

# A Proactive Approach to Tower Maintenance

After inspecting transmission towers and poles for corrosion, ITC prolongs the life span of structures with special coating.

By **James Smith**, *ITC Transmission*,  
and **Fred Hall**, *Utility Lines Construction Services*

**G**alvanized transmission towers often rust and corrode over time, and without proper maintenance, utilities may need to invest in untimely and costly replacement. By implementing a proactive maintenance program, however, utilities can save millions of dollars and extend the life expectancy of their assets.

Unfortunately, many utility companies are reducing their investment in transmission tower maintenance, which can double or triple long-term maintenance costs, said Steve Feldman, national sales director, PPG Protective and Marine Coatings, North America.

One utility, however, is taking a proactive, rather than a reactive, approach to its maintenance of its transmission towers and poles. *ITC Transmission*, a subsidiary of ITC Holdings

Corp. (ITC), inspects its towers and poles, and paints them with a rust-inhibiting coating from PPG North America and Keeler & Long. The coating increases the longevity and preserves the structural integrity of the towers and poles. It also assures that the structures are aesthetically pleasing.

Because ITC's towers are sometimes located in the center median of major roads, it is important to the surrounding community that these structures are properly maintained. For many years, ITC didn't paint its towers, and as a result, the residents called in to complain of the visual appearance. To meet the needs of its customers, however, ITC soon began working with its contractor to paint the towers in its service territory.

To meet the needs of customers, ITC works with Utility Lines Construction Services (ULC), Morris Painting and PPG North America to paint the towers within its service territories. The company has a goal of painting 12,000 *ITC Transmission* towers within the next 10 years.

## Visual Inspections

Before painting the towers, ITC must first ensure that the towers are structurally sound. ITC, which doesn't employ in-house linemen, turns to its field contractor, ULC, to provide a team of tower linemen to inspect its towers.

ITC set up a "climbing inspection" goal of 2,000 towers per year by its linemen. Based on these inspections, ITC identified circuits in need of tower maintenance work and painting. ITC then set a budget to paint about 1,200 towers per year.



A field crew paints an energized 138-kV double circuit.

During the inspection process, the linemen fill out a form on each tower, noting problems such as bent steel, loose bolts, broken/chipped insulators, poor condition of the ground wire at the attachment point, rust on the wire or signs of corrosion. They then set up maintenance orders to repair and replace these noted problems.

Rather than inspecting and painting the towers within the same year, ITC often has the linemen inspect the towers in advance and then schedule the painting within the following year or two.

Once painting is scheduled, the painters also perform visual inspections and complete the inspection form prior to applying a coating. Since it can be a year or more since the towers have been inspected, the painters doublecheck the footings, inspect the grounds, look for any sign of rust, search for broken or missing steel, and make sure the tower is secure for their own personal safety. The workers also inspect the end plates of the arms, fix the cotter keys if broken and look at the static shoes to see if the fillers are worn or broken.

The company also checks the static from tower to tower and looks for wire strands that have been broken off from sleeves or evidence of burn marks. In addition, the workers search for rights-of-way issues such as tree growth under the lines or anything else that may pose a danger to the security of the line. They then make ITC aware of these issues.

### Evaluating the Structures' Condition

As the case with all large grids, inspections found it had decades between installation and various degrees of prior maintenance painting. For that reason, the field crews discovered that the structures were in all different types of conditions from protected to stained to corroded.

Protected structures are defined as those having sufficient galvanized or maintenance coating protecting the steel. This allows them to be placed in the later years of the maintenance cycle.

Stained structures, on the other hand, are still being protected by a thin layer of galvanized coating on the steel surface. This is the stage just before corrosion of the steel begins. The thin layer of galvanized coating will have a light brown color and will be smooth to the touch. Maintenance of these structures normally requires minimal surface preparation and one coat of PPG's KL4400 Series, a coating that ITC uses on its system.

Corroded structures, however, have lost all of their protective galvanized and/or maintenance coating. The steel surface is also rusting, thus losing structural integrity. The surface will be rough and/or pitted, and rust particles normally will come off when rubbed. Maintenance of structures in this condition require more extensive surface preparation and a surface tolerant primer prior to the KL4400 finish coat. As a result, it is far more costly to maintain corroded structures than those in the stained condition. In fact, the cost could be double of the stained structures.

Once lines have been assessed, they are placed into the maintenance painting schedule. The stained structures are given top priority, and structures identified as "protected" are



Workers paint an energized 138-kV double-circuit angle with a special coating from PPG North America.

placed at the end of the schedule. From a coating perspective, ITC has determined that corroded structures will require much the same surface preparation and coatings in a few years as they do at the time of evaluation. This proactive approach reduces maintenance costs by not allowing stained structures to reach the more costly corroded condition.

### Painting Process

ITC began by first focusing on towers next to roads that had showed rust to the point that they were brown. The workers sandblasted them and then used different types of coating and paints. At the end of the testing phase, they were left with two coatings, including zinc-based and epoxy-based paint.

After experimenting with different types of paint, ITC and its contractor opted to go with the KL4400 series. This is a single component, self-priming, zinc-based protective coating that has a proven history for long-lasting protection on the transmission towers. The painting contractor has provided a 15-year guarantee, so ITC has the security that the towers will have a long painting cycle.

Before painting the towers, the painters prepare the surface as needed. If it is coated with rust, they remove the loose rust and then they apply a rust inhibitive or penetrating primer prior to the application of the finish coat.

Rather than applying the paint with large brushes or rollers, the workers instead apply the coating with giant mitts. They dip their hands in the galvanized gray paint and then rub it on the steel.

To maximize efficiency, the painters use a block and tackle method. One of the workers has a block up with an "S" hook at the top of the steel with a block and pulley. The worker at the bottom has a 5-gallon bucket of paint. Rather than filling

## The Four Phases of Transmission Tower Corrosion

PPG Industries recently released a white paper detailing the four phases of transmission tower corrosion and how priority management can keep repair costs from escalating. According to PPG, more than 3,200 electric utilities operate hundreds of thousands of transmission towers in the United States. The majority of these structures were built between 1960 and 1990, and many of these structures will soon need maintenance and repairs.

Oftentimes, galvanized transmission towers or poles can function for 20 to 35 years before showing signs of corrosion. Once that process begins, however, the corrosion advances exponentially. For example, a tower or pole with less than 5% rust after 30 years will oxidize to the point of failure within a decade, according to PPG. The accelerated corrosion can also lead to an increase in the expenditure to repair it.

Rather than focusing on towers or poles that need the most or least significant repairs, PPG advises utilities to fix

Here are the four phases of transmission tower corrosion:

### Phase 1: Coffee stain rust (cosmetic, not structural)

- 5% rust
- On edges and bolts
- About 1 mils to 2 mils of galvanization remains

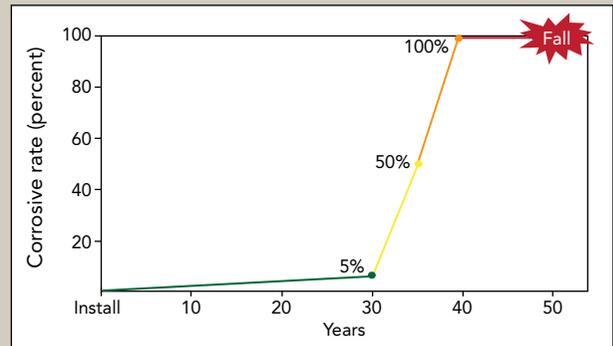


### Phase 2: Abrasive rust

- On bolts, edges and horizontal flat areas
- Rust falls off on touch



towers that are closest to transitioning from one phase of corrosion to the next. This saves several thousand dollars in repair costs per tower and also helps owners identify which towers should be repaired first and which ones can be fixed at a later date.



For more information, download the white paper at [www.ppgpmc.com/northamerica](http://www.ppgpmc.com/northamerica).

### Phase 3: Extensive abrasive rust



### Phase 4: The tower falls



it up to the top of the bucket, the worker fills it up to about 2 to 3 gallons in the bucket. The worker then hoists the paint to the painter on the tower, and once it is up, one worker on the grounds acts as the groundman while the suspended painter paints the tower.

The painters will perform any required surface preparation on their way up the tower. Once they reach the top, they apply primer or finish on their way down to the bottom of the tower. If they apply primer, then they come back another day to apply the finish coat, starting at the top and working their way down the tower.

Three to four painters can paint a 345-kV tower in about five hours. Often, they can single coat about two towers a day.

In addition to painting the structure, they also cover the tower legs with paint below grade. They then come back a few days later and back-fill the holes.

### Safety Concerns

Unlike many other utilities, ITC requires that all of its tower painters have successfully completed a week-long training course.

A third-party firm provides CPR training as well as a course on how the painters can identify potential hazards and implement safe work habits and climbing practices. Fall protection is also an important part of the training, and the workers are expected to be tied off 100% by using two lanyards and a safety



After linemen inspect the towers, painters then use mittens to paint a steel arm on a transmission tower.

harness. As they climb up the tower, one lanyard is around a piece of steel.

The workers also go through a full-week training program in which they have to perform an emergency rescue.

For the last five years, the painters have taken the training, and it has paid off. In fact, the company has been 100% injury free on tower painting since they first started the training sessions.

By proactively, rather than reactively, maintaining their transmission structures, ITC, with the help of its contractors, has been able to cut costs, improve reliability and prolong the lifetime of its towers. Rather than waiting for its towers to corrode, the utility is instead actively inspecting, painting, and

repairing its towers so they will serve customers for years to come. **TDW**

**James Smith** (jsmith@itctransco.com) is the tower maintenance specialist and vegetation manager for ITC Transmission in Novi, Michigan. He has worked for the company for the past four years. He also worked for Detroit Edison and retired after 32 years working as an engineering supervisor, a service/project planner, industrial marketing engineer, a service center operations supervisor of the lines and a journeyman lineman. After retiring, he then went on to work for Michigan Electric Transmission Co., which was purchased by ITC.

**Fred Hall** (fhall@itctransco.com) is the manager of contracting for Utility Lines Construction, where he has worked for six years. In his position, he oversees vegetation management, power painting, facility maintenance, mowing and snow removal. He retired as a general supervisor from Detroit Edison, where he worked for 33 years.

#### Companies mentioned:

International Transmission Co. [www.itctransco.com](http://www.itctransco.com)

Keeler & Long [www.ppg.com](http://www.ppg.com)

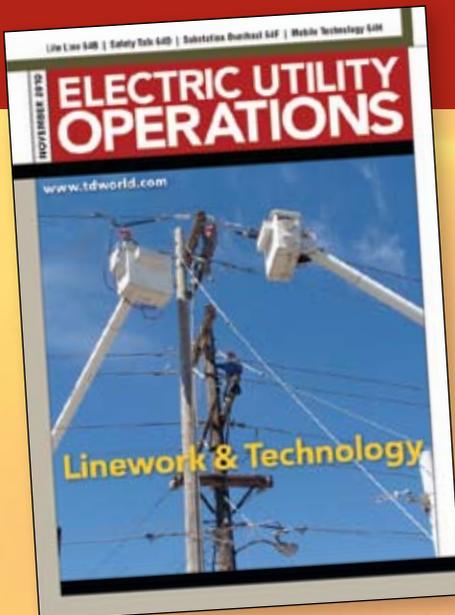
Morris Painting Co. [www.morrispaintingco.com](http://www.morrispaintingco.com)

PPG Protective and Marine Coatings

[www.ppgpmc.com/northamerica](http://www.ppgpmc.com/northamerica)

Utility Lines Construction Services [www.ulc119.com](http://www.ulc119.com)

# ELECTRIC UTILITY OPERATIONS



The *Electric Utility Operations* section is designed to help utility field personnel increase productivity and safety on the job. The section, which goes out to 10,000 *T&D World* readers each month, carries a monthly theme, and includes features and departments such as Life Line, Safety Talk and Field Applications.

To make *Electric Utility Operations* more valuable to our readers, we'd like to hear from you. Do you know of a lineman or foreman who we could profile in Life Line? Do you know of a safety issue we should feature in Safety Talk? Is your utility working on an interesting or challenging project right now? Has your field crew come up with an innovative work practice, or invented a faster or easier way to get things done? If so, please contact Amy Fischbach, contributing editor, at 913-385-7725 or [afischbach@tdworld.com](mailto:afischbach@tdworld.com).