Look Out Below

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The hidden dangers of sign and light poles

We have all heard news reports over the years detailing the damage caused by falling light or sign poles. Many legacy restaurants have been in the same location for more than 20 years and have the original sign or light poles on their property. To the casual observer, these poles do not seem to pose a threat. However, aging poles and their foundations may have degradation issues that can only be identified through a quality inspection process.

A Proven Hazard

Falling sign poles can be very dangerous, due to their height, weight and size. Elevated signs are engineered to ensure stability and safety; however, years of stress and corrosion can create unsafe conditions. The International Sign Association (ISA), in conjunction with the University of California San Diego, recently conducted a study on telescoping sign poles titled, "Evaluation of Sleeve Connection of Cantilevered Steel Sign Structures." The study was prompted by a handful of reported incidents of these poles failing. Telescoping sign pole design was the common engineered recommendation at the time, and tens of thousands are in existence today.

The study was conducted over a three year period. It revealed that the telescoping poles are susceptible to fatigue cracks at welded connections. Wind vibrations over an extended period of time create cracks, many of which are below the surface of the steel and therefore invisible.

In response to the findings, ISA published new guidelines for sign structure installation and inspection. For new construction, ISA now recommends a tapered sign pole, which does not have the same stress points as the older telescoping poles. ISA recommends periodic inspection of freestanding sign structures, at least annually, for evidence of structural degradation. Over time, these poles can be damaged by weather or vehicles.

Inspection Basics

Poles should be inspected for fatigue cracks, especially along the transition points. Carefully examine the pole for evidence of internal and external corrosion, and inspect all mounting hardware. Visual inspections can detect many possible issues; however, non-visual defects require a more thorough inspection.

A third-party certified non-destructive testing inspector should perform inspections for non-visible, below-surface damage. These inspectors employ one of four test methods: radiological, ultrasonic, magnetic particle or dye penetration.

The inspector may use X-ray equipment to inspect the internal steel structure. This method can only be conducted by a qualified technician, as precautions must be taken to ensure there is no radiation exposure. This is a highly reliable test, but it is also very costly.

In an ultrasonic test, the ultrasound technology works much like a medical test. Electronic pulses pass through the steel and create a profile that can reveal cracks and internal metal loss. Phased array is the most common and reliable type of ultrasonic testing used by NDT inspectors.

With magnetic particle testing, the inspector applies electric current and magnetized particles to the pole. The metal particles will align along any cracks.

Lastly, the inspector can apply a penetrating dye to the surface to make cracks visible. This method is not recommended as it will not show below-surface cracks.

Regardless of which testing method is employed, all fatigue cracks or structural issues should be reviewed by a structural engineer for appropriate remediation. Delays in addressing an unsound structure could result in damage or injury should the pole fail.

Common Light Pole Problems

Light poles also can have structural degradation that is not always visible. Appurtenances, or accessories added to the pole, can create stress and corrosion. Meanwhile, the foundation concrete can crumble and hardware can corrode.

Light poles and foundations are engineered to ensure structural integrity. Engineers take into account the effective projected area and the wind drag co-efficient to determine pole sizes and mounting methods. They consult wind maps to determine wind speed calculations. Engineers use these calculations, referred to as the combined stress ratio, to validate if the intended load on the pole will withstand the stress. However, there are several ways pole integrity is jeopardized after installation.

It is common for businesses to add appurtenances, such as security cameras and banners, to poles by drilling into the steel. Modifications affect the effective projected area and load on the pole, and un-coated surfaces or dissimilar metals will, over time, introduce corrosion. Changing light fixtures on poles without having an effective projected area determination can also create structural stress on the pole, even if t he light fixture is lighter in weight. Businesses should have the fixture and pole reviewed for proper load when changing or adding an appurtenance.

Light pole foundations present their own set of risks as they age. Several years ago, a common practice was to cover concrete foundations with steel jackets to protect the foundation. However, when steel jackets were removed after 15 or 20 years, it became clear that the foundations were not protected. The jackets were not waterproof and actually sped up the degradation of the concrete.

In addition, mounting hardware can be problematic on aging poles and foundations. Anchor bolts can corrode or lean, and improper installation too close to the edge of the foundation can cause radial cracks. Anchor bolts must have adequate projection to accept all of the stacking hardware, such as structural washers, leveling nuts, jam nuts and lock nuts. (Jam nuts help prevent wind vibrations from walking the leveling nut off the bolt.) All threads on the hardware must be fully engaged to ensure proper stability of the pole. Over time, the hardware can loosen, corrode or fail altogether.

As we all know, moisture is a key factor in corrosion. Look for common culprits that can lead to corrosion of poles, foundation and hardware, including missing appurtenances and hand-hold covers, pooling water by the base of the foundation due to landscaping and standing water on top of the foundation by the base plate. This is especially true in coastal and snowy environments where salt accelerates corrosion.

If you identify structural issues, partner with an engineer for proper remediation. In the case of light poles, that could mean replacing the foundation, removing rust from the hardware, adding or replacing hardware, and/or replacing the pole. Many restaurants have clearance bar poles (gateway poles) and flag poles that can have the same degradation issues as light poles, so they should also be considered as areas of risk.

Monitoring Poles for Problems

Several companies have initiated monitoring programs after becoming aware of the potential structural issues in sign and light poles. Many employ a surveying company to gather data, an engineering firm to analyze the field survey data and provide remediation recommendations, and trained service providers to perform the necessary repairs.

I would urge companies to ensure that their remediation is performed as soon as possible after the risks are identified. Many times, when one element is failing, it puts stress on other elements. A simple fix then becomes more costly and requires further engineering.

And, of course, safety is always at the forefront of our minds. Ensuring your parking lot poles and sign poles are structurally sound is very important for the safety of your customers, employees and pedestrians. Remember, partner with a professional engineer for final analysis of any structure, as well as for recommendations for repair.

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