Safety Hazards

Wind Turbines - Working on

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How does a wind turbine work?

Wind turbines are a form of renewable energy. A wind turbine uses the wind's kinetic energy and converts this energy into electricity. The wind turns the propeller-like blades around the turbine rotor, which is attached to the driveshaft. The driveshaft spins a generator, creating electricity. The amount of energy generated by wind turbines depends on the wind speed, the area covered by the blades, and air density.

There are two types of wind turbines, vertical axis wind turbines and horizontal axis wind turbines. Horizontal axis wind turbines are currently the most commonly used turbines.

Are there any health and safety laws concerning wind turbines?

All offshore renewal energy is regulated under the *Canadian Energy Regulator Act*. Otherwise, wind turbines are regulated within the province or territory in which they operate. For contact information for the occupational health and safety regulator in your jurisdiction, please see our OSH Answers Fact Sheet: Canadian Government Departments Responsible for OHS. Additional legislation that may apply includes environmental impact assessments, highway safety acts, transportation of dangerous goods, and the workplace hazardous materials information system (WHMIS).

Before a wind turbine can be installed, there are requirements that must be followed including zoning, public hearings, building permits, electrical permits, site suitability, environmental impact, noise survey, and electrical grid connections.

While in operation, wind turbine farms may produce low-frequency noise. Zoning requirements and other factors should be considered if the wind turbine farms are near property.

The CSA Group has published a Guide to Canadian wind turbine codes and standards (2008). This Guide provides general information on the codes and standards related to the approval, design, installation, operation, and maintenance of wind turbines in Canada.

What are the occupational health and safety hazards associated with wind turbines?

There are occupational hazards associated with the manufacturing, transportation, installation, operation, and maintenance of a wind turbine.

The wind turbine components are transported, often very far, before being erected. A wind turbine's blade can be up to 36.6 metres (120 feet) long. Transporting items of this length on highways or trains may require warning vehicles or other additional safety measures.

The installation of wind turbines may also be challenging. The areas where they are erected are usually fields or hillsides where there may not be clearly defined roads or access points. Some locations may be remote.

The installation requires many professionals, including those who specialize in foundations and cement, engineers, steelworkers, electricians, fall protection, etc.

A risk assessment of the operation is recommended for a better understanding of the hazards at each phase of the process. By identifying hazards and assigning risk, appropriate controls can be prioritized and implemented.

Some hazards while installing include:

- Working at heights
- High voltage
- Electric shock
- Musculoskeletal disorders
- Noise
- Vibration
- Temperature extremes
- Crush injuries
- Wind
- Lightning
- Rotating equipment

- Lifting, rigging, slinging (including materials handling)
- Hand tools
- Exposure to chemicals such as oils and lubricants
- Exposure to cement
- Welding
- Working alone or in isolation
- Stress

After the wind turbine is installed, it requires regular preventive maintenance. These hazards would be similar to that of the installation, including working at heights, exposure to chemicals, extreme temperature, mobile equipment, etc.

How can these hazards be controlled?

While there are many hazards associated with wind turbines, there are also many controls.

A lot of work can be completed before the wind turbine arrives on site. Preparing the worksite ahead of time can increase efficiency and reduce hazards by ensuring there is enough space to work, and enough trained personnel are present to complete all required tasks. During installation, much of the work at height can be eliminated if smaller components are put together on the ground, before being installed at height.

Each jurisdiction will have health and safety legislation that outlines requirements for many of the hazards encountered at the work environments and for situations. Care should be taken to follow the requirements for safeguarding, confined spaces, ladders, work platforms, fall protection, personal protective equipment, etc.

Additional controls include:

- Lock out/tag out
- WHMIS
- Training
- Safeguards
- Housekeeping
- Safe work procedures
- Active weather monitoring
- Attachments for tools

- Noise
- Proper lifting and rigging equipment
- Fall prevention equipment
- Personal protective equipment, including arc flash protection

In addition, control measures implemented in the design phase of the turbine should be considered to protect equipment from overheating, overvoltage, or other electrical failures such as grid failure.

What are the health concerns when living near wind turbines?

Health concerns are sometimes reported by the people living near wind turbines. The concern often relates to the noise generated when the wind turbine is operating.

Wind turbines produce noise from two main sources: the motor and the wind passing over the blades. Low frequency noise is a common complaint from persons living or working near wind turbines. These low-frequency sounds are within the infrasound range of 1 to 20 Hz. This low frequency sound is not usually heard by humans but it may make small vibrations that may be noticed, often while sleeping. This noise level may also be dependant on the type of wind turbine (design features).

Infrasound and its effects are not well understood and research in this area is ongoing. Much of the research and data available is observational, where individuals who live close to wind turbines self-report symptoms or issues. Some studies suggest that wind turbines increase annoyance and sleep disturbances, whereas other studies indicate that psychological factors and political views could determine whether adverse health effects are experienced or not while living in proximity to wind turbines.

In 2012, Health Canada began a large-scale epidemiology study in collaboration with Statistics Canada to provide advice in acknowledgement of community health concerns expressed in relation to wind turbines. For more information, please see Wind Turbine Noise and Health Study: Summary of Results.

Where can I find more information*?

The Canadian Renewable Energy Association has published numerous resources on renewable energies, including wind energy. They also review the development, construction, installation, operations, and maintenance of wind turbines. For more information, please see: https://renewablesassociation.ca/

(*We have mentioned these organizations as a means of providing a potentially useful referral. You should contact the organization(s) directly for more information about their services. Please note that mention of these organizations does not represent a recommendation or endorsement by CCOHS of these organizations over others of which you may be aware.)

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