EPRI | ELECTRIC POWER RESEARCH INSTITUTE

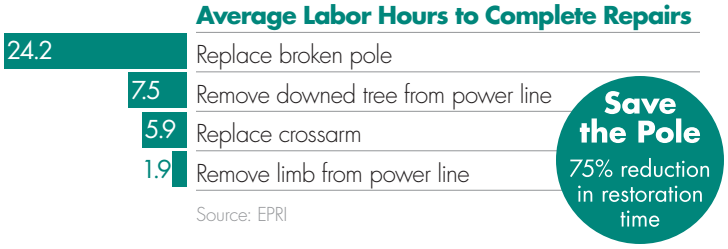
EPRI Distribution Structural Resiliency Testing

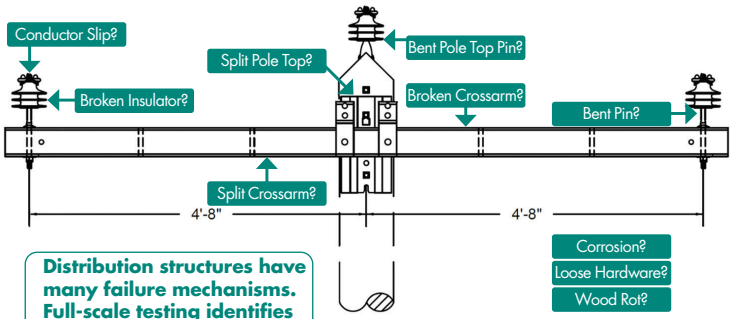
Whether wood, steel, composite, or concrete, distribution structures are a deceptively complex engineered system designed to last for decades and withstand extreme environmental events all while being continually subjected to electrical stress. While they may seem simple at first glance, distribution structures are a complex system of materials and components that must work together in a reliable and predictable way. Increased expectations for reliable electricity drive the need to improve performance during normal operations. In addition, major weather events necessitate improved resiliency and reduced restoration time. EPRI's laboratories and test capabilities can help you understand how your designs perform and what you can do to further improve their performance.

The Challenge of Predicting Performance

EPRI's resiliency research results have shown that a key to reducing restoration time is predictable and consistent structure performance during storms. Put simply, it is important to know the order in which components will fail, and it is important that the pole itself is not the first component on that list.

One approach is to apply the concept of mechanical coordination to your designs. Coordination is well understood in power system protection, and the same concept can apply in structure performance. Unlike protection system coordination, however, structures are made up of physical components with unknown or unpredictable performance characteristics. This makes it very difficult to model or simulate structural performance.





Distribution structures have many failure mechanisms. Full-scale testing identifies likely failure points and options for improvement.

Testing Produces Practical Results to Make a Difference

One of the best ways to understand how a structure performs is to see it in action. Normally, this would require you to be in the field when a tree falls on a line. Fortunately, EPRI's laboratories are able to perform this test safely, repeatably, and with full data and imagery collection.

The purpose-built test site at EPRI's High Voltage laboratory in Lenox, Massachusetts gives utility designers and engineers the ability to see their designs in action and identify opportunities to improve the design in real-time. The researchers construct full-scale structures built to your specifications, then subject the structure to the impact of a mid-span tree-strike. Sensors and cameras capture the action so that the test team can analyze performance and identify design changes that could improve performance.

This design-validation testing is a critical step to take before a new line is constructed.

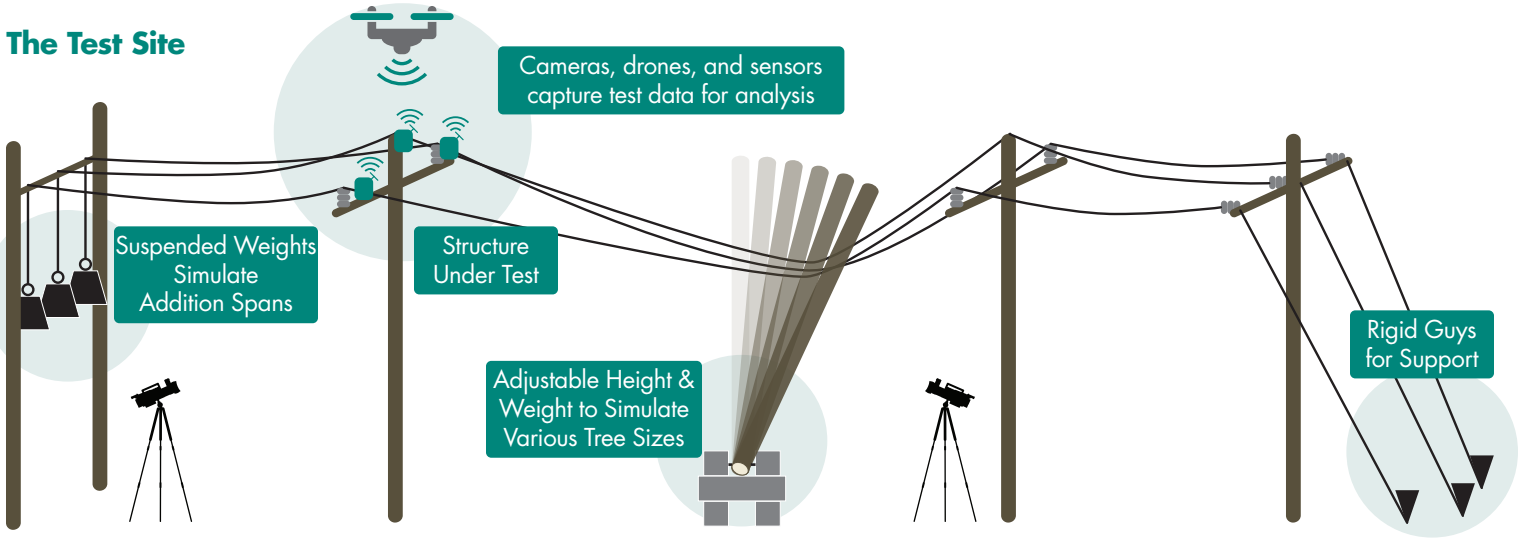
Drive Decisions with Data, Not Just Assumptions

See test videos and a success story in the EPRI Journal

Now that engineers have the opportunity to test their designs, they no longer have to only rely on models, rules-of-thumb, or anecdotes to inform their designs. They can instead perform a test and have objective data that describes how that specific design performs during tree strikes. This information then allows design engineers to confidently create designs that are prepared to meet the reliability and resiliency expectations of the 21st century.

Distribution Structure Resiliency Testing

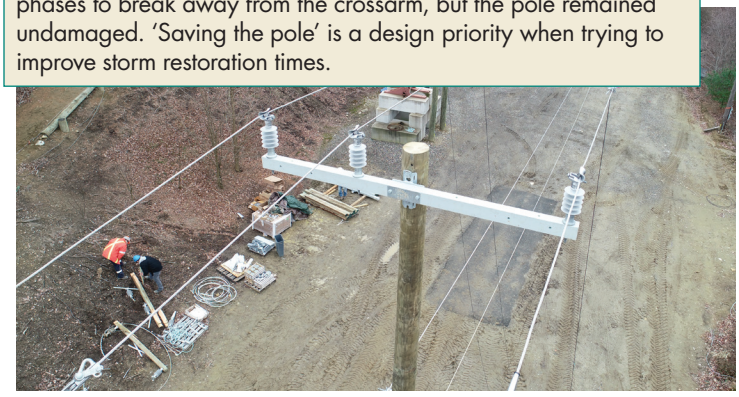
The Test Site



The EPRI test site is designed with the flexibility to meet your needs. We have tested many types and sizes of structures. Call us to talk about how we test your structure!

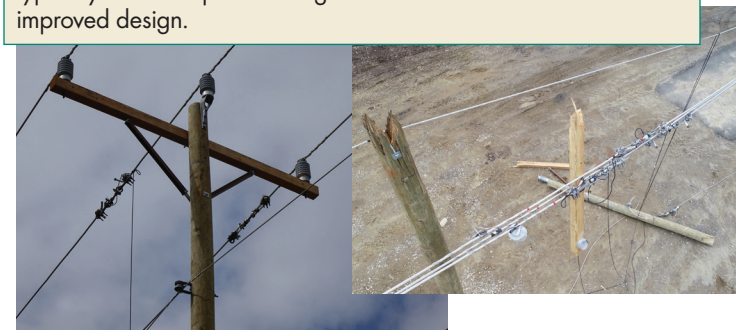
The full-scale overhead structure test facility exposes lines to midspan tree strikes to investigate structural failure modes and identify opportunities to improve structure resiliency.

In some cases, utilities must place all three phases on the crossarm. Full-scale testing showed that the utility could expect all three phases to break away from the crossarm, but the pole remained undamaged. 'Saving the pole' is a design priority when trying to improve storm restoration times.



The full-scale test facility allows testing of novel distribution design options, such as davit arm construction for heavily treed express feeders. Test results showed that this design could sustain a tree strike with little damage.

Utilities use the full-scale test facility to assess potential resilient design improvements. The failure mode of this structure was typically a broken pole. Testing demonstrated the need for an improved design.



Why EPRI?

EPRI's unique laboratory capabilities and technical expertise make EPRI the leading choice for resiliency, structural, and electrical testing for transmission and distribution engineers. The test team includes experts in structural, electrical, design, and materials engineering. The team's deep technical expertise means that you not only get world-class testing, but there is also a team of people that understand the broader implications of design choices and modifications.

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