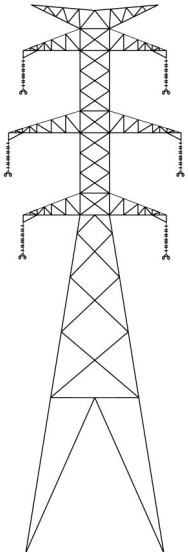
Transmission Structures

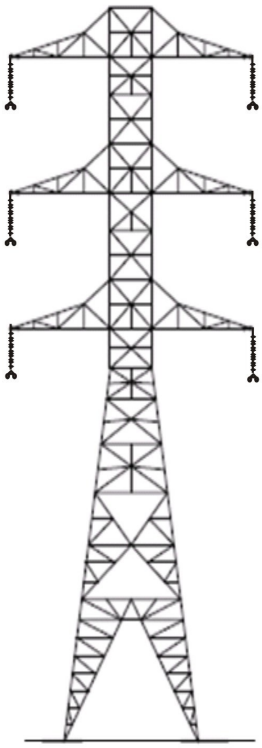
Transmission structures are one of the most visible elements of the electric transmission system. They support the conductors used to transport electric power from generation sources to customer load. Transmission lines carry electricity over long distances at high voltages, typically between 115 kV and 765 kV (115,000 volts and 765,000 volts).

There are many different designs for transmission structures. Two common types are:

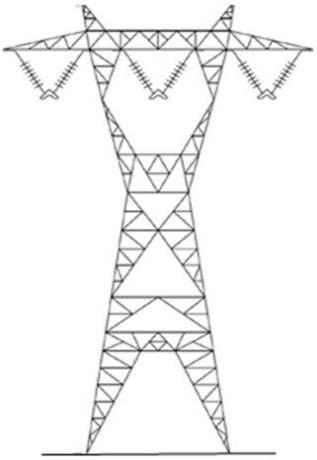
- **Lattice Steel Towers (LST)**, which consist of a steel framework of individual structural components that are bolted or welded together
- **Tubular Steel Poles (TSP)**, which are hollow steel poles fabricated either as one piece or as several pieces fitted together.



220-kV double-circuit LST
(Height range: 110-200 ft.)



500-kV double-circuit LST
(Height Range: 150-215 ft.)



500-kV single-circuit LST
(Height range: 80-200 ft.)

Both LSTs and TSPs can be designed to carry either one or two electrical circuits, referred to as **single-circuit** and **double-circuit** structures (see examples above). Double-circuit structures typically hold the conductors in a vertical or stacked configuration, whereas single-circuit structures typically hold the conductors horizontally. Due to the vertical configuration of the conductors, double-circuit structures are taller than single-circuit structures. On lower voltage lines, structures sometimes carry more than two circuits.

A single-circuit alternating current (AC) transmission line has three **phases**. At low voltages, a phase usually consists of one conductor. At high voltages (over 200 kV), a phase can consist of multiple conductors (bundled) separated by short spacers. A double-circuit AC transmission line has two sets of three phases.

Dead-end towers are used where a transmission line ends; where the transmission line turns at a large angle; on each side of a major crossing such as a large river, highway, or large valley; or at intervals along straight segments to provide additional support. A dead-end tower differs from a suspension tower in that it is built to be stronger, often has a wider base, and has stronger insulator strings.

Note: This information is applicable to electric transmission systems in general and not specific to any project.

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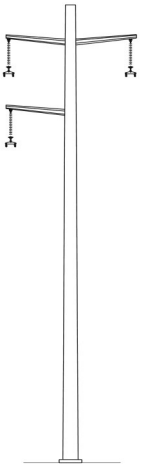
Example of a 500–kV single-circuit LST.

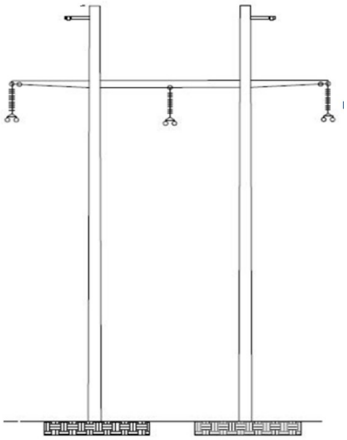
Example of a 220-kV double-circuit LST.

Structure sizes vary depending on voltage, topography, span length, and tower type. For example, double-circuit 500-kV LSTs generally range from 150 to over 200 feet tall, and single-circuit 500-kV towers generally range from 80 to 200 feet tall. Double-circuit structures are taller than single-circuit structures because the phases are arranged vertically and the lowest phase must maintain a minimum ground clearance, while the phases are arranged horizontally on single-circuit structures. As voltage increases, the phases must be separated by more distance to prevent any chance of interference or arcing. Thus, higher voltage towers and poles are taller and have wider horizontal cross arms than lower voltage structures.

220-kV double-circuit TSP
(Height Range: 70-200 feet)



220-kV single-circuit TSP
(Height Range: 70-200 ft.)



220-kV single-circuit H-frame TSP
(Height range: 55-200 ft.)

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