

## Traction Power & Electrical Systems

SYSTRA's power systems engineers and designers have diverse engineering backgrounds, essential to the successful analysis, design and construction of the many varieties of power distribution systems encountered throughout the transportation industry. We understand the importance of a well-designed power system, which consists of utility interconnections, substations, and power distribution and delivery systems, to enhancing reliability, passenger comfort and safety, and reducing operating costs. SYSTRA's engineers have specialized project experience in areas such as:

- Load Flow Analysis
- Electrical Power System Analysis
- AC and DC Substations
- Transmission and Distribution
- Contact Rail Systems
- Overhead Contact Systems
- Signal Power Systems
- Auxiliary Power Systems

Whether designing new power systems or modernizing existing systems, SYSTRA offers practical, cost-effective solutions that can be implemented under traffic conditions with minimal disruption to operations and without compromising safety. SYSTRA's engineers use the firm's flagship simulation software, RAILSIM® Load Flow Analyzer for time-based modeling of transit vehicle movements and the resulting power flows, in order to optimize system design and troubleshoot existing systems. These simulations accurately predict the behavior of the electrical system under various conditions, including existing and future schedules. Performance prediction enables conceptual designs to be thoroughly tested and analyzed before final design begins, providing an accurate basis for optimum selection of power system configuration, equipment siting and sizing. It also can provide a basis for estimating construction and operating costs for the planning of new lines or extensions, and for support in electric utility rate negotiations.

We assist clients with power system design and operation, and leverage a project's preliminary design phase for reducing the life-cycle costs of traction power system elements. The system life-cycle costs represent total capital, operating and maintenance costs incurred over the useful life of a project; in other words, the total cost of project ownership. Using a methodical approach, supported by computer-aided analytical tools, SYSTRA implements a number of design strategies in order to determine the most cost-effective alternative for a project's requirements, site conditions, and pre-existing design standards.

Our AC and DC substation work incorporates creative design solutions tailored to community acceptance, such as strategic location, 'faux' architectural treatments, landscaping, and other visual screening treatments such as installing inside architect-designed masonry buildings. SYSTRA engineers work closely with clients to plan, design, and construct substation facilities which best meet client needs for construction and operating budget, existing standards, new technology, available space, accessibility and clearances, maintainability, reliability, and control and indication.

Similarly, SYSTRA engineers are fully aware that the catenary system is viewed as being the most conspicuous element in a light rail / trolley system design, and offer solutions that are modern, maintainable, and the least conspicuous including 'low-profile' designs that minimize the quantity and visual impact of OCS equipment.

We have designed traction power distribution systems and construction phase services for light and heavy rail, electric trolley/streetcar, automated people mover and electrified railroad systems,



and for a variety of other facilities including passenger stations, signal and communication systems, and storage and maintenance yards and shops. SYSTRA has contact rail experience utilizing both all-steel and composite-type rail, including the design of sectionalization, rail support systems, rail heating systems, feeder cables and cable connections, and feeder cable duct banks. We are knowledgeable in low-maintenance signal power supply systems for a wide range of frequencies, and design of auxiliary power supply systems for peripherals, which includes lighting, ventilation, pumps, track switch heating, and passenger station and maintenance facilities.

