



Advancing Wind Power in Illinois Conference 2011

Kent Utsurogi

Monarch/Centerline

Small Wind “How To”

Breakout Session

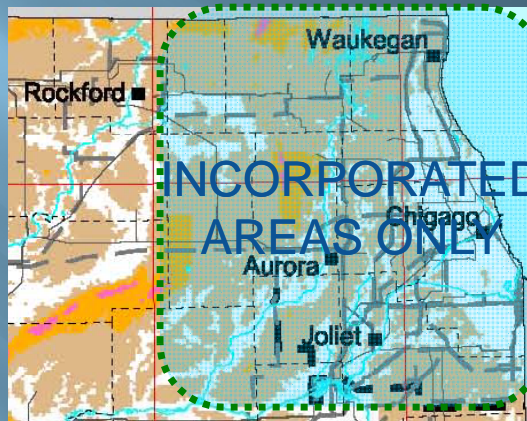
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HOW TO RECEIVE A **BUILDING PERMIT** FOR A WIND TURBINE

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 Principal Architect



Permit Complexity to Wind Power



Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m ²	Wind Speed at 50 m m/s	Wind Speed at 50 m mph
1	Poor	< 200	< 5.8	< 12.5
2	Marginal	200 - 300	5.8 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8

* Wind speeds are based on a Weibull k value of 2.0



The 'Municipal Fear Factor'

- “Wind Power is Great! just not in ‘my backyard’ syndrome”.
- Once a project is located outside of the typical Illinois AG farmland zoning, the building permit process is now governed by the ‘model’ Building Code system.
- A wind turbine is now defined as a ‘structure’ or ‘accessory structure’. The ‘set’ of International Building Codes are used.
- Don’t expect municipal entities to be proactive towards your application. Building Officials and Inspectors are by their official responsibilities need to be cautious.
- Unless there have been previous applications for wind turbines and the same staff member, expect a little hesitation, even a little ‘hysteria’.

Permit “Resistance” Correlation

- As one moves further into the urban core towards Chicago, one can expect more tedious or bureaucratic the application process.
- Thus as permit ‘resistance level’ rises expect the construction and submission costs to increase essentially making a project economically unviable.
- There can be major differences in permitting ease from municipality to municipality. Expect increased issues if municipality has adopted many amendments to the model code.
- The ‘Ultimate’ bureaucracy (because being so large) is the City of Chicago, even with their Green Permit process. Also they do not use any of the model codes.

Permit Process “Uncharted Territory”

- Expect a ‘Two Step’ process with Zoning and Building rolled into one continuum (in Illinois).
- In the Chicago Metro Area almost all municipalities require a site plan review process in order to receive a building permit. By statute a wind turbine could be subject to this process.
- If a wind turbine is not already defined in the municipal code it is not automatically a permitted use or structure and requires an amendment of that Municipal Ordinance.
- Also the model Building Code provides if requirements for a certain item are not listed in the code then it can be the building official’s direct ruling.
- This singular ruling does not apply to what would be considered zoning or site planning issues.
- Expect review comments from at least five different departments.

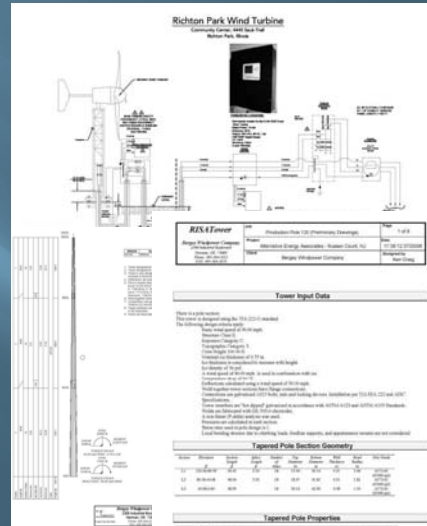
Manufacturer’s Data vs Design Team

- Myth 1: Manufacturer’s information and data is not the Consultant team’s prepared data; only compiled data.
- The permit consultant team cannot represent manufacturer information as their own nor create additional data unless they did the actual design work for the pole/turbine or it is truly ‘fiction’.
- In general the consulting team presents manufacturer’s data along with their own work for foundations and wiring for anything not supplied by the manufacturer.



Minimum Manufacturer's Data

- Specific for wiring requirements for turbine and complete wiring schematic of unit to meet utility interconnection submission requirements.
- Cut sheets for pole with metal strength data.
- Some form of tower structural calculation output with Engineer's profession seals or a certification of meeting an applicable model code. Sometimes document accepted as is if turbine deemed a manufactured product.
- Otherwise Illinois Professional seals and recalculations maybe required for the tower.



Fact: Illinois professional regulations do not allow what may be described as stamping of documents done by others.

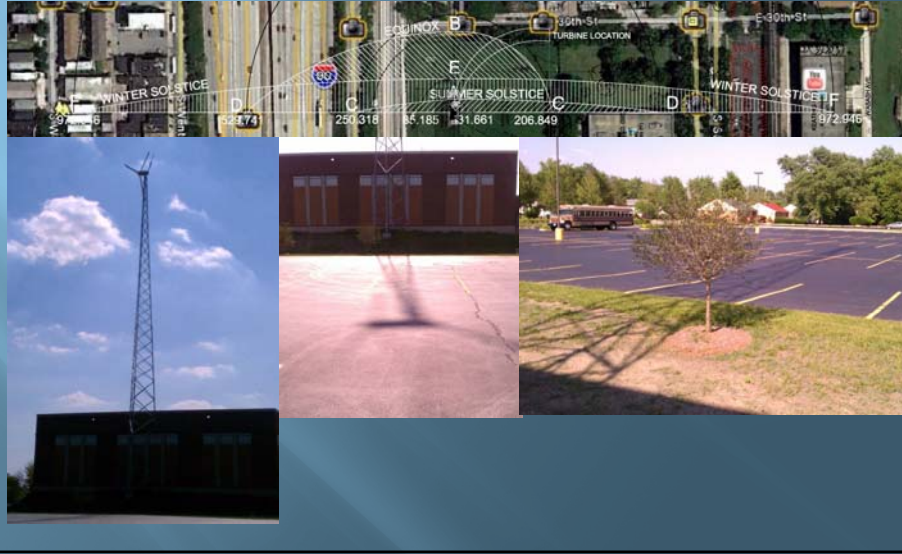
Shadow/Solar Information

- As one gets into more urbanized areas a type of shadow study maybe required.
- There are 'dynamic' computer modeling shadow software available that come from building energy analysis field.
- There are manual calculation methods which are not too tedious when done for the two solstices and equinox.
- As Shadow Study **IS NOT** a Flicker Study.



Shadow/Solar Information

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Acoustics Information

- Almost all municipalities have noise/sound level criteria 'buried' in their zoning ordinance and generally part of a nuisance ordinance.

Sound Level Comparisons

NOTES ON ACOUSTIC TECHNOLOGY FOR REFERENCE AND REDUCE COMPARISON:

What's a decibel? Probably the most common usage of "decibel" is when we sound loudness, or in scientific terms sound pressure level (SPL). This is a measurement of sound pressure level at a certain distance. The question of what a decibel means depends on the context. In physics, sound pressure level is measured in Pascals. In acoustics, sound level is measured in decibels (dB). In environmental acoustics, sound level is measured in decibels (dB) relative to a reference level.

Weighting Filter: The human ear does not hear all frequencies equally. A weighting filter is used to adjust the sound level measurement to match human hearing. The most common weighting filter is A-weighting, which is used to measure noise levels in environmental acoustics. A-weighting is based on the human ear's sensitivity to sound at different frequencies.

Sound Board: The sound board is a device used to measure sound levels. It consists of a microphone and a speaker. The sound board is used to measure the sound level of a source and to compare it to other sound sources.

Sound Level Comparisons: The sound level of a source is compared to other sound sources. This is done by comparing the sound level of the source to the sound level of a reference source. The sound level of the source is then expressed in decibels (dB) relative to the reference source.

SKYSTREAM 3.7TM

Equipment
 Primary Wind Screen: 17.8cm (7") in diameter
 Secondary Wind Screen: 6.1cm (2.4") in diameter

Primary Wind Screen

Secondary Wind Screen

Sound Board 122 cm (48") in diameter and 1.9 cm (0.75") thick.

Results

Skystream on 33' (10 M) tower

Prevailing Wind: 55 dB

Sound Analysis

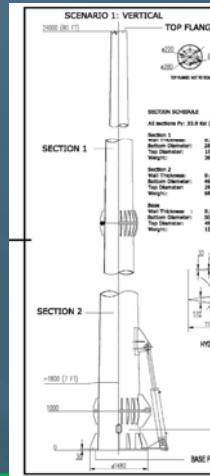
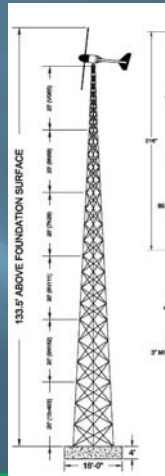
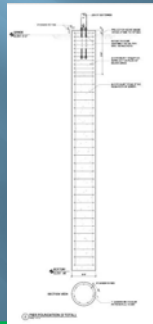
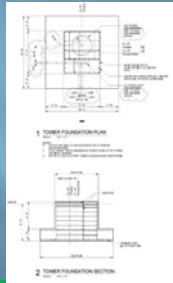
Skystream 3.7m Noise Analysis
 Bushland, TX (2007)
 17.8 cm Primary Wind Screen, 6.1 cm Secondary Wind Screen

The charts translate to a sound pressure level (observer perception) of 55 dBA at a slant distance of 17.8 m from the rotor hub. For the wind turbine operating in a typical background noise of 44 dBA, the sound pressure level (observer perception) would be 55 dBA at a slant distance of 18.4 m from the rotor hub. Sound perception is heard downward from the machine and dissipates as the distance increases.

Noise Source	Sound Level (dB)	Comment
Jet airplane	150	At 100 m
Jet airplane	145	At 200 m
Jet airplane	130	At 400 m
Jet airplane	120	At 800 m
Jet airplane	110	At 1600 m
Industrial noise	100	At 10 m
Inside car	90	At 10 m
Home	60	At 10 m
Bedroom	40	At 10 m
Pneumatic drill	100	At 10 m
Stereo music	90	At 10 m
Office	70	At 10 m
Wind turbine	55	At 17.8 m

Tower & Foundation Selection

- Assuming towers between 90 feet and 140 feet.
- Self Supporting Lattice or SSV
- Monopole
- Spread Footing
- Piers or Caissons



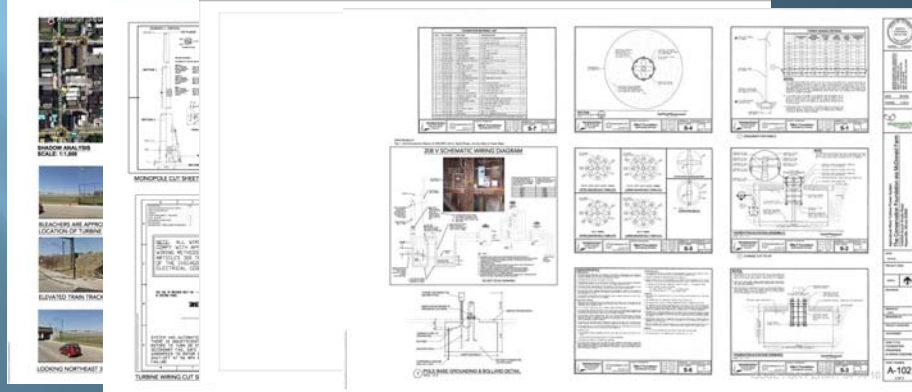
No Guyed Lattice towers: In the Chicago Metropolitan incorporated areas, it is doubtful that any guyed lattice towers will be allowed or even fit on the site.

Summary of Permit Requirements

- **Minimum Document if Turbines is considered a manufactured product.**
 - Manufactures' information on the wind turbine and tower as integrated unit proving that it meets a code standard and design wind speed of the location.
 - A Plat of Survey (Topographic information is generally not required by statute but could be requested)
 - Site Plan with all site entitlement information
 - Site Development Plan
 - Code Plan
 - Electrical Plan or Wiring Diagram
 - Soils Report (Requires Geotechnical Consultant)
 - Foundation Design
 - Structural Calculations for the foundation
 - Statement of compliance to Illinois Accessibility Code
- **Possible Additional Information Requested**
 - Shadow Analysis
 - Topographic Information
 - Elevations or Context Studies
 - Site Restoration Information
- **Seals Required**
 - Structural Engineers (SE) (Not Professional Engineer PE) for the Foundation. Illinois does not recognize a PE for structural engineer
 - Architect (More of a State Statute and IAC requirement). State Statute allows Architect to seal electrical but local codes can override.
 - Possible PE seal for Electrical Work.
 - Possible Illinois Seal SE for manufacturer's tower or pole.

Putting It All Together

- For permit submission it will be a combination of drawings and reports.
- The building permit application is typically centered around a general contractor applying.
- There will varying degrees of licensing and bonds required to receive a permit.



Construction 'Time'

- The bulk of a wind turbine is the foundation so concrete curing is the main time constraint after weather.

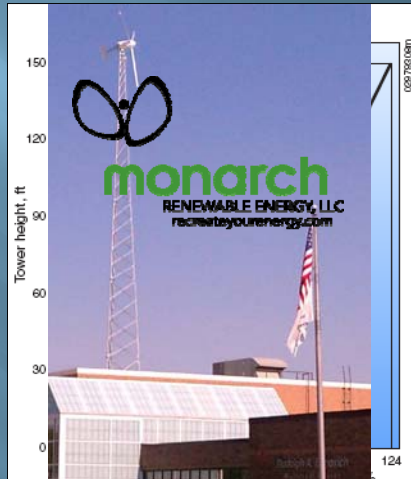


Challenges Towards Becoming Mainstream



"Beauty is in the Eye of the Beholder"

In Conclusion - Tall is Good



120 ft Bergey, no wind on the ground. Android Weather app says 2 MPH, flags at a stand still, turbine is still rotating.