



Welded Cap Conductor Rail for 3rd Rail Mass Transit Systems



Aluminum-Stainless

The Global Solution



Aluminum-Stainless Steel Power

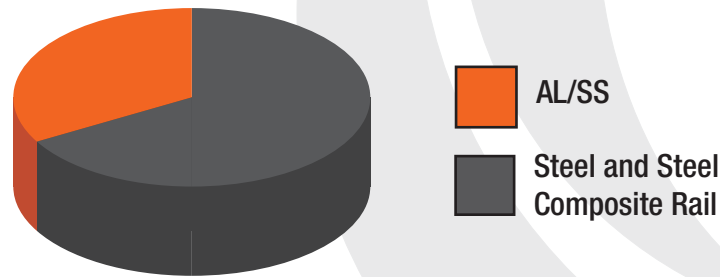


DID YOU KNOW? There are over 3000 miles (5000km) of AL/SS

The World's Busiest Metro Systems Rely on Aluminum-Stainless Steel Power Rails

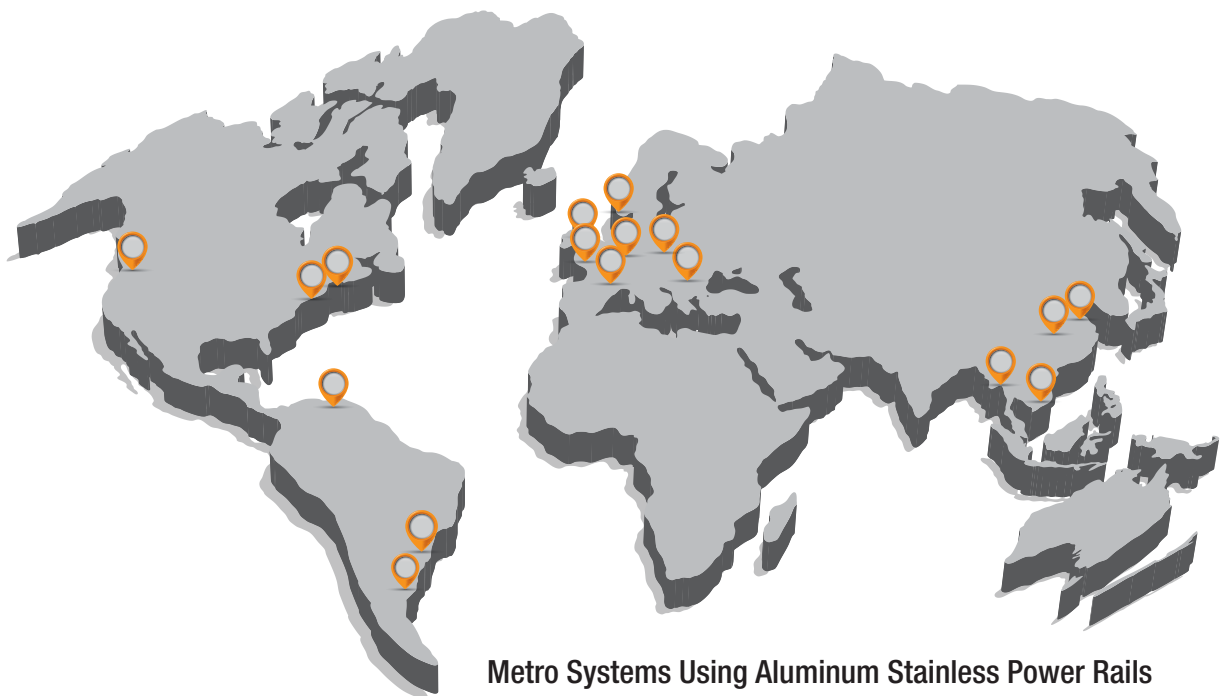
Urban commuters around the world count on their cities' Metro and Light Rail rapid transit systems to get them to where they are going. Virtually all 3rd rail transit systems built in the last decade run on safe, rugged, and efficient Aluminum/Stainless power rails.

Some of the largest public transportation networks in the world now rely on Aluminum-Stainless Steel rails to keep their systems running efficiently.



Global 3rd Rail by Power Rail Type

Rails Preferred Worldwide



3rd rails in use worldwide

Aluminum-Stainless
The Efficient Solution

The Aluminum-Stainless



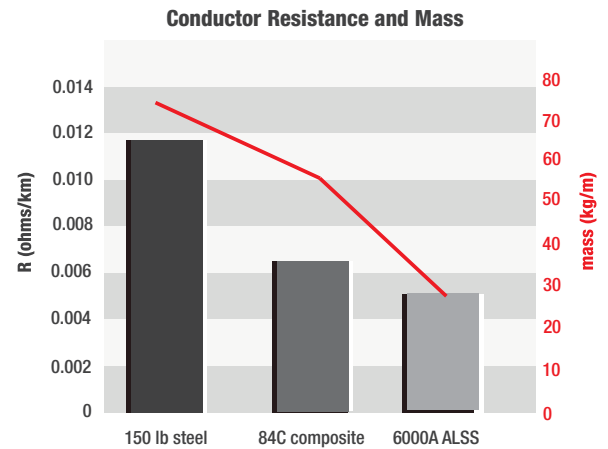
***DID YOU KNOW?* Aluminum-Stainless Rail has 60% less electrical**

Why Use Aluminum-Stainless Rather Than Steel Power Rails?

For over a half century, AL/SS rails have provided safe, reliable, and efficient power under demanding operating conditions.

Lower Electrical Resistance - Greater Electrical Efficiency

Lower I^2R losses allow aluminum conductors to provide more power and aluminum requires fewer substations. The tight electrical bond between the stainless cap and aluminum rail yields very low contact resistance.



Power Rail Advantage

Low Power Loss

Greater conductivity means less energy lost and more power available for vehicles.

Rust-free Contact Surface - Longer Rail Life

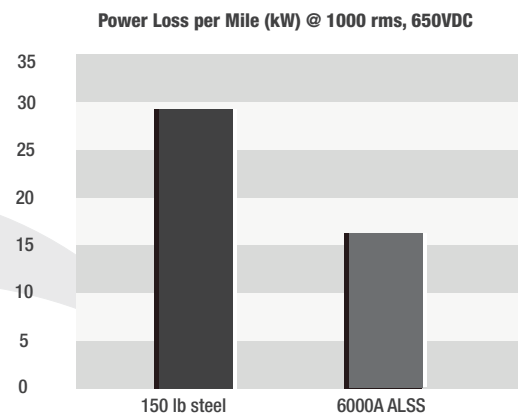
The stainless steel cap prevents the formation of non-conductive iron oxide at the collector shoe contact surface. This results in less erosion of the conductor from micro-arcing and mechanical wear.

Greater Collector Shoe Life - Lower Maintenance Costs

Collector shoes glide easily on the low-friction stainless steel surface resulting in longer collector shoe life than with steel and steel/aluminum rail.

Lower Life Cycle Costs

AL/SS rails are truly today's "green rails", yielding substantial energy reduction, infrastructure savings, and significant material handling advantages. All this adds up to lower total life-cycle costs versus all-steel or steel/aluminum composite rails.



resistance compared to an equal cross-section of steel rail



Welded Cap Rail
The Durable Solution

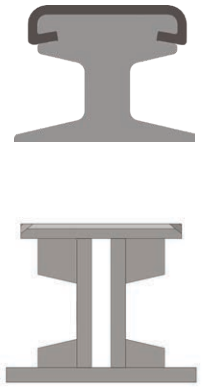
Welded Cap AL/SS Rail

***DID YOU KNOW?* Conductix-Wampfler ramps are constructed**

Durability and Reliability

Conductix-Wampfler's patented Welded Cap Rail technology solves all previous concerns with earlier AL/SS products' wear ability, delamination, and general durability.

- Wrap-around stainless steel cap designs protect the aluminum conductor body from damage and eliminate delamination in even the harshest environments.
- Rail components have been customized to provide high durability and reliability in especially high demand areas, such as on-ramps, where make/break collector contact occurs.
- Double-web ramp design provides exceptional strength and durability .



Superior Durability

When to Consider Welded Cap Aluminum-Stainless Power Rail

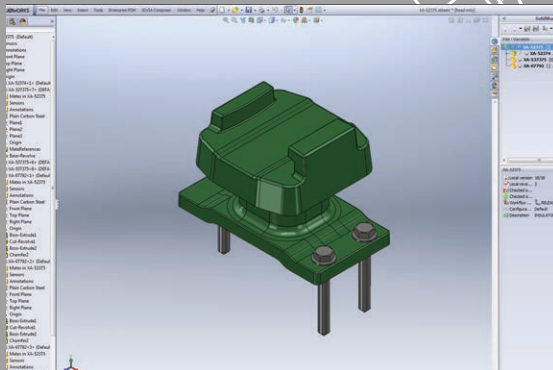
Situation	Benefits of replacing steel rail with AL/SS
Existing 3rd rail has remaining useful life	<ul style="list-style-type: none">- Offset the high cost of electricity- Take advantage of available funds for upgrade
Existing 3rd rail at the end of useful life	<ul style="list-style-type: none">- Higher capacity- Energy savings
Existing power distribution system will stay in place, but has insufficient capacity	<ul style="list-style-type: none">- Longer service life- Lower installation costs
New System - clean sheet design	<ul style="list-style-type: none">- Reduced Number of substations or smaller conductor size- High capacity- Energy Savings- Longer Service Life- Lower Installation Costs

from heavy gauge stainless steel for enhanced durability

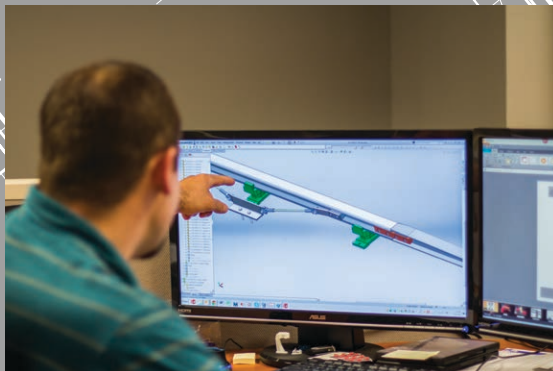
Conductix Wampfler Transit

Global Experience

Power Rail System



Engineered 3D CAD Model



Experienced Design Staff



Rapid Prototyping Capabilities

The **Conductix-Wampfler Global Transit Division**, headquartered in Omaha, NE, has a proven reputation as a world-class supplier of aluminum transit power rail and safe stinger systems. We are your partner of choice when you need to power 3rd rail metro, light rail, people movers, monorail systems, and vehicles in maintenance areas.

Over six decades, we have worked closely with our project partners: end users, vehicle manufacturers, consulting engineers, system integrators, and construction and maintenance firms to develop highly reliable and cost effective solutions.



***DID YOU KNOW?* Conductix-Wampfler has Conductor Rails from**

Conductix-Wampfler

Global Leader in Energy Transfer Systems

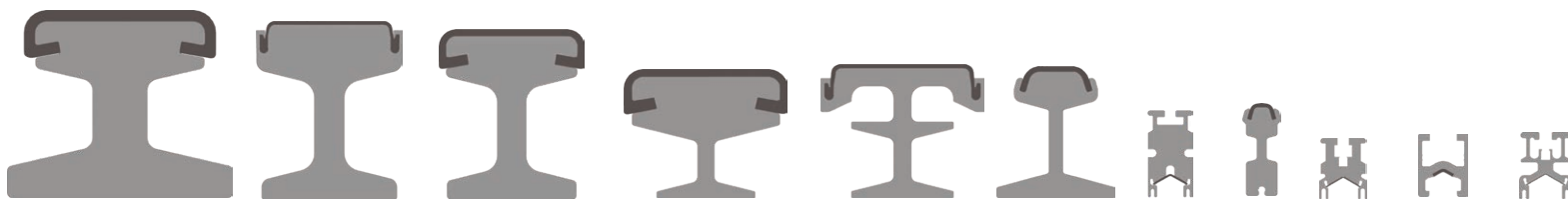
Engineering Excellence

Conductix-Wampfler is active on all major continents serving the mass transit, mining, automotive, intralogistics, and material handling sectors. We offer unsurpassed global support from 22 strategic offices around the world. Our mission is to design and build cost-effective and energy efficient products that keep your vital systems moving.

We are your partner throughout your project from the early concept stages, through the engineering design phase, system development, testing, manufacturing, delivery, and on-site commissioning. We strive to consistently meet or exceed your project needs and apply our considerable experience to recommend the right conductor rail solutions integrated into the overall transit system. We offer a wide range of standardized conductor rail options, along with customized solutions for unique operating conditions. We set the standard for long term component reliability and performance:

- Power rail and insulating rail covers
- Protective rail cover boards
- Insulators and insulator brackets
- End engagements and ramps
- Collectors
- Testing and analysis of installed 3rd rail systems (PRIAS)
- Safe stinger and plug systems for depots and maintenance areas

We have the engineering know-how, practical experience, and testing capabilities to be a partner in your success! Our **PRIAS** (Power Rail Impact Analysis System) can identify potential rail problems so they can be addressed and significantly improve power rail performance.



6000 Amps to 300 Amps

A welder in a grey shirt and blue jeans is working on a rail in a factory. A bright orange flame is visible from the welding process. In the background, there is a Miller welding machine and other industrial equipment. The scene is set in a large industrial facility with red walls and various machinery.

Welded Cap Rail

The Superior Design

Welded Cap Rail

DID YOU KNOW? In the 1960s, Conductix-Wampfler pioneered

Not all Aluminum/Stainless Steel Rails are Created Equal!

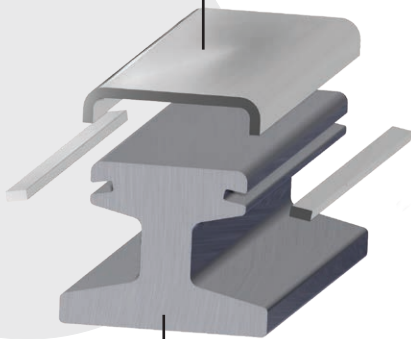
While most aluminum-stainless power rails exceed steel power rails in overall energy efficiency, **not all AL/SS power rails are created equal.**

Conductix-Wampfler's patented "Welded Cap Rail" offers significant advantages. This product is the most advanced, field-proven, and reliable AL/SS rails currently available. In fact, the Conductix-Wampfler Welded Cap Rail is one of the few aluminum power rails approved by New York City Transit, a distinction earned only after passing a battery of stringent tests.

Patented, Proven Technology

Stainless Steel Contact Cap

- Wear resistant
- Corrosion resistant
- Low electrical resistance
- Readily available alloy

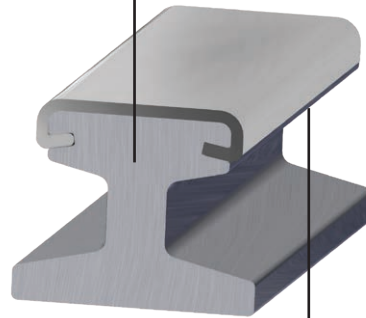


Aluminum Conductor

- Low electrical resistance
- High strength and stiffness
- Corrosion resistant
- Economical, even with low production volumes

Durable Construction

- 40% of the resistance and 14% of the weight of an electrically equivalent steel rail
- Oxide removed from aluminum face
- Oxide inhibitor applied between stainless steel cap and rail body

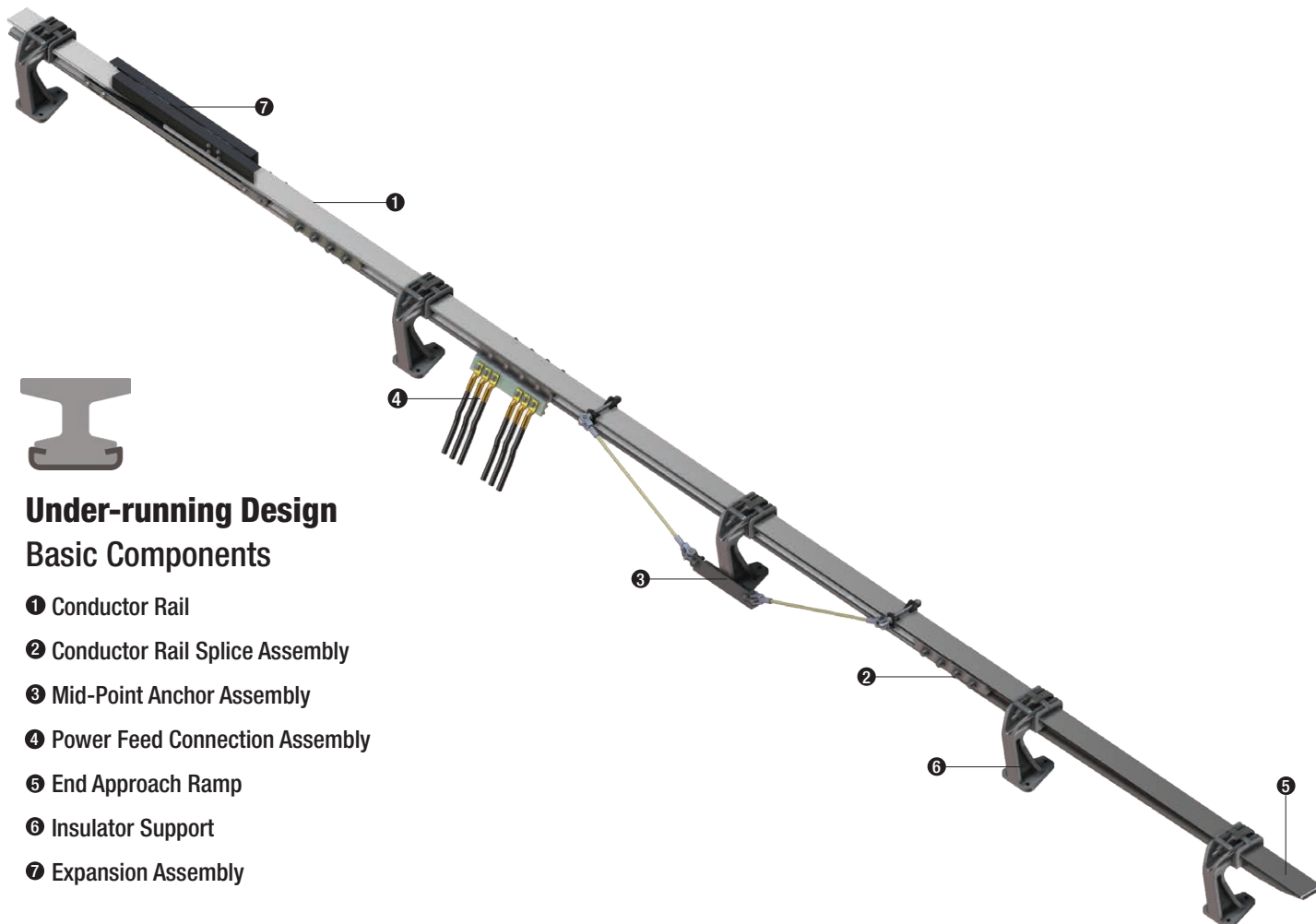


- Reduced collector wear; edge welds are out of the collector path
- Wrap-around cap protects conductors
- Ensures tight bond over a wide thermal range

AL/SS conductor technology & has been improving it since

Welded Cap Rail System

Typical Components



Under-running Design Basic Components

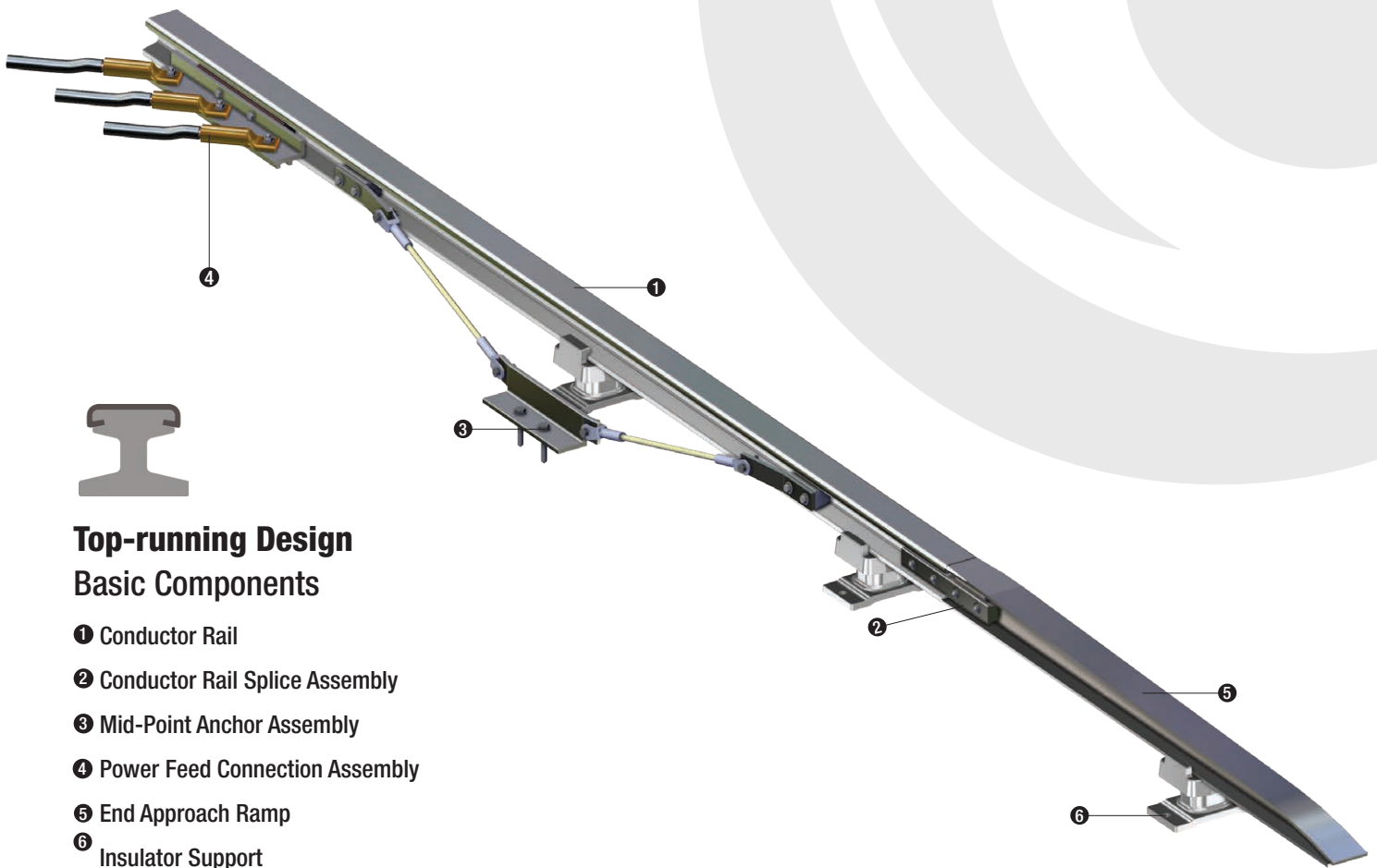
- ❶ Conductor Rail
- ❷ Conductor Rail Splice Assembly
- ❸ Mid-Point Anchor Assembly
- ❹ Power Feed Connection Assembly
- ❺ End Approach Ramp
- ❻ Insulator Support
- ❼ Expansion Assembly

Standard Configuration

1	Conductor Rail	The conductor rail system is installed alongside the running rails to supply the electrical traction power from the traction substations to the rolling stock.
2	Conductor Rail Splice Assembly	The conductor rail (under-running & top-running) end approach ramps, and expansion joints are designed to be joined end to end through a bolted connection by means of two splice plates and fastening hardware.
3	Mid-Point Anchor Assembly	Mid-point anchors mechanically fix the power rails back to the rail tie at specific locations to direct thermal movement due to thermal expansion.
4	Power Feed Connection Assembly	The power feeding points are positioned along the conductor rail in accordance with power distribution plans and specifications.
5	End Approach Ramp	The contact surface of the end approach ramp uses a gradual curve to provide a smooth transition of the collector shoes upon entering or leaving a conductor rail section to ensure minimal arcing or wear.

DID YOU KNOW?

Conductix-Wampfler Welded Cap Rail is



Top-running Design Basic Components

- ❶ Conductor Rail
- ❷ Conductor Rail Splice Assembly
- ❸ Mid-Point Anchor Assembly
- ❹ Power Feed Connection Assembly
- ❺ End Approach Ramp
- ❻ Insulator Support

Standard Configuration

6	Insulator Support	The insulator supports are designed to adequately insulate the conductor rail from ground under all specified operating and environmental conditions, while also supporting and locating the conductor rail with reference to the running rail.
7	Expansion Assembly	The expansion joints for conductor rail systems are designed to accommodate thermal expansion. Expansion can result from the contraction of the conductor rail due to changes in ambient temperature, heat rise of the conductor rail created by current flow, solar radiation, and guideway movement.
8	Cover System (not shown)	The conductor rail system utilizes protective covers to minimize the risk of electrical shock due to accidental contact with the conductor rail and provide protection against debris.

Conductix-Wampfler Technical Services Group



DID YOU KNOW? A Conductix-Wampfler PRIAS study provides

Technical Services Group

Our **Technical Services Group** has extensive experience with all aspects of transit power rail systems, including product engineering and design, proof of concept testing, system design, and installation supervision. We have what you need to ensure a successful project, every time!

Engineering Capabilities

- Power rail design consulting
- Three dimensional component prototypes
- Independent testing of components and systems
- System design and layout
- Project management
- On-site installation support and training
- System commissioning
- System inspection and optimization
- Other engineering services as required

Custom power rail design and performance testing services to include:

- Collector shoe wear testing
- Heat rise testing to 10,000 amps
- High moisture isolation
- Electrical panel evaluation
- Fault force / short circuit evaluation
- Mechanical properties of materials testing
- Dielectric testing
- Electrical resistance and impedance testing

We can also perform a **PRIAS™ (Power Rail Impact Analysis System)** study to assist with optimal rail operation. PRIAS captures collector movement as well as voltage and current data to locate power rail imperfections and evaluate system performance. This can be employed as a commissioning service or as part of your on-going maintenance program.

detailed power rail and collector performance data

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