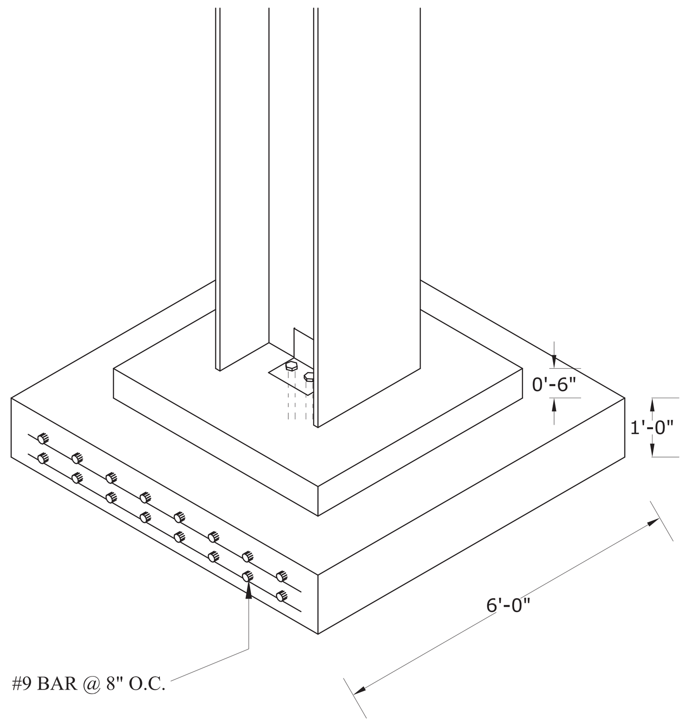
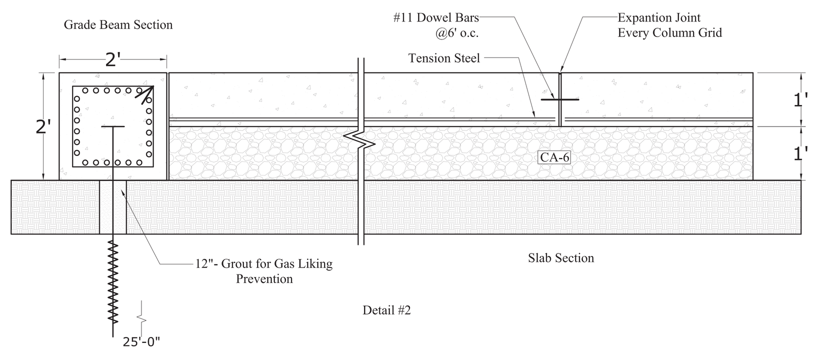
# Zero Excavation/ Energy Conscious Proposals




## Zero Excavation Warehouse Design

Zero Excavation Build Design is the way of the future. This design introduces a zero cost for trucking and disposal of contaminated materials by introducing a capping system with a grade beam that is supported by a pile design to support the tall walls. Each site will introduce a different soil profile which will cause small changes. Overall, this design will be very useful for the renovations of brown fields or brown sites.

## Zero Excavation Process

General Site Prep will be needed. A site survey will be needed to determine the elevation of which everything will be built upon. Dozers and rollers will level the site as well as compact the soil in order to prepare for foundation placement. PLEASE NOTE: NO EXCAVATION (Removal of soil from site) WILL BE ALLOWED!!!

The site will be leveled and compacted. After that, surveyors will layout center lines for the rows of foundations as well as the centerline for the grade beams. Carpenters will lay out forms for the specified foundations that are needed. Ironworkers will come in and tie the rebar for design requirements. A specialized pile driver will come in and install the Helical Piles so that the top of the Helical Pile will be cast into the concrete. Concrete Finishers and Masons will pour and finish the foundations.

A helical pile is an assembly of mechanically connected steel shafts with a series pitched steel plates welded at specified locations on the lead section. Monitoring of the installation torque provides verification that the design capacity has been attained. The piles are screwed into the ground (like a cork screw) using either machine mounted or hand-held hydraulic drill equipment. Helical pile working load capacities up to 25 tons can be installed with minimal headroom and within tight conditions. Low mobilization costs, as well as no spoils allow conventional helical piles to be extremely competitive for pile loads less than 25 tons.

The General Foundations will be a 6'x6'x1' Pad with two layers of #9 Bar spaced at a 8" pattern. The Beam the spans the outer wall of the building will be 2'x2'x2' which has helical piles driven under them for additional support. The grade beams on the outer walls will take a little more prep work when it comes to forming and construction; however, the helical piles can be installed with a simple hand-held hammer drill. This will minimize all excavation purposes for all foundations. The steel for the warehouse will be introduced to ensure proper planning of the project. From here, the precast walls or whatever facade the architect requests can be introduced to the sides of the building as well as the roof. CA 6 will be added to the height of the grade beam with a drainage system of throughout the ground to ensure that if there is any water introduced to the warehouse interior, it will be removed via the storm water piping system introduced . The site of the warehouse will almost 1 Million Cubic feet of CA 6 introduced into the foundation area. From there, the site will be ready for the 12" concrete pad (tension steel will be added) which will be poured in sections with a smooth finish. After this, an epoxy coating will be applied to assist in better lighting of the warehouse.



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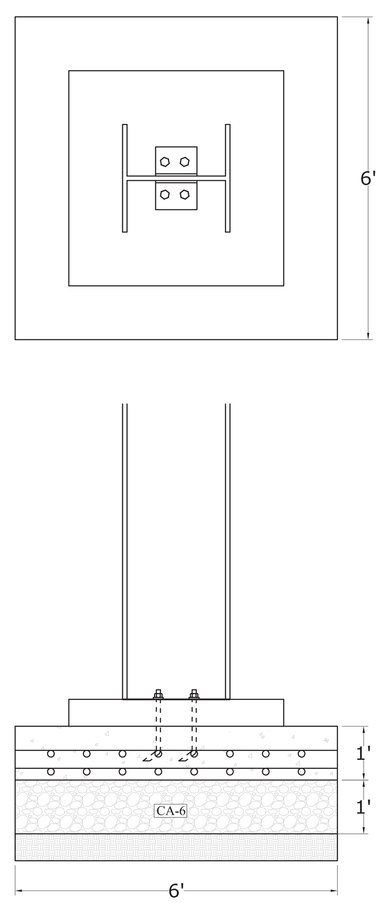
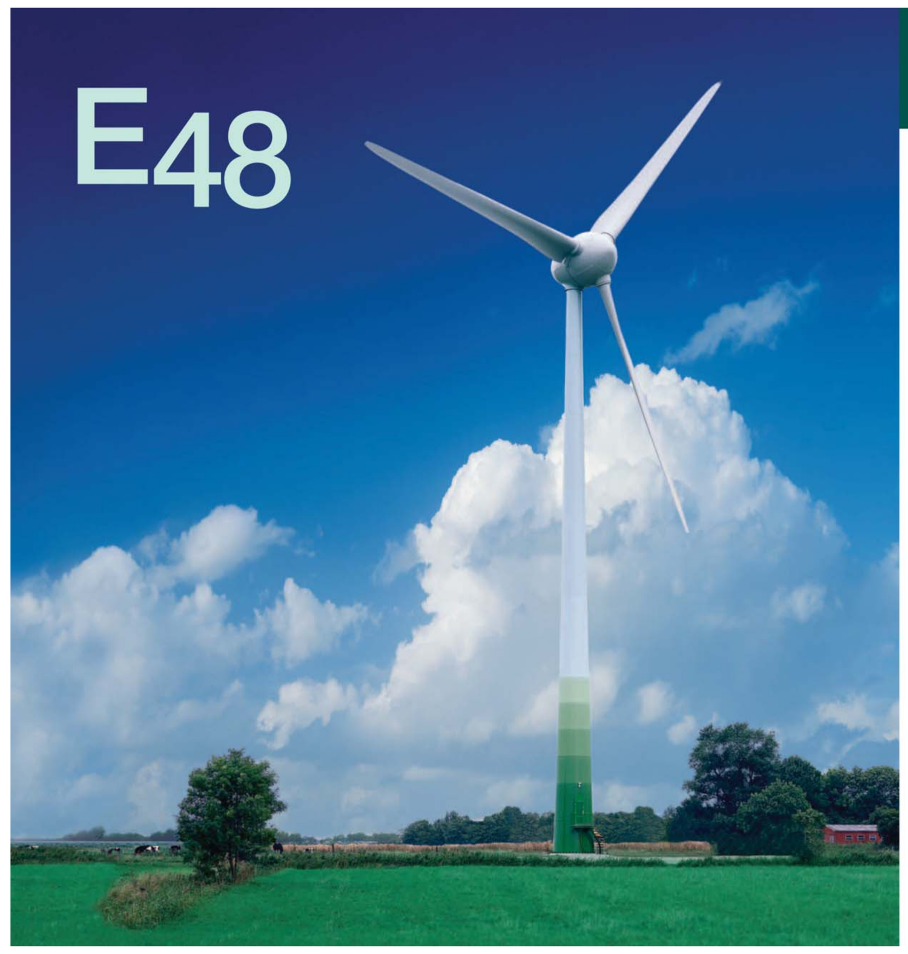






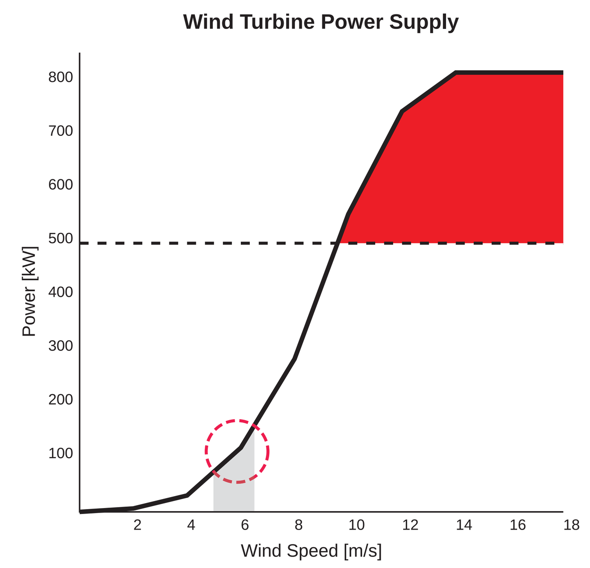

**TECHNICAL DATA**

| | |
|---|---|
| Rated power: | 800 kW |
| Rotor diameter: | 48 m |
| Hub height: | 50 – 76 m |
| Wind class (IEC): | IEC/NVN II |
| **Turbine concept:** | Gearless, variable speed, variable pitch control |
| **Rotor** | |
| Type: | Upwind rotor with active pitch control |
| Direction of rotation: | Clockwise |
| Number of blades: | 3 |
| Swept area: | 1,810 m² |
| Blade material: | Fibreglass (epoxy resin); integrated lightning protection |
| Rotational speed: | Variable, 16 – 30 rpm |
| Pitch control: | ENERCON blade pitch system, one independent pitching system per rotor blade with allocated emergency supply |
| **Drive train with generator** | |
| Hub: | Rigid |
| Main bearings: | Single-row cylindrical roller bearings |
| Generator: | ENERCON direct-drive synchronous annular generator |
| **Grid feeding:** | ENERCON converter |
| **Braking systems:** | – 3 independent blade pitch systems with emergency supply<br>– Rotor brake<br>– Rotor lock |
| **Yaw control:** | Active via adjustment gears, load-dependent damping |
| **Cut-out wind speed:** | 28 – 34 m/s (with ENERCON storm control) |
| **Remote monitoring:** | ENERCON SCADA |

## Energy Strategy

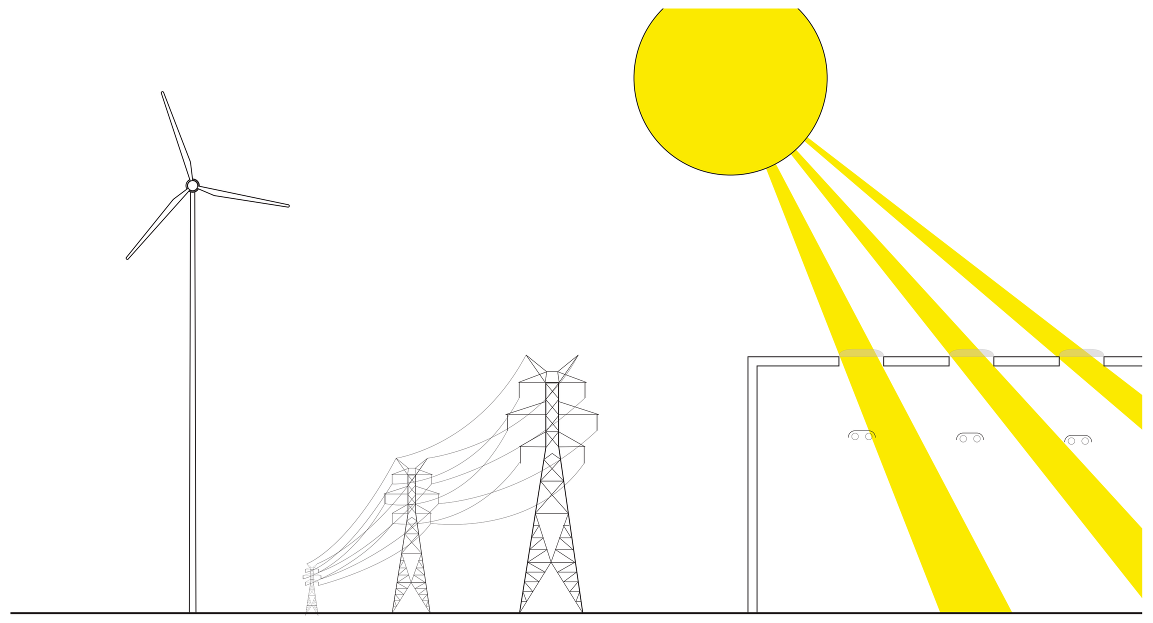
Through a conservative use of electricity and implementing wind power, this design seeks to minimize the energy use of the warehouse.

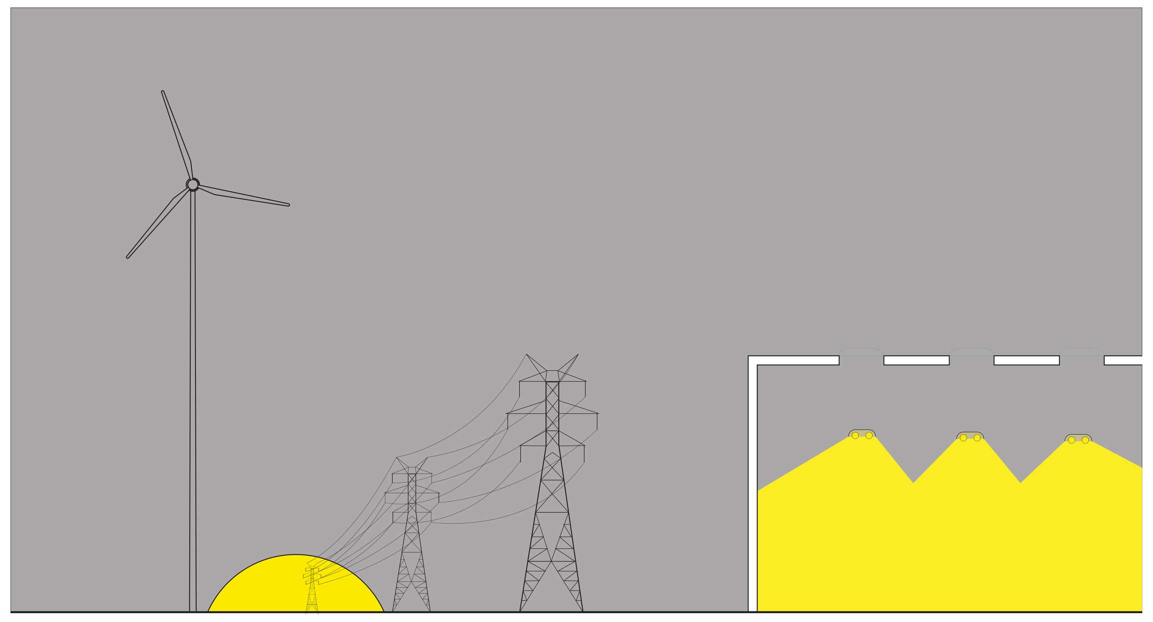
This proposal is based on a 1,000,000 sf warehouse operating 24 hours a day; using 10,000 kWh on a daily basis.




## Wind Turbine Supply

This graph illustrates the power supply of the E48 Turbine for 1,000,000 sf warehouse design. Within the Illinois region, average wind speeds are approximately 6 m/s, so on average this turbine will supply about 20% or electrical needs. However on higher speed days it will produce as much as double the needed energy supply.





## Lighting Conservation

To conserve energy in the lighting of the warehouse, skylights should be implemented to minimize lighting needs during the day. Using skylights as well as light sensor-activated lamps could save as much as 1,000 to 2,000 kWh per day.

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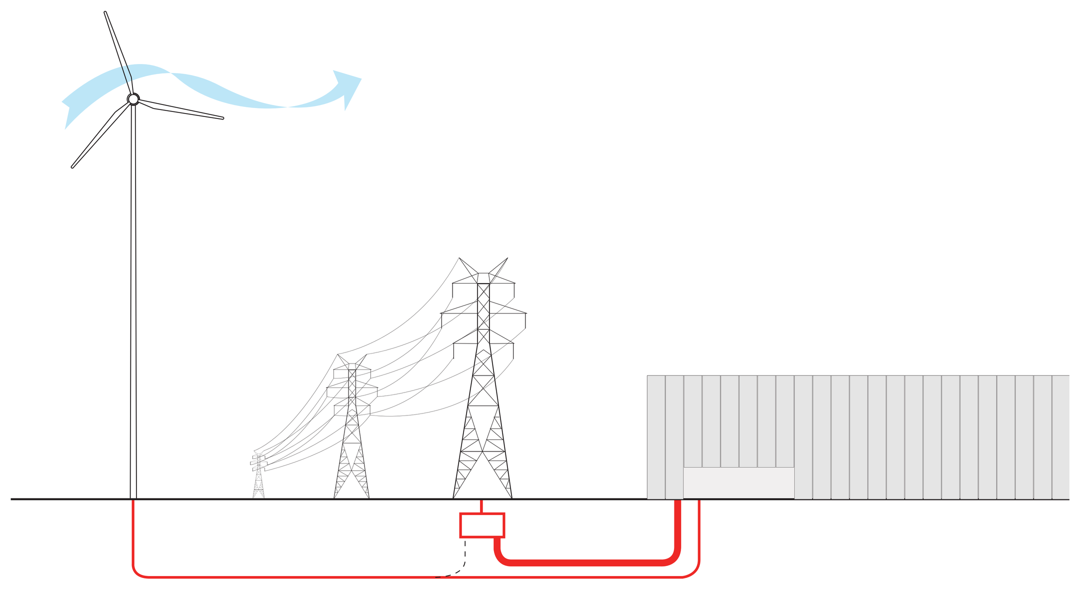
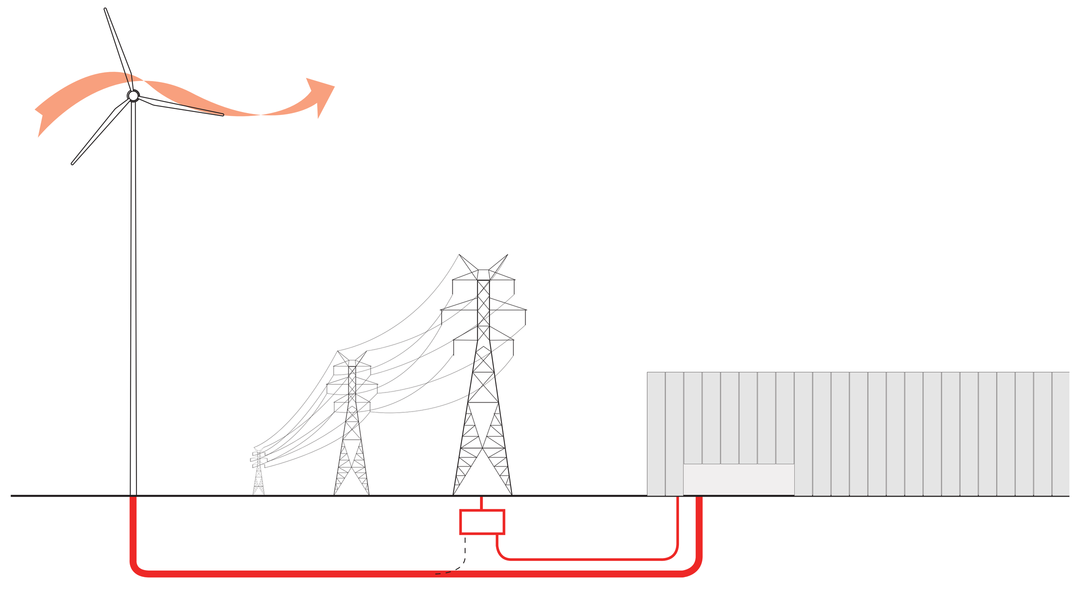


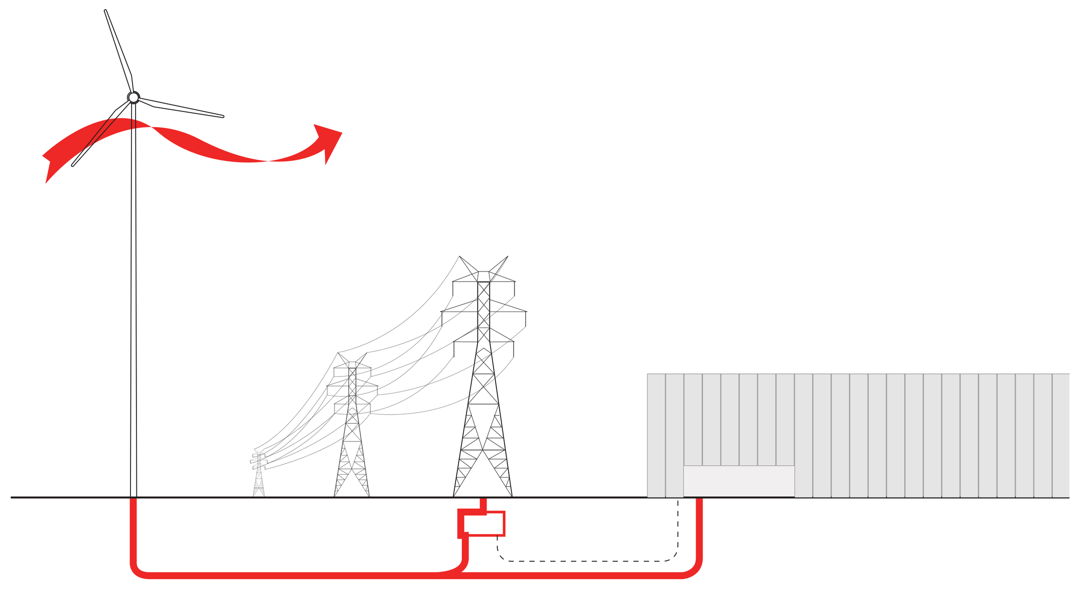
## Average Wind Speed Supply

This diagram illustrates power supply from wind turbines during average wind speeds of about 5 to 6.5 m/s. In this scenario wind provides between 15 and 20 percent of total electricity to the warehouse, the rest is supplied by the grid.



## High Wind Speed Supply

This diagram illustrates power supply from wind during high wind speed of 8 to 9 m/s. It shows how wind can supply



## Very High Wind Speed Supply

At wind speeds greater than 9 m/s, wind power will supply full power to the warehouse as well as begin feeding power back into the grid. Overflow of electricity varies to as much as double the needed power supply.

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