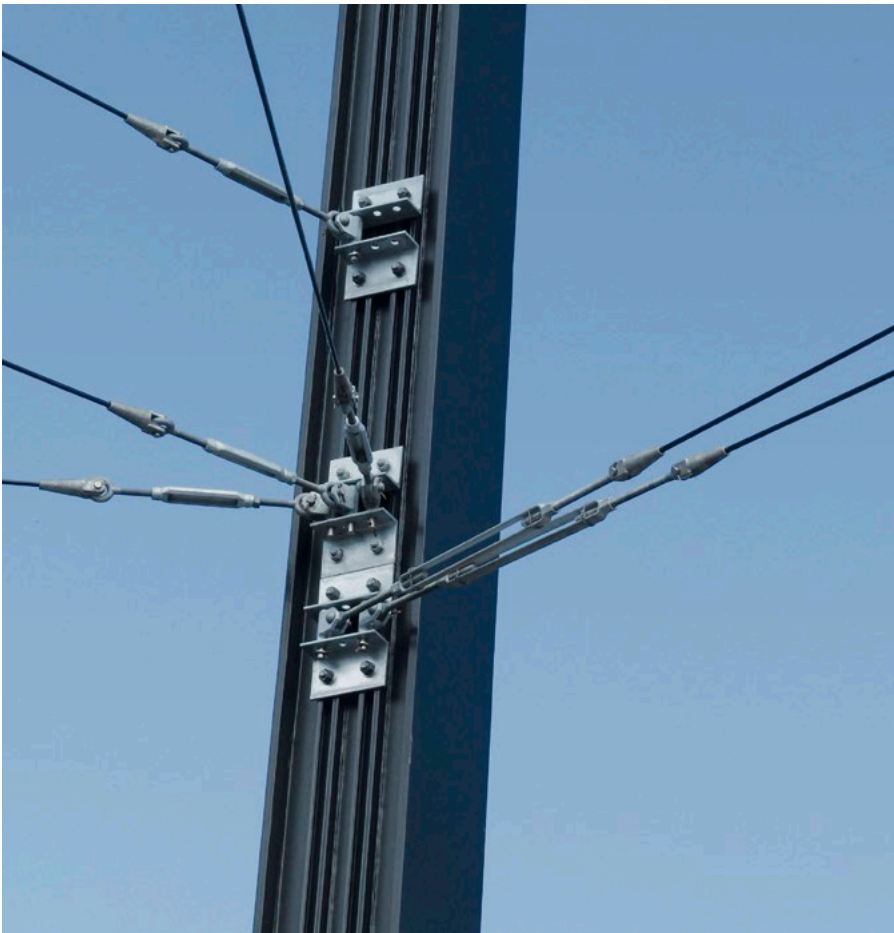
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## Insulation

### Insulation elements

The LightRail system's insulation elements are injection mouldings. They can act both as primary or secondary insulation. They are attached either to the cantilevers or to the cross spans. Delta cable clamps, pulleys, registration arm clamps, registration arms and ring bolts can all be connected to the insulation elements.

A tube cap insulator is used as the insulation element between the cantilever and the mast. All insulation elements are designed for use up to a maximum voltage of 1,500 V.

— [1, 2, 3]

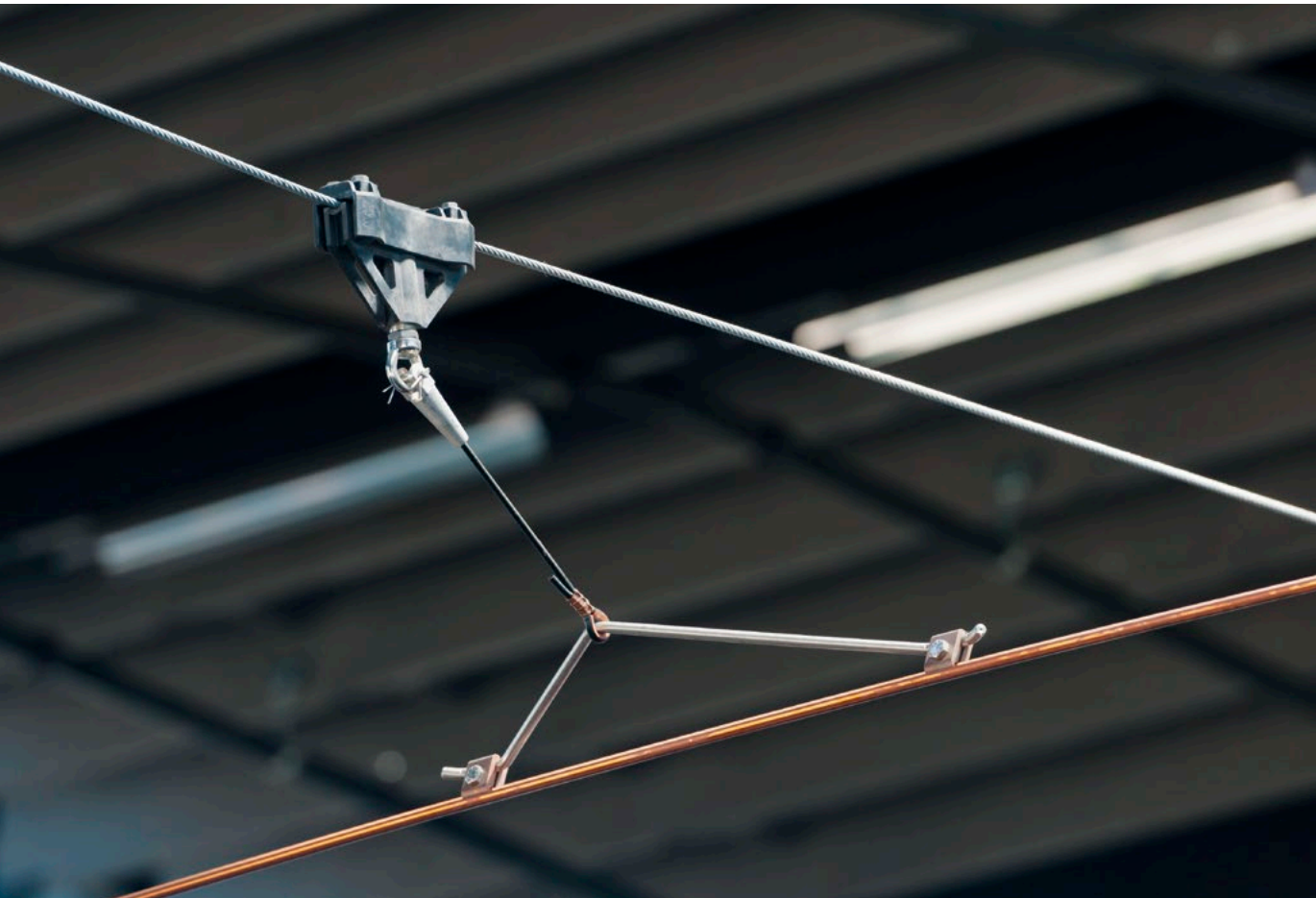
### Kevlar cables and loop insulators

Kevlar cables or loop insulators act as the insulation elements for use with anchor cables, cross spans and pull-offs. Kevlar cables can also be used for suspending trolley bus overhead contact lines.

— [4, 5]

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## Suspension systems / registration arms

### Pendulum

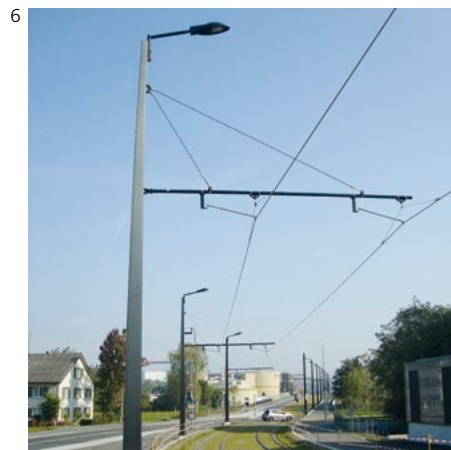
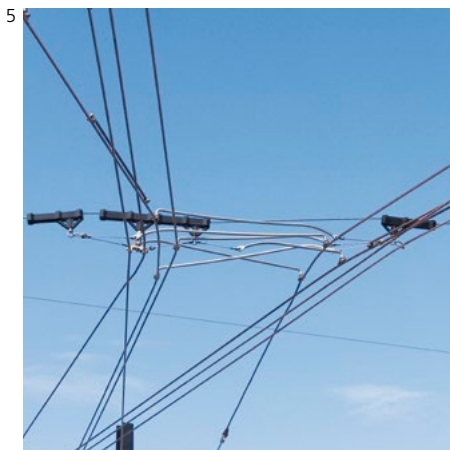
The pendulum suspension is used for single contact lines in large radii or on long straight sections.

— [1, 2]

### Delta cable

The delta cable suspension optimises the dynamic interplay between pantograph and contact line even at high speeds and with long spans. The delta cables are made up in advance to the desired length, ready for installation.

— [3]



### Registration arms

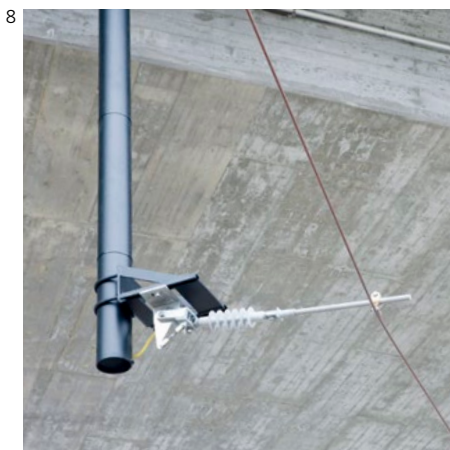
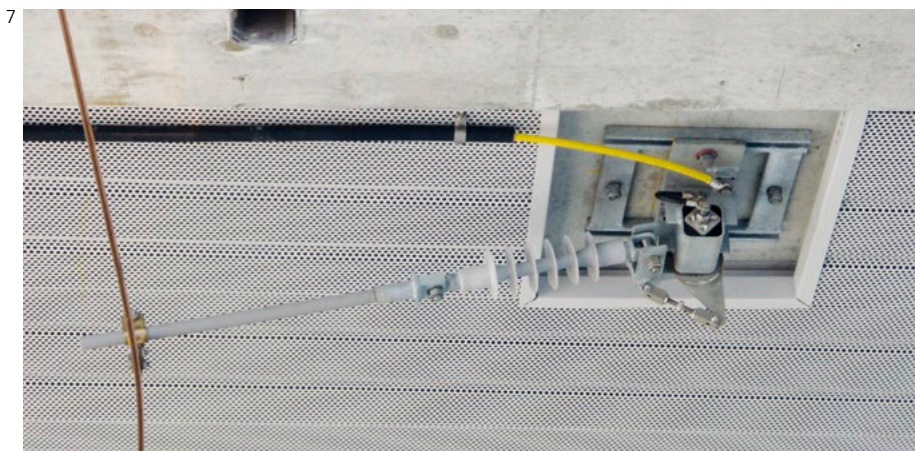
Depending on the application, either flat-laying registration arms or synthetic registration arms are used.

— [4, 5, 6]

### Tunnel suspension systems

In tunnels, the single contact line is held in position using tunnel support structures. Other Furrer+Frey systems, such as overhead conductor rails, offer suitable alternatives.

— [7, 8]







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### Tensioning devices / fixed point anchors

There is a wide range of popular and well-tried components to choose from when it comes to tensioning devices or fixed point anchors. Tensioners either integral to or encased in the mast are also possible. The lines are tensioned via ratchet wheels with a transmission ratio of 1:3 or via counterweight wheels with a ratio of 1:2. Sprung systems are also possible.

— [1, 2, 3]

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### Power feeds

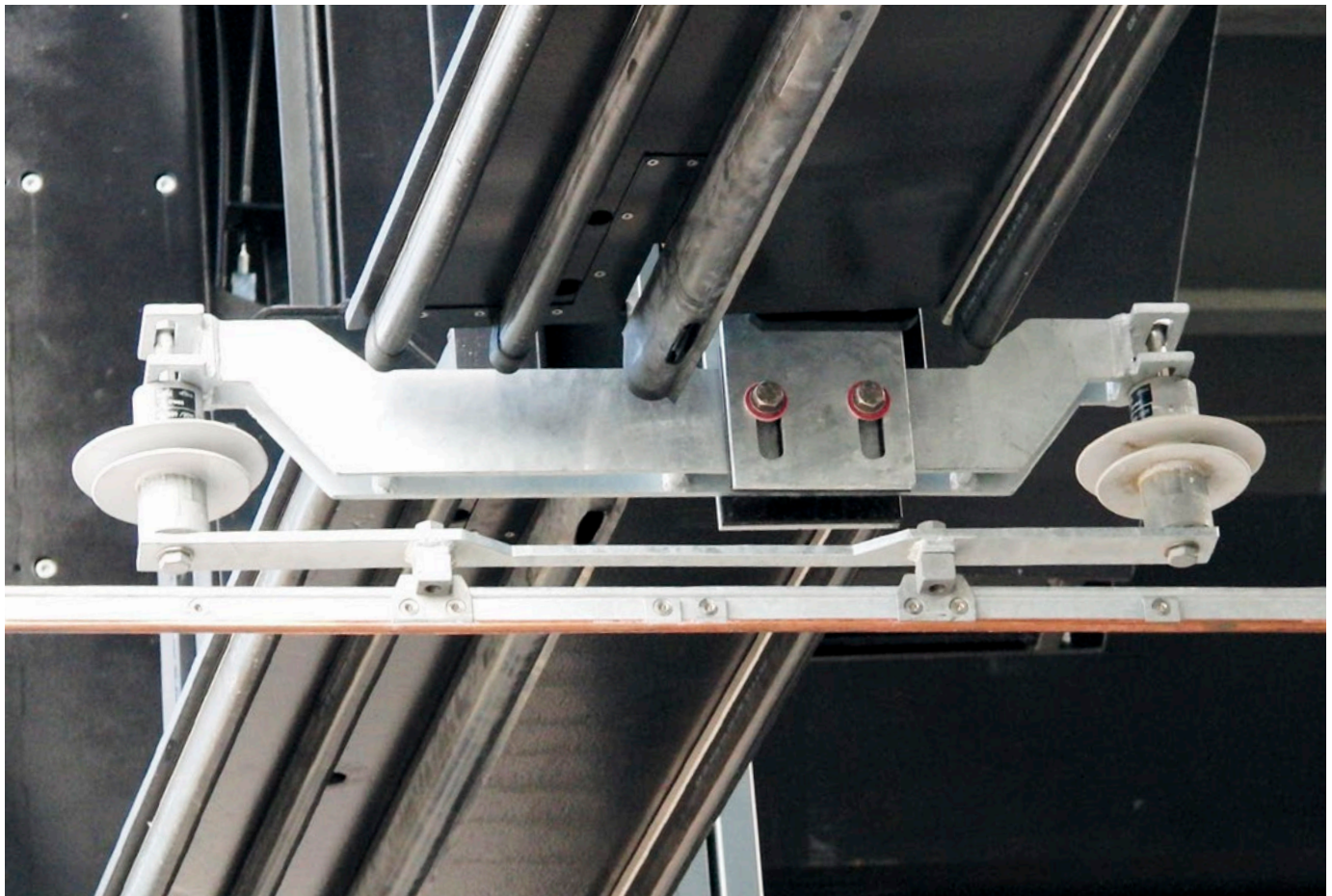
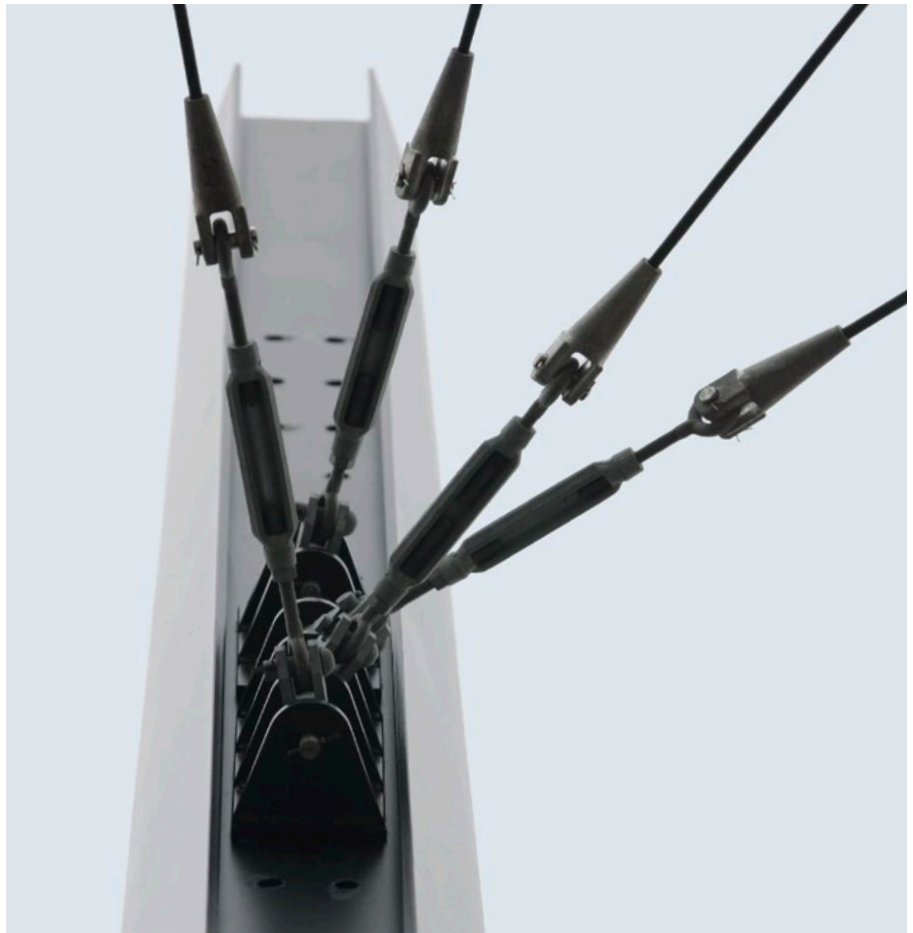
Electric power feeds are tailored, designed and constructed to meet customer needs. Well-proven, standardised components are used.

— [4, 5, 6]

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Furrer+Frey covers the entire added-value chain from development to maintenance.

## Development and innovation

Customer-oriented solutions are produced in our development department. The components are then subjected to electric and mechanical testing.

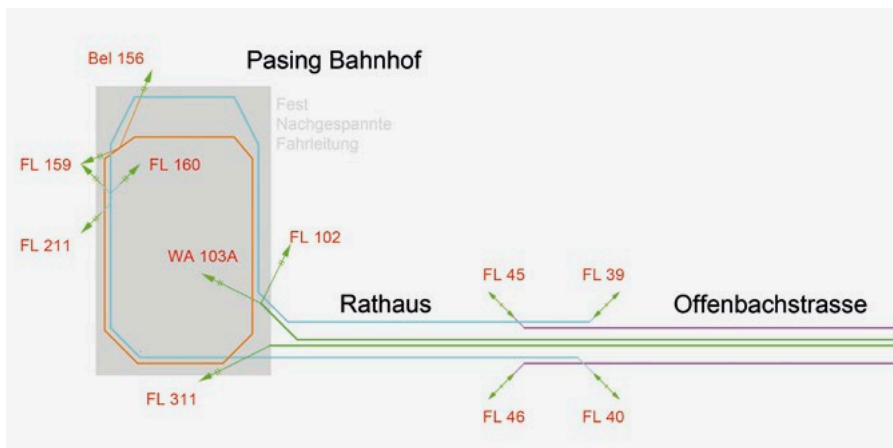
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## Studies and design concepts

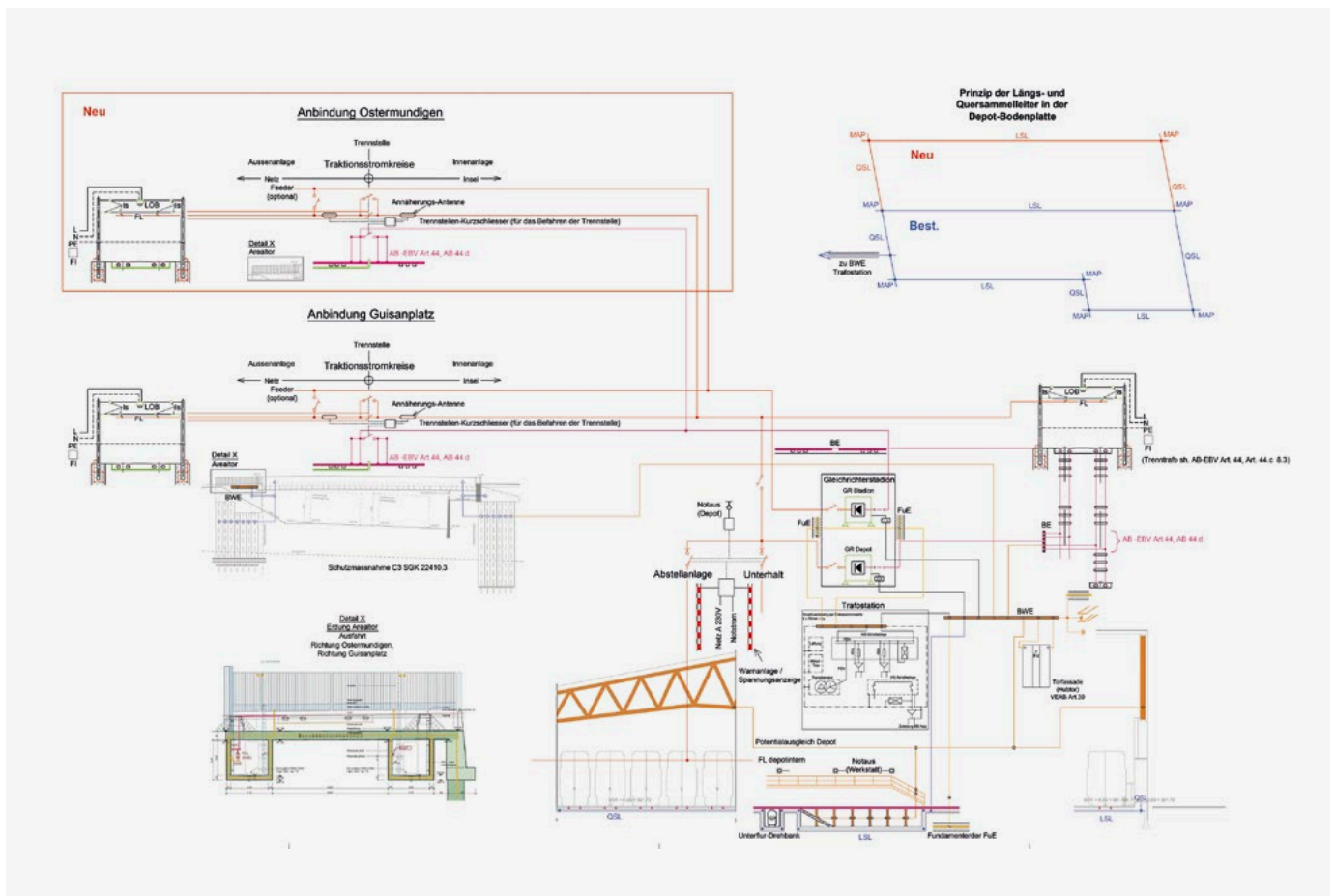
We also draw up studies and create design concepts for our clients. These extend from earthing concepts and feasibility studies to professional assessments; they can be integrated into a contact line project or undertaken as a separate task.

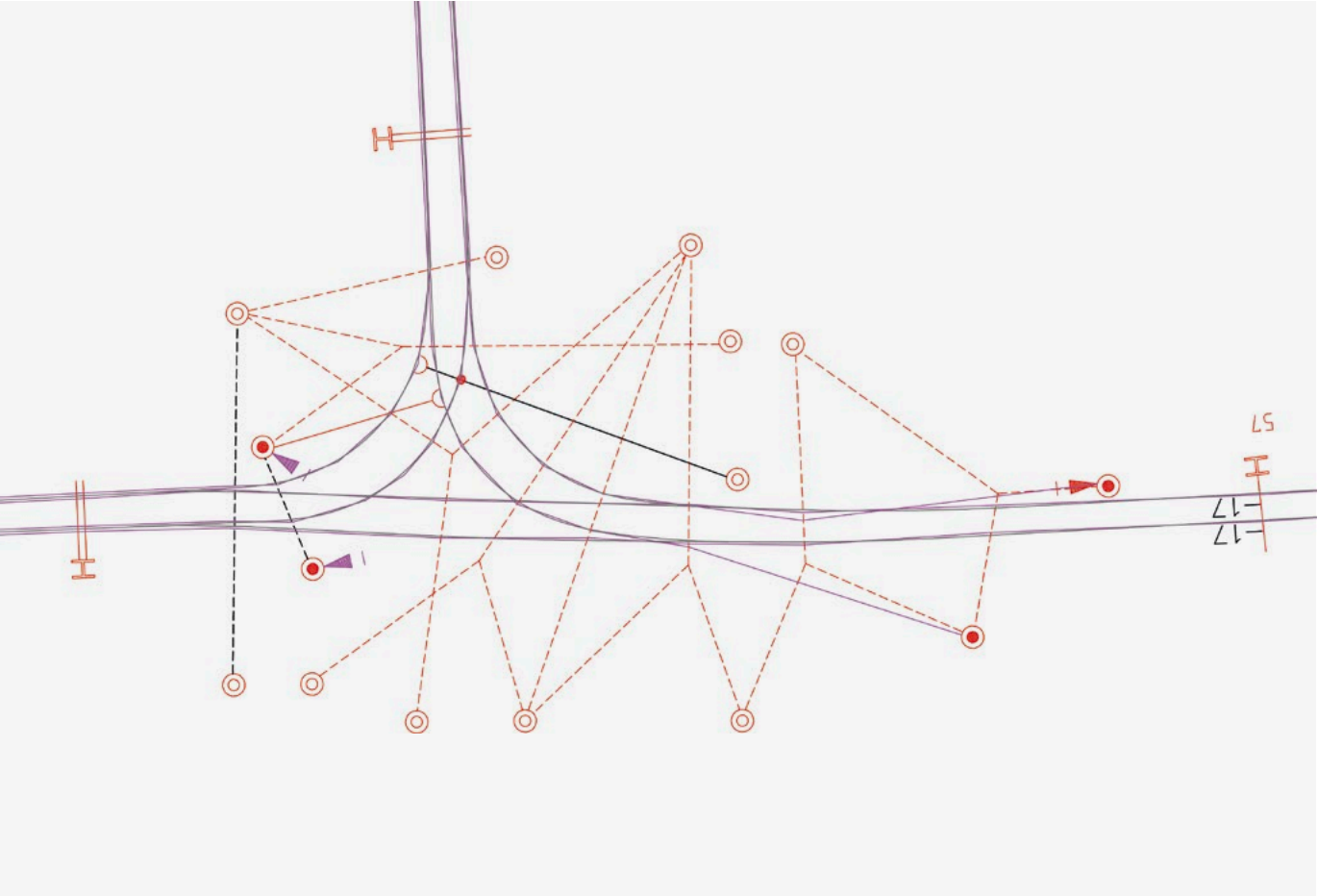
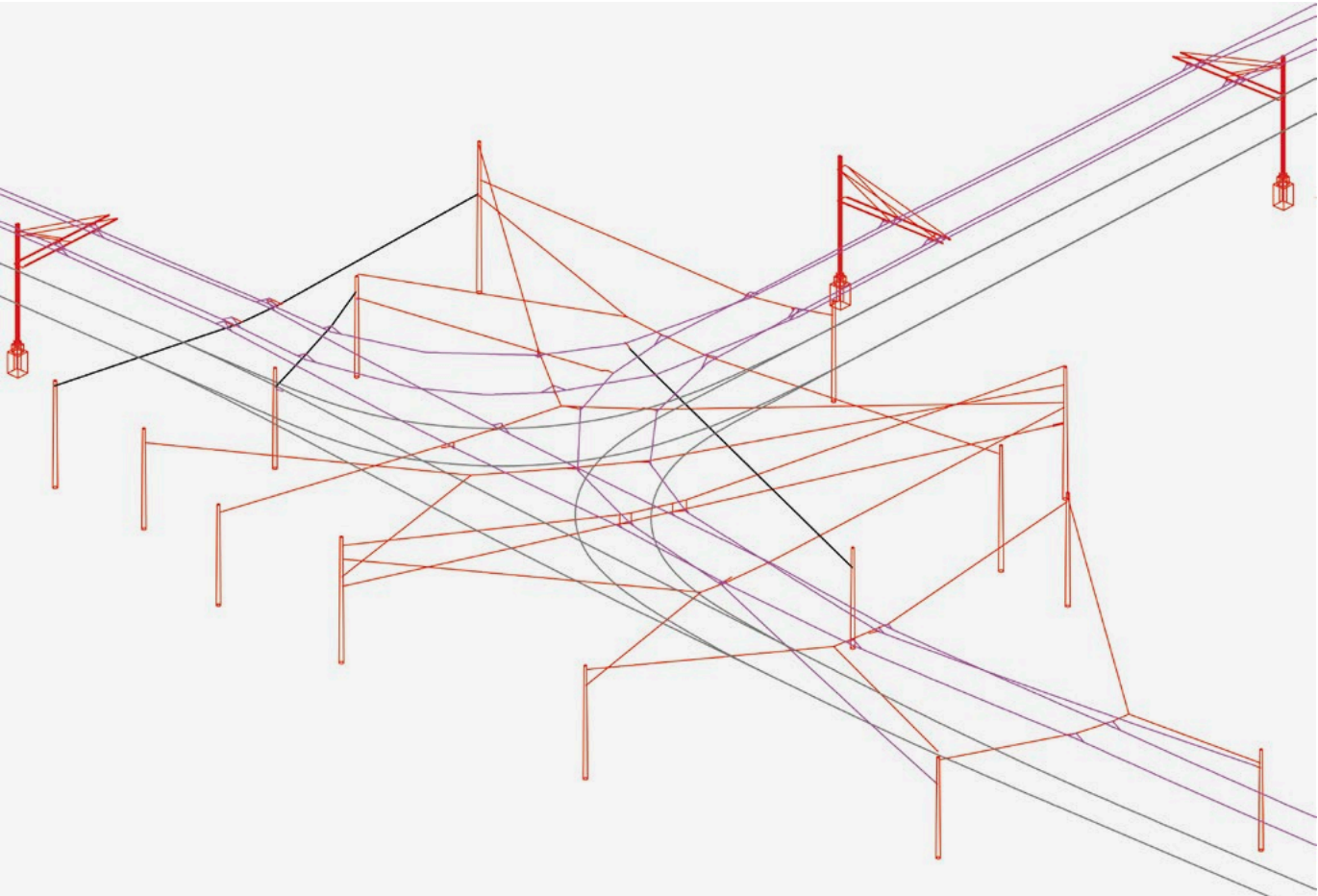
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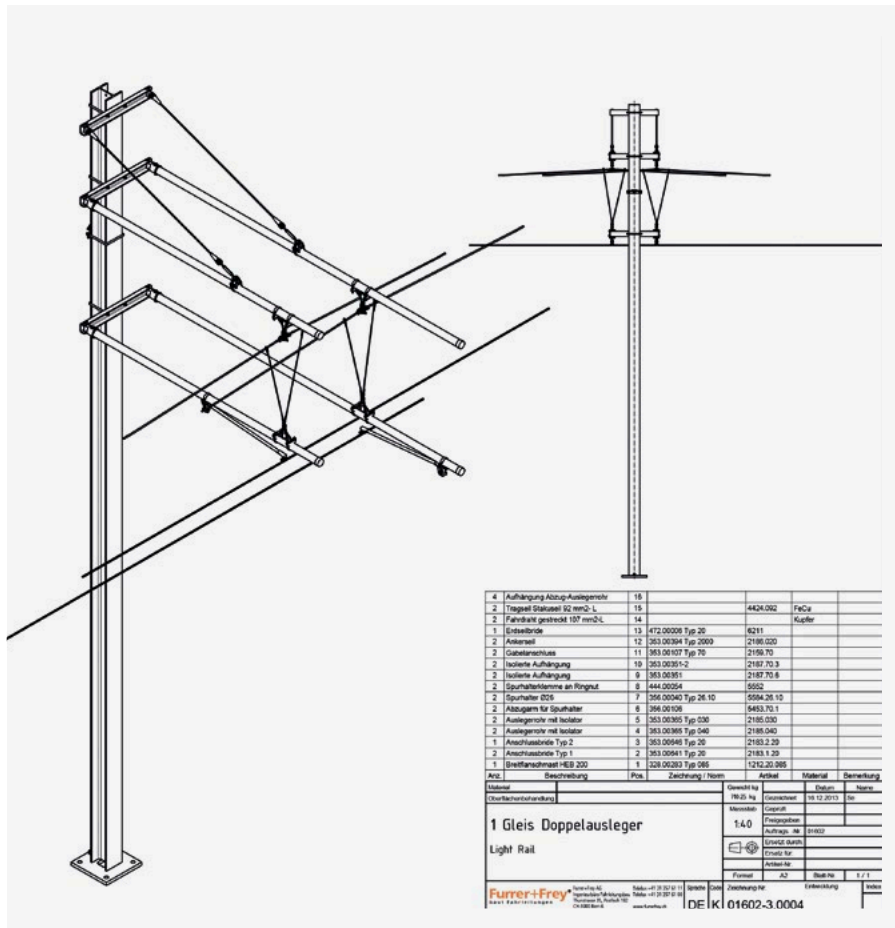


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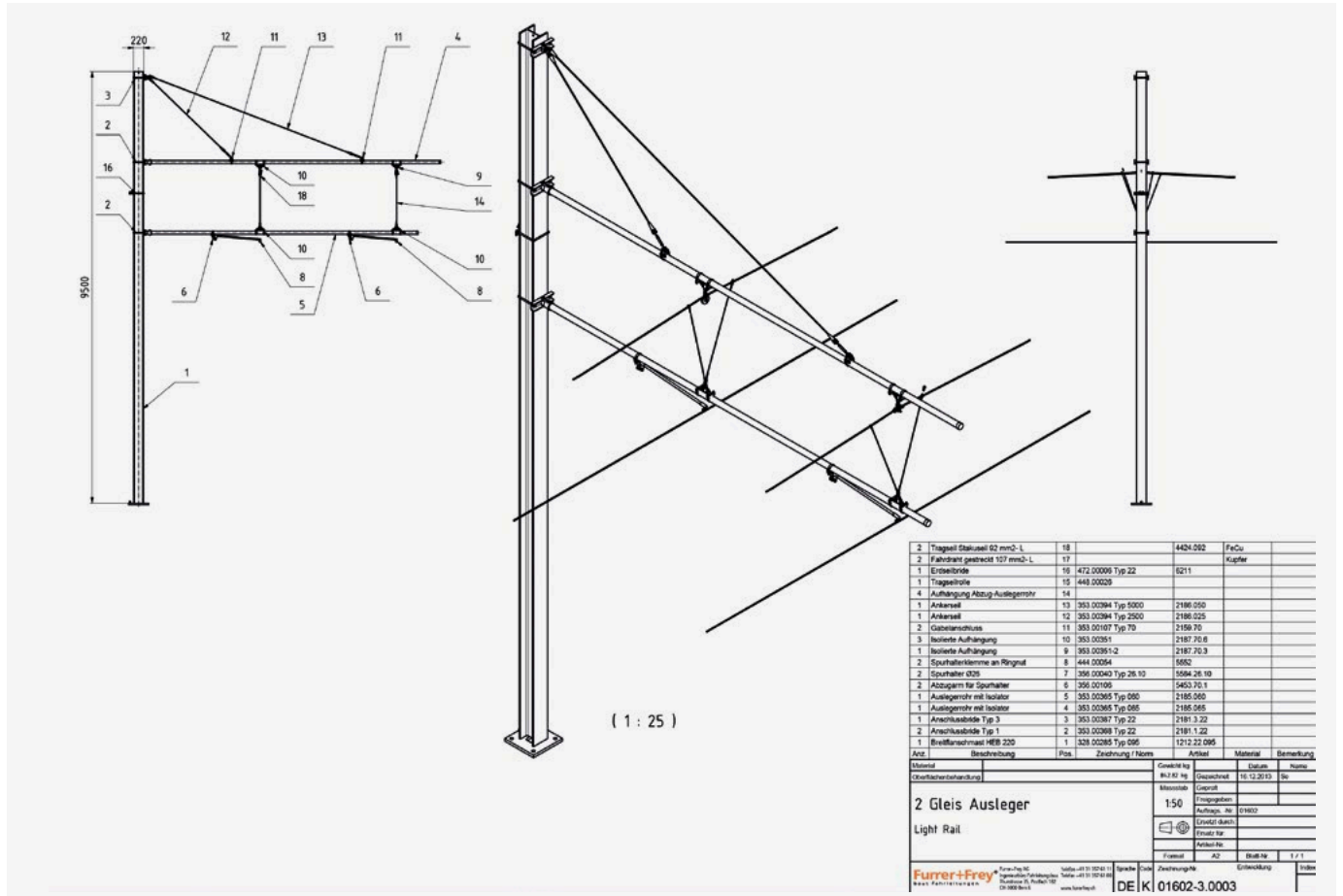




## Planning

Projects are planned using the latest CAD systems. Site plans, profiles, both longitudinal and cross-section, and lists of materials can be drawn up using 2D and 3D applications.

— [1, 2, 3, 4]





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## Assembly

The LightRail system allows rapid and hassle-free assembly. Assembly work is carried out by highly-trained staff using the very latest equipment.

— [1, 2]

## Material deliveries

Materials are delivered from storage directly to the construction site. All the LightRail system materials are held in stock and, as such, can be supplied quickly.

— [3]

## Commissioning

When commissioning the system, Furrer+Frey provides its customers with expert technical support, equipment and measuring instruments. The Dynamic Catenary Monitoring (DCM) system can be made available for testing the contact line. The monitoring equipment can be employed independently as a stand-alone system or mounted on the customer's vehicles.

— [4, 5]

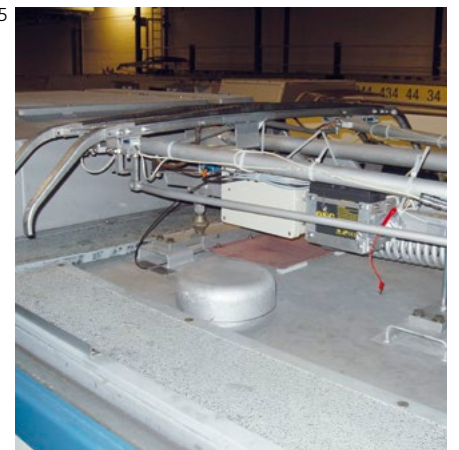
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## Maintenance

Furrer+Frey also assists its customers when carrying out maintenance work, thus completing the added-value chain.

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The Glattal (Zurich), Bern Mobil (Bern), TransN (Neuenburg) and the Rigibahn (Vitznau) are just some of the transport companies which employ the LightRail overhead contact line system. We would be delighted to show you a selection of reference projects or we can send you the relevant reference reports.

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