



Engineering



SAE Towers' state-of-the-art design technology systems, coupled with the most experienced in-house staff of engineers in the Americas, ensures that your design work will be done right, on time and with an eye toward *quality, reliability and constructability*.

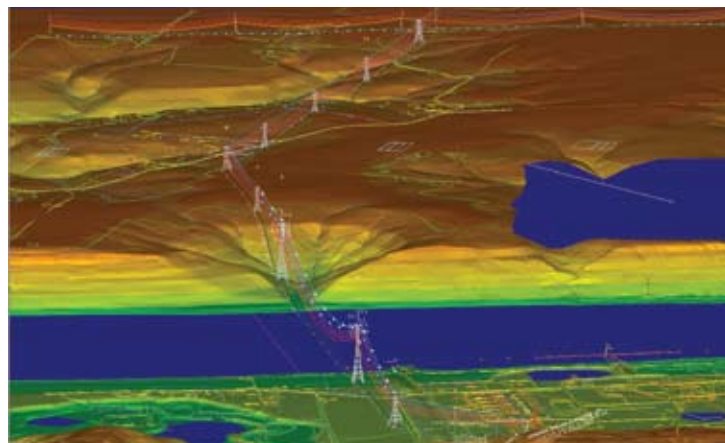
Whether it's a discrete design job or part of a full-service Optimized Transmission Structure Solution, our in-house engineering staff is ready to move your transmission structure project from concept to reality. Our engineers understand today's construction methods and design accordingly. They are aware of the field-fitness challenges. They are committed to interactive collaboration and continuous improvement through on-going application of lessons learned. They value the unique requirements of different customers, different geographies, different cultures. Chosen for their versatility, dedication and education, distinguished by their long track record of success, known for their defining tradition of customer service, our in-house staff of engineers has the tools, training and real-world experience to generate cost-efficient, weight-optimized designs that consider the full scope and complexity of your project requirements:

- Size
- Terrain
- Phase configuration
- Structural variation
- Voltage range
- Line and foundation designs
- Weather conditions
- Transmission structure maintenance and accessibility
- Electrical clearance assessment
- Transmission structure body geometry



Line Design Expertise

Augmenting our transmission structure engineering capabilities, are a broad array of in-house line design services. This combination is unique in the Americas, further positioning SAE Towers as your one-stop vendor for Optimized Transmission Structure Solutions.



Our comprehensive line design services include:

- Plan and profile development
- Structure spotting
- Load criteria
- Sag and tension
- Structure optimization
- Structure design, detailing, prototyping and full-scale testing
- Foundation design

Unmatched Design Capabilities

We are the preferred design house in the Americas for difficult river crossings, direct current structures and other complex challenges. All of our transmission structure designs are optimized for weight efficiency and constructability in order to minimize total in-place cost.

We design guyed and self-supporting delta and flat lattice towers for single, double and multiple circuit configurations ranging in voltages from 69 kV to 765 kV. Our engineering expertise covers the full range of tower types, including tangent and running angle suspension, strain and dead end towers.

Our pole design capability covers a wide array of types and configurations, including single circuit, double circuit and overhead-to-underground transitions, all with or without underbuilt circuit supports, in voltages from 69 kV up to 400 kV. We routinely provide reliable solutions for complex

Quality. Reliability. Timely Delivery.



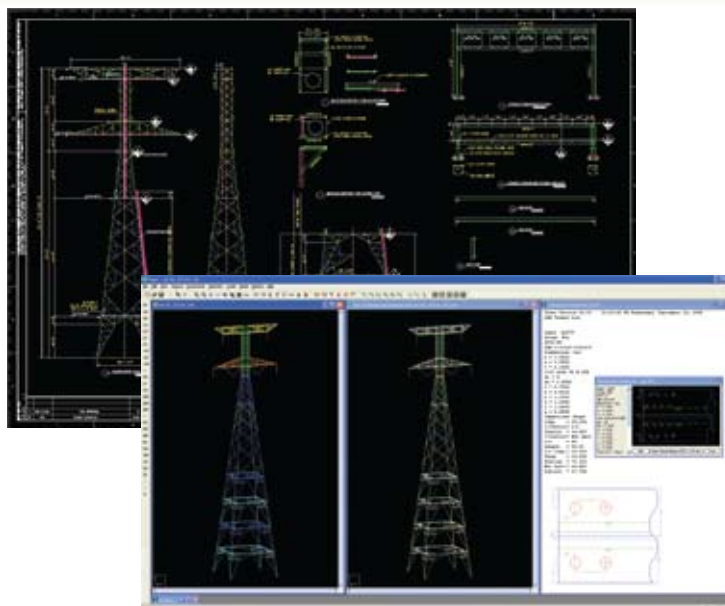
base plate specifications, special crossarm requirements and multiple accessory configurations. We also design high-mast lighting poles in varying heights for diverse wind conditions and equipment requirements

Our substation structure designs are based on years of experience and knowledge regarding the use of these structures. From in-service deflection limits to special grounding requirements, we also understand the unique needs of transmission line termination structures. For new substation structure designs, we use the concepts of ASCE's *Substation Structure Design Guide (MOP 113)* as well as ANSI's *Recommended Practices of Seismic Design of Substations (IEEE-693)*.

Actively contributing to the exchange of technical knowledge and information, our engineers participate on CIGRE, ASCE, international and national standards committees.

State-of-the-Art Design Tools and Resources

We utilize the latest versions of PLS-CADD, PLS-POLE, TOWER, AutoCAD, bocad and other CAD software. Drawing on an extensive database of tower designs going back more than 40 years, we are able to expertly design towers, poles, substation structures and transmission hardware for all terrains, environments and operating conditions. We can generate automatic structure designs based on linear or non-linear analyses. Our shop drawings are prepared in-house and are fully integrated with our manufacturing processes as CAD/CAM output flows directly and seamlessly to CNC fabricating equipment. We plan and budget for ongoing investment in training and information technology in order to continuously improve the quality of our engineering services.



It all starts with the design.

It all ends with transmission structures that are field-fit constructible, cost effective, weight optimized, live-line maintainable and reliable.

With more than 40 engineering team members organization-wide and with design groups in house at each of our locations—USA, Brazil and Mexico—we are well positioned to deliver world-class design services to our customers throughout the Americas.

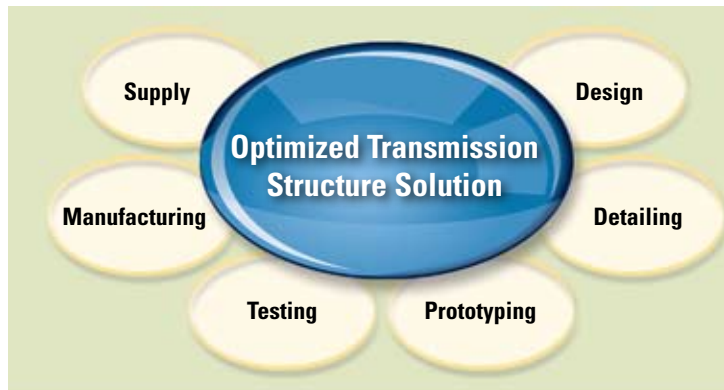
Engineering Design Milestones



- *First double circuit 500 kV towers in Brazil*
- *First direct current 600 kV towers in Brazil*
- *First 765 kV towers in Brazil*

Our plants in the Americas have earned the following certifications:

- Quality Management Systems - ISO 9001
- Environmental Management Systems ISO 14001
- Occupational Health & Safety Management Systems - OHSAS 18001



SAE Towers

The largest steel lattice producer in the Americas providing Optimized Transmission Structure Solutions through world-class in-house capabilities.

- *Field-Fit Constructability*
- *Cost Effectiveness*
- *Weight Efficiency*
- *Shorter/Simpler Transaction Cycles*
- *Improved Live Line Maintainability*
- *Long Term Reliability*

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