

## Small Wind Turbine Tower Foundations

*Inspectors should make sure the groundwork is well-laid.*

By MICK SAGRILLO

Mick Sagrillo (msagrillo@wizunwired.net) of Sagrillo Power & Light is a small-wind consultant and educator.

I frequently get calls from permitting authorities concerned about wind turbine and tower engineering, and how best to assure a good small wind installation. They often want to require an independent engineering review of the project. That engineering review is not only extremely expensive, but also unnecessary.

### Turbine and Tower Engineering

A small wind system, including the foundation, tower, turbine and blades from a *bona fide* company with a good business reputation, is a fully engineered set of components. It was designed by engineers familiar with the forces exerted upon them, and extensively tested for failure modes. Turbine manufacturers are understandably concerned about the reliability of the products they sell; any failure affects the company's reputation. In addition, each manufacturer carries product liability insurance. Engineering verification has been submitted to the insurance carrier. Neither the manufacturer nor the insurer wants to risk a product failure with the resulting claims or lawsuits. In the long run, good engineering is cheaper than failure.

Today's towers are designed to meet the requirements of the Telecommunications Industry Association Standard ANSI/TIA-222-G, the industry standard for telecom towers. Under the standard, the tower and foundation must withstand either the 50-year peak gust for the area or 110-mph wind speeds, whichever is greater. In

addition, towers are engineered for up to 1 inch of ice coating the structure, depending on the part of the country where the tower will be installed. If earthquakes are common to the area, they are also taken into account in the design of the tower and foundation. Finally, of course, wind towers are engineered for the mass and dynamics of a turbine at the top.

Tower manufacturers are adequately insured should there be a warranty claim or lawsuit.

So, you can understand why a wet-stamp engineering review by a licensed in-state engineering firm is a redundant effort, and a waste of money to the applicant. Secondary reviews are expensive because the reviewing engineers are not privy to all of the proprietary design data that the turbine or tower manufacturer developed for its products.

A local engineer is forced to make many assumptions. The local firm has its own expensive insurance policy in case those assumptions prove wrong. The cost of this second level of insurance is built into the review fee.

### So, What's the Problem?

Most permitting officials find this explanation acceptable. That doesn't mean they should just sign off on the system. There are a couple of requirements that can help assure a successful project.

First, local permitting authorities should require that turbine specifications and tower drawings from the manufacturers be submitted along with the building permit application. These need not be wet-stamped engineering drawings — photocopied documents from the manufacturers are sufficient. After all, submitting falsified documents is fraud, and no responsible party wants to go there.

The drawings should include foundation plans and specifications. This turns out to be one of the most critical, yet overlooked, requirements for a building permit. For whatever foolish reason, several disreputable installers have cut corners under-sizing their foundations. I've seen several corner-cutting installations pull a concrete pier right out of the ground, destroying the whole system as the tower crumpled.

The simple solution is a quick inspection of the excavation, forms and rebar before the concrete pour. The building inspector should affirm that the foundation will meet the specifications of the drawings. "Pre-pour" inspections would have prevented the foundation failures mentioned above. Those turbines would still be flying, and the lawsuits avoided.

Interestingly, the original requirement for an independent engineering review would not have prevented these failures. In fact, requiring a wet stamp can actually induce a false sense of safety since the drawings themselves have no bearing on the quality or safety of the installation, except to verify the manufacturer's specifications for what should be done. After that, the assurance of a safe installation can only come by carrying out the instructions to the specifications of the drawings, with follow-up by an inspector who actually reviews the drawings and measures the forms in the ground for compliance.

This simple process saves the applicant unnecessary wet-stamp engineering costs, yet provides the permitting agency with the assurance that the installation is completed to industry standards. This, along with the National Electric Code requirements for wiring, indicates that the system was installed using small wind industry best practices and due diligence — the most that a permitting authority can ask for. **ST**



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