



## TEXAS TECH UNIVERSITY™

### Operating Policy and Procedure

#### **OP 60.14: Wind Turbine Safety**

**DATE:** October 23, 2018

**PURPOSE:** The purpose of this Operating Policy/Procedure (OP) is to identify hazards associated with wind turbines to perform research or maintenance activities and to ensure that any person ascending wind turbines located on Texas Tech property (whether or not owned by Texas Tech) is trained in the proper procedures and safety processes associated with wind turbines.

**REVIEW:** This OP will be reviewed in September of every fourth year by the Managing Director of Environmental Health and Safety with substantive revisions forwarded to the Vice President for Research.

#### **POLICY/PROCEDURE**

Any person climbing a wind turbine must be trained through a safety course. Contractors will be required to furnish documentation of the same training. The trainings are detailed below based on the purpose for the climb.

##### **1. Responsibilities**

There will be three categories of training for potential climbers: (1) those responsible for day-to-day operations are required to take the Competent Wind Turbine Climber and Rescue Certification;( 2) those who will occasionally climb for maintenance or research purposes will be required to take Fall Prevention and Protection Awareness Training - FPP105 offered by Sandia National Laboratory; and (3) visitors who must be approved by TTU’s research scientist are required to take an on-site Competent Climb Training (4-hour training), which is taught by TTU’s research scientist.

Texas Tech University will ensure that:

- a. Before any TTU employee is allowed to climb a turbine, that individual must attend an orientation. The research scientist will lead this orientation. The orientation must be attended only once. This does not apply to contractors.
- b. All provisions of the wind turbine safety program outlined in this OP are followed.
- c. Anyone required to work on a wind turbine is trained in the proper procedures of wind turbine climbing;
- d. Anyone ascending a wind turbine has training certification available for viewing;

- e. A copy of the training certificate for university employees is retained in the employee's personnel file;
- f. No one other than trained individuals is allowed on or in wind turbines;
- g. At least two university employees with Competent Wind Turbine Climber and Rescue Certification are on site at the tower any time the wind turbine is climbed; however, university-trained employees will not be required to be on site with certified contract personnel who have completed the Competent Wind Turbine Climber. Contractors must have two trained people on site when a wind turbine is ascended.
- h. Only safety equipment inspected and approved by the research scientist is to be used at the wind turbine site by TTU employees and visitors; contractors are responsible for maintaining their own approved safety equipment. The research scientist is responsible for inspecting all equipment used by TTU.
- i. Security measures are in place and workable at the wind turbine site (locked doors, locked gates, locked ladders, locked elevators, or any other means required to secure the wind turbine); and
- j. Only one climber is on the ladder during maintenance and research operations.

## 2. **Pre-climb Safety for Certified Climbers**

- a. Survey the job site to determine personal protective equipment (PPE) required.
- b. Identify all fall protection elements.
- c. Identify anchorage points and use equipment designed for the type of anchorage present.
- d. Determine any special equipment needed.
- e. Ensure that all personnel are familiar with any special equipment or procedures that will be used.
- f. Ensure that emergency services know how to access wind turbine locations.
- g. Ensure that a first aid kit is available and stocked with the appropriate supplies for site-specific incidents.
- h. All climbers must be trained in first aid and cardiopulmonary resuscitation (CPR).
- i. All climbers must be aware of environmental conditions (weather, vermin, terrain, etc.).
- j. All climbers must wear hard hats with chin straps while climbing.
- k. All climbers must wear Class 0 (all cotton clothing) while in the turbine.
- l. Ensure that a site safety meeting has been performed with all personnel who will be working on or in the wind turbine.

### 3. **Rescue Planning**

In the event a climber becomes stuck or injured on or in a wind turbine, call 911 and request dispatch of personnel who are climb certified from EMS and the Lubbock Fire Department Heavy Rescue Team to the scene.

### 4. **Equipment**

- a. Always use the proper equipment for the job.
- b. Never alter or use incorrect body harnesses. Safety belts are not acceptable fall protection equipment.
- c. Because of the possibility of items falling off personnel, only one person is allowed on the ladder at a time and they are not allowed to have any tools that are not tethered to their harness.
- d. All personnel involved in the maintenance of the wind turbine will wear hard hats at all times in the drop zone. The drop zone is identified as a circle with its center at the base of the tower and having a minimum radius of one foot for every two feet of working height that may vary with wind direction and speed as determined by the research scientist. The drop zone will vary with the height at which personnel are working. (Example: If personnel are working at a height of 50 feet, the drop zone would be a circle around the tower with a 25-foot radius.) The drop zone will be marked with caution tape or any means to show exactly where the drop zone extensions to.
- e. When using tools, always have a safety line attached to the tool to prevent it from falling, as long as it does not create an unsafe condition for the worker/workers using the tool.
- f. Any lanyard or body harness that has been exposed to loading shall be taken out of service until the manufacturer can recertify it for use.

### 5. **Inspection by a Certified Climber**

- a. Check the general condition of the structure before climbing. (Review maintenance records for pertinent information if they are available.)
- b. Check all components of the wind turbine before climbing (e.g., ladders, elevators, safety cable tension on the ladder, etc.).
- c. Inspect all PPE and climbing equipment prior to each use. Inspect lanyards for wear, cuts, and burns.
- d. If communication equipment is used, inspect it before each climb.
- e. Inspect all body harnesses, slings, lines, and connectors before each climb.
- f. With no exception, all climbers will use approved equipment to maintain a 100% tie-off while on or in the wind turbine.

## 6. Certified Climber Working in the Nacelle

- a. Be aware of where the red **EMERGENCY STOPS** are located in the nacelle.
- b. While working in the nacelle, you **MUST** secure yourself with at least one safety line.
- c. Always make sure that there is no one below the turbine while you are working in the nacelle (even a small wrench is dangerous when falling from a height of 100 ft. (30 m)).
- d. The security bolt (rotor lock) **MUST** be mounted and locked out in the disc brake before anyone climbs out in the nose cone or starts working on the rotating parts. Power to start the turbines should be locked out and tagged. Tagging the service switch cannot be used as part of the lockout.
- e. If you are to work in the blade hub or with the blades, the security bolt **MUST** be mounted in the disc brake and locked, the traverse **MUST** be locked with the lock bolts, or the turbine **MUST** be in **EMERGENCY STOP**.
- f. Only authorized individuals may move the covering plates that cover the rotating parts or the electrical parts.
- g. After inspection, greasing, etc., close the skylights. Ensure that you have all tools before you start the descent and **REMEMBER** that the red emergency stops must be off before you can start up the turbine.
- h. If the blades have been or are iced, there is **great danger** in walking below or close to the rotor. In weather conditions where icing of blades may occur, the operator should ensure the area surrounding the turbine is clear in case of falling ice.

## 7. Precautions in Case of Fire

Call 911 and the emergency response team. If it is safe to do so:

- a. If the fire occurs in connection with an uncontrolled turbine, under no circumstances should you go near the turbine.
- b. With any type of fire in or near a turbine, the turbine must always be disconnected at the main switches. If it is not possible to access the main switch of the turbine, you should contact the power station for a disconnection of the supply.
- c. A radius of a minimum of 1640 ft. (500 m) from the turbine must be evacuated and roped off.

## 8. Lockout/Tagout

(Refer to [OP 60.06, Lockout/Tagout Program](#))

- a. The employer shall establish a program consisting of energy control procedures, employee training, and periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, startup, or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source and rendered inoperative.

- b. This program shall address all electrical, mechanical, pneumatic, hydraulic, and stored energy issues related to the work being performed on wind turbine apparatus.

## 9. Electrical Safety

### **Certified Climbers who are to work or perform maintenance on turbines must complete “Arc Flash” Training and perform all activities in accordance with NFPA 70E 130.2**

Approach Boundaries to Live Parts operating at 50 Volts or more (NFPA 70E 130.2)

#### a. Limited Approach Boundary

The limited approach boundary is the closest approach distance for unqualified employees unless additional protective measures are used. It is an approach limit at a distance from an exposed live part within which a shock hazard exists.

Where there is a need for an unqualified person to cross the limited approach boundary, a qualified person shall advise the person of the possible hazards and continuously escort the unqualified person while inside the limited approach boundary. Under no circumstance shall the escorted unqualified person be permitted to cross the restricted approach boundary.

#### b. Restricted Approach Boundary

A restricted approach boundary is an approach limit at a distance from an exposed live part within which there is an increased risk of shock because of an electrical arc over combined with inadvertent movement for personnel working in close proximity to the live part.

No qualified person shall approach or take any conductive objects closer to exposed live parts operating at 50 Volts or more than the restricted approach boundary as set forth in NFPA 70E, Table 130.2(C), unless the following apply:

- (1) The qualified person is insulated or guarded from the live parts operating at 50 Volts or more (insulating gloves and sleeves are considered insulation only with regard to the energized parts upon which work is being performed), and no uninsulated part of the qualified person's body crosses the prohibited approach boundary. (Table 130.2(C).
- (2) The live part operating at 50 Volts or more is insulated from the qualified person and from any other conductive object at a different potential.
- (3) The qualified person is insulated from any other conductive object as during live-line bare-hand work.

#### c. Prohibited Approach Boundary

A prohibited approach boundary is an approach limit at a distance from an exposed live part within which work is considered the same as making contact with the live part. (See Attachment D, Table 130.1(C) (a).)

## 10. Electrical Personal Protective Equipment Requirements

- a. Personal protective equipment shall conform to the NFPA 70E Standards given in Table 130.7 (C) (14). See Attachment A

- b. Selections of Personal Protective Equipment

When selected in lieu of the flash hazard analysis, Table 130.7(C) (14 &15) (a) shall be used to determine the hazard/risk category for each task. See Attachment B

- c. Arc Flash Protective Equipment

- (1) The flash suit design shall permit easy and rapid removal by the user. The entire flash suit, including the hood and face shield, shall have an arc rating that is suitable for the arc flash exposure. When exterior air is supplied into the hood, the air hoses and pump housing shall either be covered by FR (fire rated) materials or constructed of non-melting and non-flammable materials.

- (2) Face Protection

Face shields shall have an arc rating suitable for the arc flash exposure. Face shields without an arc rating shall not be used. Eye protection (safety glasses or goggles) shall always be worn under the face shield or hoods. See Attachment C, Table 130.7(C) (16)

- (3) Protective Clothing Characteristics

FR (flame rated) clothing shall meet the requirement of NFPA 70E, 130.7(C) (12) through (15). See Attachment C, Table 130.7(C) (16) Protective Clothing Characteristics

[Attachment A: NFPA 70E Table 130.7\(C\)\(14\), Standards on Protective Equipment](#)

[Attachment B: NFPA 70E Table 130.7\(C\) \(15\) \(a\), Hazard/Risk Category Classifications](#)

[Attachment C: NFPA Table 130.7 \(C\) \(16\), Protective Clothing and Personal Protective Equipment \(PPE\)](#)

[Attachment D: NFPA 70E Table 130.4 \(C\) \(a\), Approach Boundaries to Energized Electrical Conductors or Circuit Parts for Shock Protection for Alternating Current Systems](#)