

# Wind Technology

## Study Guide

**Assessment:**  
**2403 Wind Turbine Technician**

Aligned to American Wind  
Energy Association  
(AWEA) Core Skill Set

Endorsed By:



*career*tech ✓  
**Testing**  
*The Provider of Online Testing Solutions*



## Overview

This study guide is designed to help students prepare for the Wind Turbine Technician assessment. It not only includes information about the assessment, but also the skill standards upon which the assessment is based, resources that can be used to prepare for the assessment, and test taking strategies.

Each of the four sections in this guide provides useful information for students preparing for the Wind Turbine Technician assessment.

- CareerTech and Competency-Based Education: A Winning Combination
- Wind Turbine Technician assessment
  - ▶ Assessment Information
  - ▶ Standards and Test Content
  - ▶ Sample Questions
  - ▶ Textbook/Curriculum Crosswalk
  - ▶ Additional Resources
  - ▶ Abbreviations, Symbols and Acronyms
- Strategies for Test Taking Success
- Notes

This assessment was developed and aligned with the American Wind Energy Association (AWEA) Wind Turbine Service Technician Core Skill Set. A committee of skilled wind turbine technicians and industry specialists used the AWEA Core Skill Set to develop a comprehensive set of skill standards for a Wind Turbine Technician to use for assessment and curriculum development. The AWEA Core Skill Set was developed by AWEA for its Seal of Approval Program. This program recognizes exemplary wind energy education programs that equip students with entry-level technician skills.

The Wind Turbine Technician assessment measures a student's ability to apply knowledge and skills necessary to be a wind turbine technician. The Wind Turbine Technician assessment is structured to cover the same modules required by the National Center for Construction Education and Research (NCCER) and determine a student's ability to succeed on a credentialing assessment.

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## CareerTech and Competency-Based Education: A Winning Combination

Competency-based education uses learning outcomes that emphasize both the application and creation of knowledge and the mastery of skills critical for success. In a competency-based education system, students advance upon mastery of competencies, which are measurable, transferable outcomes that empower students.

Career and technology education uses industry professionals and certification standards to identify the knowledge and skills needed to master an occupation. This input provides the foundation for development of curriculum, assessments and other instructional materials needed to prepare students for wealth-generating occupations and produce comprehensively trained, highly skilled employees demanded by the work force.

### Tools for Success

CareerTech education relies on three basic instructional components to deliver competency-based instruction: skills standards, curriculum materials, and competency assessments.

**Skills standards** provide the foundation for competency-based instruction and outline the knowledge and skills that must be mastered in order to perform related jobs within an industry. Skills standards are aligned with national skills standards and/or industry certification requirements; therefore, a student trained to the skills standards is equally employable in local, state and national job markets.

**Curriculum materials and textbooks** contain information and activities that teach students the knowledge and skills outlined in the skills standards. In addition to complementing classroom instruction, curriculum resources include supplemental activities that enhance learning by providing opportunities to apply knowledge and demonstrate skills.

**Certification Assessments** test the student over material outlined in the skills standards and taught using the curriculum materials and textbooks. When used with classroom performance evaluations, certification assessments provide a means of measuring occupational readiness.

Each of these components satisfies a unique purpose in competency-based education and reinforces the knowledge and skills students need to gain employment and succeed on the job.

### Measuring Success

Evaluation is an important component of competency-based education. Pre-training assessments measure the student's existing knowledge prior to receiving instruction and ensure the student's training builds upon this knowledge base. Formative assessments administered throughout the training process provide a means of continuously monitoring the student's progress towards mastery.

Certification assessments provide a means of evaluating the student's mastery of knowledge and skills. Coaching reports communicate assessment scores to students and provide a breakdown of assessment results by standard area. The coaching report also shows how well the student has mastered skills needed to perform major job functions and identifies areas of job responsibility that may require additional instruction and/or training.

# Wind Turbine Technician Assessment Information

## What is the Wind Turbine Technician assessment?

The Wind Turbine Technician assessment is an end-of-program assessment for students in wind turbine technician programs. The assessment provides an indication of student mastery of knowledge and skills necessary for success in an entry-level position in the wind turbine industry.

## How was the assessment developed?

The assessment was developed by the CareerTech Testing Center in alignment with the AWEA Core Skill Set. A committee of industry representatives and educators validated the areas covered on the assessment. The assessment content was developed and reviewed by a committee of subject matter experts.

The committee assigned frequency and criticality ratings to each skill, which determines the significance of each task for test development:

**Frequency:** represents how often the task is performed on the job. Frequency rating scales vary for different occupations. The rating scale used in this publication is presented below:

1 = less than once a week      2 = at least once a week      3 = once or more a day

**Criticality:** denotes the level of consequence associated with performing a task incorrectly. The rating scale used in this publication is presented below:

1 = slight                                      2 = moderate                                      3 = extreme

## What does the assessment cover?

Specifically, the test includes 70 multiple-choice test items over the following areas:

Introduction to Wind Energy	13%	Tower Safety	7%
Safety Skills	23%	Mechanical Processes	14%
Electrical Safety Skills	9%	Electrical Processes	20%
General Work Skills	5%	Hydraulic Processes	9%

## What are the benefits of using the assessment?

Students receive a certificate for each assessment that he/she passes. This certificate may be included in his/her portfolio and used to communicate the student's mastery of the subject matter to potential employers.

## When should the assessment be taken?

The CareerTech Testing Center recommends that students take this assessment as soon as possible after receiving all standards-related instruction, rather than waiting until the end of the school year.

## Is the assessment timed?


No. Although students may take as long as they need, most finish the assessment within one hour.

## What resources can students use on the assessment?

Students are allowed to use calculators and scratch paper on CTTC assessments; however, these items must be provided by the testing proctor and returned to the proctor before the student's exam is submitted for scoring. Calculator apps on cell phones and other devices may not be used on these assessments.

## What accommodations can be made for students with Individualized Education Plans (IEPs)?

Accommodations are allowed for students with an Individualized Education Plan. Examples of allowable accommodations include:

- Extended time — This assessment is not timed, therefore students may take as much time as needed to finish. The assessment must be completed in one testing session.
- Readers — A reader may be used to read the assessment to a student who has been identified as needing this accommodation.
- Enlarged text — Students needing this accommodation can activate this feature by clicking the  icon in the upper right corner of the screen.

## What can students expect on Test Day?

All CTTC assessments are web-based and delivered exclusively by a proctor in the school's assessment center. The proctor **cannot** be an instructor or anyone who was involved with the student during instruction.

Assessments are delivered in a question-by-question format. When a question is presented, the student can select a response or leave the question unanswered and advance to the next question. Student may also flag questions to revisit before the test is scored. All questions must be answered before the test can be submitted for scoring.

After the assessment is scored, the student will receive a score report that not only shows the student's score on the assessment, but also how the student performed in each standard area.

## Can students retake the test?

Students may retake the test unless their school or state testing policies prohibit retesting. Students who can retest must wait at least three days between test attempts.

# Standards and Test Content

## Introduction to Wind Energy (9 questions)

1. Wind Terminology **(3/3)**
2. History of the wind industry **(1/1)**
3. Advantages and Disadvantages of the wind industry **(1/1)**
4. Wind Farms **(1/1)**
  - Siting
  - Foundation Construction
5. Understand the Environmental Concerns Affecting: **(2/2)**
  - Site location
  - Turbine Operation
6. Basic Components and Functions of Wind Turbine systems **(3/3)**
7. Types of Wind Turbine systems **(2/2)**
8. Sizes of Wind Turbine systems **(1/2)**
9. Wind Turbine Operation **(3/3)**
10. Emerging Applications in the Wind Turbine industry **(1/1)**
11. Inspection Intervals and Maintenance Cycles **(3/3)**
12. Job Classification system within the Wind Industry **(2/2)**
  - Turbine Operation Technician
  - Turbine Operation Crew Leader
  - Turbine Operation Site Manager
13. Job Requirements for Entry Level Wind Turbine Technicians **(2/3)**
14. Skill Requirements for Entry Level Wind Turbine Technicians **(3/2)**



## Safety Skills (16 questions)

1. Describe the Purpose of the Occupational Safety and Health Act (OSHA) **(3/3)**
  - OSHA 30 Hour Awareness Training
2. Struck By Hazards & Safety Procedures **(3/3)**
  - Falling Objects
  - Trucks
  - Cranes
3. Caught In/Between Hazards **(3/3)**
  - Pinch Points
  - Trench hazards
  - Unguarded machinery
  - Equipment

4. Proper Personal Protection Equipment **(3/3)**
  - Proper Clothing
  - Helmet
  - Gloves
  - Respiratory Protection
5. Fall Protection **(3/3)**
  - Fall Protection PPE
  - Floors
  - Platforms
  - Roofs
  - Compliance
6. Health Hazards in Construction **(3/3)**
7. Ladder Safety Procedures **(3/3)**
8. Fire Protection Techniques **(3/3)**
  - General Fire Safety including types of fires, extinguishers, and fire triangle
  - Fire Prevention
  - Hand-held systems use, inspection, and service
  - Hot Work requirements
  - Escape and egress knowledge
9. SDS/HazCom **(3/3)**
  - Explain use of Safety Data Sheets
  - Difference in hazardous materials, substances, and waste
  - Understand basic first aid procedures for exposure
  - Proper storage of materials
10. Hand and Power Tools Safety **(3/3)**
11. Scaffold Safety **(2/3)**
12. Crane Safety, Rigging, and Procedures **(3/3)**
  - Proper Assembly & Disassembly
  - Proper Signaling
  - Environmental Conditions including ground and weather conditions
  - Proper Rigging Inspection
  - Crane Safety during and after construction
  - Proper Maintenance
13. Motor Vehicle, Mechanized Equipment, and Powered Industrial Vehicles **(3/3)**
14. Excavation Safety Procedures **(2/3)**
15. Steel Erection Safety Procedures **(3/3)**
16. Basic First Aid Procedures **(3/3)**
17. Confined Spaces **(3/3)**
  - Permit-required spaces
  - Non-Permit required spaces



18. Ergonomics **(3/3)**

- Lifting
- Stretching
- Bending & Twisting

19. Dress Safely for Performing Wind Turbine Technician Duties **(3/3)**

- Proper PPE
- Jewelry Removal
- Confinement of Long Hair

20. General Job and Safety Rules **(3/3)**

- Awareness of Surroundings and Safe Conduct
- Hygiene and Safety from Diseases

21. Recognize and Report Hazardous Shop Conditions **(3/3)**

- Equipment Defects
- Accidents
- Material Spillage

22. Proper Usage of Respirators **(2/3)**

- Usage in Contaminated Areas

23. Safety Color Code **(3/3)**

- Federal Safety Red
- Federal Safety Yellow
- Federal Safety Orange
- Federal Safety Purple
- Federal Safety Green
- Federal Safety Black and White
- Federal Safety Blue

24. Safety Tags **(3/3)**

- Do Not Start
- Danger
- Caution
- Out of Order

25. Prevention of Slips, Trips, and Falls **(3/3)**

26. Safety Techniques Associated with Power Lift Equipment **(3/3)**

- Sensor Lift
- Bucket Truck

27. Risk Assessment **(3/3)**

- Understand Liability Issues and Contract Language
- Identification, Assessment, and Prioritization of Risks
- Control Probability of Incidences
- Ability to Complete a Job Safety Analysis



## Electrical Safety Skills (6 questions)

1. Safe Work Procedures around Electrical Hazards **(3/3)**
  - OSHA Standards
  - NFPA 70E
  - Precautions for avoiding electrical shock
  - Precautions for avoiding arc flash
  - Precautions around various power sources
  - Procedures to follow when treating victims of electrical shock
2. Awareness of Possible Electrical Concerns **(3/3)**
  - Surroundings
  - Self
3. Electrical Personal Protective Equipment (PPE) **(3/3)**
  - High voltage gloves
  - High voltage shoes
  - Face shields
  - Flash suits
  - Ear Plugs
4. Accident Prevention **(3/3)**
5. Electrical Lockout/Tagout Procedures **(3/3)**
6. Bonding and grounding **(3/3)**
7. Static Electricity and its Effects on Electrical Safety within a wind turbine system **(2/3)**
8. Lightning and its Effects on Electrical Safety within a wind turbine system **(3/3)**
9. High versus Low Voltage Safety Concerns **(3/3)**

## General Work Skills (4 questions)

1. Professional Conduct in the Workplace **(3/3)**
2. Site Rules **(3/3)**
  - Tool Inventory
  - Check In/Out of Tools
  - Avoid interaction with Wildlife on sites
  - Remain on maintained roadways
  - No Smoking in turbines
  - Clean-up after everyone
3. Work within a Team Environment **(3/3)**
4. Implement Customer Service skills **(3/3)**
  - Communicating with customers
  - Servicing Customer needs
  - Understanding various customers encountered on the job



5. Knowledge of Diversity **(2/2)**
  - Age
  - Gender
  - Sexual Harassment
  - Cultural Awareness
6. Proper Communication Etiquette **(3/2)**
  - Verbal
  - Email
  - Radio
7. Write Technical Reports **(3/3)**
  - Ability to clearly convey technical information in various types of documents
  - Ability to accurately report accidents
8. Interpret Technical Documents **(3/3)**
  - Plan work based upon technical inspection or condition reports
  - Read/Interpret and Use Manufacturer Documentation
9. Schematics **(3/3)**
  - Types of Schematics
  - Uses of Schematics
  - Understand differences in European and American schematics
10. Convert Units of Measurement **(2/2)**

• Metric	• Force
• PSI	• Mass
• BAR	• Temperature
• Volume	• Length
• Pressure	• KPascals
• Distance	
11. Proper Housekeeping Procedures **(3/3)**
  - Importance of Cleaning throughout Inspection and Maintenance

## **Tower Safety (5 questions)**

1. Competent versus Authorized Technicians for Tower Safety Processes **(3/3)**
2. Fall Protection Systems **(3/3)**
  - ANSI Fall Protection Code
  - Donning & Doffing system
  - When & How to Inspect system
  - Care of System
  - Components
  - Anchor Points (painted yellow)
  - Levels of Fall Protection System
    - Engineer Out the Hazard
    - Fall Prevention

- ▶ Fall Restraint
- ▶ Fall Arrest
- 3. Types and Functions of Rescue Equipment **(3/3)**
  - Controlled Descent/Ascent
    - ▶ Ascenders
  - Descenders
    - ▶ Auto Descent
    - ▶ Manual Descent
  - Other Components
    - ▶ Slings
    - ▶ Carabineers
    - ▶ Rope Grab
    - ▶ Pulley (change direction)
    - ▶ Edge roller
    - ▶ T-bar
    - ▶ Sked
- 4. Inspection, Re-Certification, and Record-Keeping Procedures of Rescue Equipment **(3/3)**
  - Daily
  - Annually
  - Quarterly
  - Usage and Time
  - According to Manufacturer's Guidelines
  - Location of records
- 5. Proper Climbing and Descending Procedures **(3/3)**
- 6. Types of Rescue **(3/3)**
  - Self
  - Assisted
  - Nacelle
    - ▶ Over
    - ▶ Inside
  - Ladder
  - Hub
  - Platform
- 7. Rescue Planning **(3/3)**
  - Rescue Plan for High Angle Rescue
- 8. Emergency Response and Rescue **(3/3)**
  - Emergency Response Procedures
  - Emergency Contact Information



## Mechanical Processes (10 questions)

### 1. Blades (3/3)

- Construction
- Routine Maintenance Requirements
  - Torque
  - Tension
  - Lubing
- Routing Inspection Requirements
- Sensors
- Theory of pitch systems

### 2. Bearings (3/3)

- Types and Uses of Bearings
- Theory of Bearings
- Installation
- Routine Maintenance Requirements
  - Lubing
- Routine Inspection Requirements

### 3. Gearboxes (3/3)

- Types and Uses of Gearboxes
- Theory of Gearboxes
- Routine Maintenance Requirements
  - Oil Sampling
  - Filters
  - Lubrication
- Routine Inspection Requirements

### 4. Yaw Systems (3/3)

- Yaw theory - why and how it yaws
- Components
  - Gears
  - Pucks
  - Sensors
  - Rings
  - Claws
  - Pinions
  - Brakes
  - Motors
- Routine Maintenance Requirements
- Routine Inspection Requirements
  - Pucks
  - Brake torquing
  - Motors
  - Cable twists



## 5. Cooling Systems **(3/3)**

- Types of Cooling Systems
  - Air-cooled
  - Water-cooled
- Routine Maintenance Requirements
  - Grease bearings
  - Pressure testing
  - Fluid check
  - Cleaning of radiator
- Routine Inspection Requirements
  - Pumps
  - Clogging
  - Thermostats
- Troubleshooting
  - Temperature
- Theory of Cooling Systems

## 6. Heating Systems **(3/3)**

- Types of Heating Systems
  - Electric
- Routine Maintenance Requirements
  - Cleaning
- Routine Inspection Requirements
  - Thermostats
  - Operation
  - Sensors
- Sensors
  - PT 100
- Troubleshooting
  - Temperature
- Theory of Heating Systems

## 7. Shaft Alignment Principles **(2/3)**

- Principles and Theory of Alignment
- Alignment techniques
  - Laser
  - Dial indicators
- Routine Maintenance Requirements
  - Torquing
- Routine Inspection Requirements
  - Cracks

## 8. Read and Interpret Mechanical Schematics **(2/3)**

- Component identification
- Symbol identification
- Shop Drawings



## 9. Safely Use Various Tools **(3/3)**

- Boroscope
- Hi-torque (including calibration)
- Laser alignment tool
- Dial Indicator
- Ping Hammer
- Measure and Interpret Information

## 10. Fasteners and Torquing **(3/3)**

- Fasteners
  - Metallurgical characteristics
    - bolt stretching
  - Grades
  - Inspection
    - torque marks
    - bolt testing using ping test
  - Assembly of fasteners
    - locking nuts
    - direction of washer
  - Differences in Wet versus Dry torquing
- Torquing
  - Safety
    - pinch points
    - hydraulic pressure
    - PPE
    - care and inspection of equipment
  - Types of torquing tools
    - electrical
    - mechanical
    - hydraulic
  - Calibration of all types of torquing tools
  - Assembly of torquing components
    - reservoir
    - pump
    - sockets
    - head
    - hoses (various types & numbers)
    - reaction arms
  - Proper Usage
    - placement of reaction arm
    - placement of hands
    - setting the PSI/BAR
    - ability to work as a team to torque
    - checking for leaks before and while torquing
    - mark torque marks on bolt when done
    - torque pattern
    - calibration of torque tool



## 11. Tensioning (3/3)

- Safety
  - PPE
  - Hydraulic Pressure
  - Situational Awareness (body placement)
  - Pinch Points
  - Ability to work as a team to tension
- Types of Tensioning Units
  - Powered
  - Manual
- Components
  - Pumps
  - Hoses
  - Heads (various types)
- Proper Usage
  - Placement
  - Setting the PSI/BAR
  - Gauge levels for stopping point
  - Checking for leaks

## Electrical Processes (14 questions)

### 1. AC/DC theory (2/3)

### 2. Electrical Principles (3/3)

- Voltage
- Current
- Resistance
- Inductance
- Capacitance

### 3. Series/Parallel Circuits (2/3)

### 4. Single and Three-Phases systems (2/2)

- Wirings
- Motors

5. Safe Usage of Electrical Tools **(3/3)**
  - Insulated
  - Insulating
6. Use and Interpret Electrical Testing Equipment **(3/3)**
  - Multimeter
  - Voltage pen
  - Clamp-on ammeter
  - Meggars
  - Motor tester
  - Outlet tester
7. Operation of Generators **(3/3)**
8. Operation of Transformers **(2/3)**
9. Motors **(3/3)**
10. Relays **(2/2)**
11. Motor Starters **(2/2)**
12. Batteries **(2/2)**
13. Electrical Sensors **(2/2)**
14. Basic Fundamentals of PLCs **(2/2)**
15. Basic Fundamentals of SCADA basics **(2/2)**
  - Fiber Optics
16. Basic Wiring Skills **(3/3)**
17. Read and Interpret Electrical Schematics **(3/3)**
  - Component identification
  - Symbol identification
18. Perform Electrical Troubleshooting/Diagnostics **(3/3)**
19. Situational Awareness **(3/3)**
  - Understanding areas to avoid
  - Understanding areas to avoid contact with



## Hydraulic Processes (6 questions)

1. Hydraulic Safety Equipment **(2/3)**
2. Hydraulic Principles **(2/3)**
3. Safe Usage of Hydraulic Tools **(3/3)**
  - Manometer
  - Pressure testers--accumulator
4. Hydraulic Components **(3/3)**
  - Pumps—motor-driven & manual
  - Hoses
  - Relief valves
  - Brakes
  - Yaw drives
  - Pitch drives
  - Gauges
  - Accumulators
  - Filters
  - Check valves
  - Cylinders



5. Hydraulic Fluids **(3/3)**
  - Types of Fluid
  - Proper process for changing fluid
  - Oil Samples
    - Process for Obtaining samples
  - Dangers
    - Pin holes/Misting
    - High Pressure
6. Read and Interpret Hydraulic Schematics **(2/3)**
  - Component identification
  - Symbol identification
7. Hydraulic Leak Detection and Repair **(2/3)**
  - Determine leak location
  - Clean-up procedures
8. Perform Hydraulic Troubleshooting/Diagnostics **(3/3)**



## Sample Questions

- \_\_\_\_\_ 1. Which type of fire extinguisher is used on an electrical fire?
- a. A
  - b. B
  - c. C
  - d. D
- \_\_\_\_\_ 2. What device is attached to scaffolding to provide a larger work area?
- a. putlogs
  - b. outriggers
  - c. broad boards
  - d. cleats
- \_\_\_\_\_ 3. The purpose of a job safety analysis is to identify, assess, and \_\_\_\_\_.
- a. correct hazards
  - b. prioritize risks
  - c. report risks
  - d. prioritize potential hazards
- \_\_\_\_\_ 4. What part is a component of a wind turbine rotor?
- a. generator
  - b. shaft
  - c. nacelle
  - d. hub
- \_\_\_\_\_ 5. What motor part rotates during operation?
- a. armature
  - b. commutator
  - c. capacitor
  - d. stator
- \_\_\_\_\_ 6. What is the minimum number of volts a circuit must have to be considered dangerous?
- a. 5
  - b. 10
  - c. 20
  - d. 30

- \_\_\_\_\_ 7. According to OSHA, insulated rubber gloves should be electrically tested how many times each month?
- a. 3
  - b. 6
  - c. 9
  - d. 12
- \_\_\_\_\_ 8. In Ohms Law, the letter I stands for \_\_\_\_\_.
- a. amps
  - b. voltage
  - c. resistance
  - d. current



## Sample Questions — Key

1. Which type of fire extinguisher is used on an electrical fire?
  - a. A Incorrect by definition
  - b. B Incorrect by definition
  - c. C Correct
  - d. D Incorrect by definition
  
2. What device is attached to scaffolding to provide a larger work area?
  - a. putlogs Incorrect by definition
  - b. outriggers Correct by definition
  - c. broad boards Incorrect by definition
  - d. cleats Incorrect by definition
  
3. The purpose of a job safety analysis is to identify, assess, and \_\_\_\_\_.
  - a. correct hazards Wrong, but plausible
  - b. prioritize risks Correct
  - c. report risks Wrong, but plausible
  - d. prioritize potential hazards Wrong, but plausible
  
4. What part is a component of a wind turbine rotor?
  - a. generator Wrong, but plausible
  - b. shaft Wrong, but plausible
  - c. nacelle Wrong, but plausible
  - d. hub Correct
  
5. What motor part rotates during operation?
  - a. armature Correct
  - b. commutator Wrong, but plausible
  - c. capacitor Wrong, but plausible
  - d. stator Wrong, but plausible
  
6. What is the minimum number of volts a circuit must have to be considered dangerous?
  - a. 5 Wrong, but plausible
  - b. 10 Wrong, but plausible
  - c. 20 Wrong, but plausible
  - d. 30 Correct

7. According to OSHA, insulated rubber gloves should be electrically tested how many times each month?

- a. 3                      Wrong, but plausible
- b. 6                      Correct
- c. 9                      Wrong, but plausible
- d. 12                     Wrong, but plausible

8. In Ohms Law, the letter I stands for \_\_\_\_\_.

- a. amps                      Wrong, but plausible
- b. voltage                    Wrong, but plausible
- c. resistance                Wrong, but plausible
- d. current                    Correct

## Curricula Crosswalk

### Crosswalk to the AWEA Core Skill Set, Multistate Academic and Vocational Curriculum Consortium (MAVCC) Wind Turbine Technician Curriculum, and NCCER Wind Modules

The following crosswalk is intended for guidance purposes only. It does not represent all curricula or resource materials that may be used for wind turbine technician programs. It is intended as a reference for curriculum planning and mapping standards to available curricula.

#### Curriculum/Resource Titles:

- 1) AWEA – Core Skill Set
- 2) MAVCC – Wind Turbine Technician
- 3) NCCER – Wind Turbine Maintenance Level I Volume 1
- 4) NCCER – Wind Turbine Maintenance Level I Volume 2
- 5) NCCER – Core Curriculum Trainee Guide
- 6) NCCER – Electrical Level 2 Trainee Guide

For more information about MAVCC curricula, please go to [www.okcimc.com](http://www.okcimc.com).

Module Name — Objective	Unit/Module
<b>Introduction to Wind Energy</b>	1) Operational Skills 2) Unit 1, 2, 5-8 3) Module 58101
1. Wind Terminology	1) Operational Skills – Turbine Fundamentals #1 2) Unit 1-8 3) Module 58101
2. History of the wind industry	1) Operational Skills 2) Unit 1 3) Module 58101
3. Advantages and Disadvantages of the wind industry	1) Operational Skills 2) Unit 1-8 3) Module 58101
4. Wind Farms	1) Operational Skills – Turbine Fundamentals 2) Unit 1 3) Module 58101
5. Understand the Environmental Concerns	1) Operational Skills – Turbine Fundamentals #1 2) Unit 1 3) Module 58101
6. Basic Components and Functions of Wind Turbine systems	1) Operational Skills – Turbine Fundamentals #1 2) Unit 1-8 3) Module 58101
7. Types of Wind Turbine systems	1) Operational Skills – Turbine Fundamentals #1 2) Unit 1 3) Module 58101

<b>Module Name — Objective</b>	<b>Unit/Module</b>
8. Sizes of Wind Turbine systems	1) Operational Skills – Turbine Fundamentals #1 2) Unit 1 3) Module 58101
9. Wind Turbine Operation	1) Operational Skills – Turbine Fundamentals #1 2) Unit 1-8 3) Module 58101
10. Emerging Applications in the Wind Turbine industry	1) Operational Skills – Turbine Fundamentals #1 – Project Operations #1 2) Unit 1-8 3) Module 58101
11. Inspection Intervals and Maintenance Cycles	1) Operational Skills – Maintenance Operations #4 2) Unit 1-8 3) Module 58101
12. Job Classification system within the Wind Industry	1) Operational Skills – Project Operations #2 2) Unit 1 3) Module 58101
13. Job Requirements for Entry Level Wind Turbine Technicians	1) Operational Skills – Project Operations #2 2) Unit 1 3) Module 58101
14. Skill Requirements for Entry Level Wind Turbine Technicians	1) Operational Skills – Project Operations #2 2) Unit 1 3) Module 58101
<b>Safety Skills</b>	2) Unit 1-2 3) Module 58102, 58103 5) Module 00101, 00103, 00104, 00106
1. Describe the Purpose of OSHA	2) Unit 2 3) Module 58102 5) Module 00101
2. Struck By Hazards & Safety Procedures	2) Unit 2 3) Module 58102
3. Caught In/Between Hazards	2) Unit 2 3) Module 58102
4. Proper Personal Protection Equipment	2) Unit 2 3) Module 58102 5) Module 00101
5. Fall Protection	2) Unit 2 3) Module 58102, 58103
6. Health Hazards in Construction	2) Unit 2 3) Module 58102 5) Module 00101
7. Ladder Safety Procedures	2) Unit 2 3) Module 58102 5) Module 00101

<b>Module Name — Objective</b>	<b>Unit/Module</b>
8. Fire Protection Techniques	2) Unit 2 3) Module 58102 5) Module 00101
9. SDS/HazCom	2) Unit 2 3) Module 58102 5) Module 00101
10. Hand and Power Tools Safety	2) Unit 2 5) Module 00103, 00104
11. Scaffold Safety	2) Unit 2 3) Module 58102 5) Module 00101
12. Crane Safety, Rigging, and Procedures	2) Unit 2 3) Module 58102 5) Module 00106
13. Motor Vehicle, Mechanized Equipment, and Powered Industrial Vehicles	2) Unit 1 3) Module 58102 5) Module 00109
16. Basic First Aid Procedures	2) Unit 1 3) Module 58102 5) Module 00101
17. Confined Spaces	2) Unit 1 3) Module 58102 5) Module 00101
18. Ergonomics	2) Unit 1 3) Module 58102 5) Module 00101
19. Dress Safely for Performing Wind Turbine Technician Duties	2) Unit 1 3) Module 58102
20. General Job and Safety Rules	2) Unit 1 3) Module 58102 5) Module 00101
21. Recognize and Report Hazardous Shop Conditions	2) Unit 1 3) Module 58102 5) Module 00101
23. Safety Color Code	2) Unit 1 3) Module 58102 5) Module 00101
24. Safety Tags	2) Unit 1 3) Module 58102 5) Module 00101
25. Prevention of Slips, Trips, and Falls	2) Unit 1 3) Module 58102 5) Module 00101



<b>Module Name — Objective</b>	<b>Unit/Module</b>
26. Safety Techniques Associated with Power Lift Equipment	2) Unit 1 3) Module 58102 5) Module 00101
27. Risk Assessment	2) Unit 1 3) Module 58102 5) Module 00101
<b>Electrical Safety Skills</b>	1) Electrical Skills 2) Unit 1, 3-5, 7 3) Module 58102 4) Module 58105, 58107 5) Module 00101
1. Safe Work Procedures around Electrical Hazards	1) Electrical Skills 2) Unit 3 3) Module 58102 4) Module 58105 5) Module 00101
2. Awareness of Possible Electrical Concerns	1) Electrical Skills 2) Unit 3 3) Module 58102 5) Module 00101
3. Electrical Personal Protective Equipment	1) Electrical Skills 2) Unit 3 3) Module 58102
4. Accident Prevention	1) Electrical Skills 2) Unit 1, 3 3) Module 58102 5) Module 00101
5. Electrical Lockout/Tagout Procedures	1) Electrical Skills 2) Unit 1, 3 3) Module 58102 5) Module 00101
6. Bonding and grounding	1) Electrical Skills – Bonding & Grounding & Lightning Protection #1, #2 2) Unit 3, 7 3) Module 58102
7. Static Electricity and its Effects on Electrical Safety within a wind turbine system	1) Electrical Skills – Bonding & Grounding & Lightning Protection #1, #2 2) Unit 3
8. Lightning and its Effects on Electrical Safety within a wind turbine system	1) Electrical Skills – Bonding & Grounding & Lightning Protection #3 2) Unit 3
9. High versus Low Voltage Safety Concerns	1) Electrical Skills – Bonding & Grounding & Lightning Protection 2) Unit 3 3) Module 58102, 58107

Module Name — Objective	Unit/Module
<b>General Work Skills</b>	1) General Work Skills 2) Unit 1, 4, 5, 7, 8 3) Module 26103 4) Module 58107, 58110 5) Module 00102, 00105, 00107, 00108
1. Professional Conduct in the Workplace	1) General Work Skills – Soft Skills #2 2) Unit 4 5) Module 00108
2. Site Rules	2) Unit 1, 4 5) Module 00108
3. Work within a Team Environment	1) General Work Skills – Soft Skills #1 2) Unit 4 5) Module 00107
4. Implement Customer Service skills	1) General Work Skills – Report Writing #1 2) Unit 4 5) Module 00107
5. Knowledge of Diversity	1) General Work Skills – Soft Skills #4 2) Unit 4 5) Module 00108
6. Proper Communication Etiquette	1) General Work Skills – Soft Skills #1 2) Unit 4 5) Module 00107
7. Write Technical Reports	1) General Work Skills – Report Writing #1 2) Unit 4 5) Module 00107
8. Interpret Technical Documents	1) General Work Skills – Report Writing #2 2) Unit 5 5) Module 00107
9. Schematics	1) General Work Skills – Schematics #2 2) Unit 4, 7, 8 3) Module 26103 4) Module 58107, 58110 5) Module 00105
10. Convert Units of Measurement	1) General Work Skills – Conversion of Units #1 2) Unit 4 5) Module 00102
11. Proper Housekeeping Procedures	1) Operational Skills – Maintenance Operations #2-4 2) Unit 4

<b>Module Name — Objective</b>	<b>Unit/Module</b>
<b>Tower Safety</b>	1) Operational Skills 2) Unit 5 3) Module 58103
1. Competent versus Authorized Technicians for Tower Safety Processes	1) Operational Skills – Turbine Fundamentals #1 2) Unit 5 3) Module 58103
2. Fall Protection Systems	1) Operational Skills – Turbine Fundamentals #1 2) Unit 5 3) Module 58103
3. Types and Functions of Rescue Equipment	1) Operational Skills – Turbine Fundamentals #1 2) Unit 5 3) Module 58103
4. Inspection, Re-Certification, and Record-Keeping Procedures of Rescue Equipment	1) Operational Skills – Turbine Fundamentals #1 2) Unit 5 3) Module 58103
5. Proper Climbing and Descending Procedures	1) Operational Skills – Turbine Fundamentals #1 2) Unit 5 3) Module 58103
6. Types of Rescue	1) Operational Skills – Turbine Fundamentals #1 2) Unit 5 3) Module 58103
7. Rescue Planning	1) Operational Skills – Turbine Fundamentals #1 2) Unit 5 3) Module 58103
8. Emergency Response and Rescue	1) Operational Skills – Turbine Fundamentals #1 2) Unit 5 3) Module 58103
<b>Mechanical Processes</b>	1) Operational Skills, Mechanical Skills, General Work Skills 2) Unit 1, 4, 6-8 3) Module 26103, 58101 4) Module 32207, 58107, 58108, 58109, 58110 5) Module 00105
1. Blades	1) Operational Skills – Turbine Fundamentals #1 – Maintenance Operations #3 2) Unit 1, 6 3) Module 58101
2. Bearings	1) Operational Skills – Maintenance Operations #3 Mechanical Skills – Bearings #1-6 2) Unit 6 4) Module 32207
3. Gearboxes	1) Operational Skills – Turbine Fundamentals #1 Mechanical Skills – Gearboxes #1-4 2) Unit 1, 6 4) Module 58109

<b>Module Name — Objective</b>	<b>Unit/Module</b>
4. Yaw Systems	1) Operational Skills – Turbine Fundamentals #1 – Maintenance Operations #5 Mechanical Skills – Yaw Systems #1-3 2) Unit 1, 6-7 3) Module 58101
5. Cooling Systems	1) Mechanical Skills – Cooling/Heating Systems #1 2) Unit 6
6. Heating Systems	1) Mechanical Skills – Cooling/Heating Systems #1 2) Unit 6
7. Shaft Alignment Principles	1) Operational Skills – Turbine Fundamentals #1 Mechanical Skills – Shaft Alignment #1 2) Unit 1
8. Read and Interpret Mechanical Schematics	1) General Work Skills – Schematics #1 2) Unit 4, 7-8 3) Module 26103 4) Module 58107, 58110 5) Module 00105
9. Safely Use Various Tools	1) Mechanical Skills – Tools & Test Equipment #1-4 2) Unit 4, 6-7
10. Fasteners and Torquing	1) Mechanical Skills – Fasteners & Torquing #1-5 2) Unit 6 4) Module 58108
11. Tensioning	1) Mechanical Skills – Fasteners & Torquing #4 2) Unit 6 4) Module 58108
<b>Electrical Processes</b>	1) Operational Skills, Mechanical Skills, Electrical Skills 2) Unit 1, 4, 7 3) Module 26103, 26104, 26112, 58101, 58104 4) Module 58105, 58106, 58107, 80201 6) Module 26202
1. AC/DC theory	1) Electrical Skills – Electrical Theory #1 2) Unit 7 3) Module 26103
2. Electrical Principles	1) Electrical Skills – Electrical Theory #2 2) Unit 7 3) Module 26103 4) Module 58105, 80201
3. Series/Parallel Circuits	1) Electrical Skills – Electrical Theory #2 2) Unit 7 3) Module 26103, 26104
4. Single and Three-Phases systems	1) Electrical Skills – Electrical Theory #2 2) Unit 7 3) Module 80201

<b>Module Name — Objective</b>	<b>Unit/Module</b>
5. Safe Usage of Electrical Tools	1) Mechanical Skills – Tools & Test Equipment #5 Electrical Skills – Basic Wiring #3-5 2) Unit 7 3) Module 26112
6. Use and Interpret Electrical Testing Equipment	1) Mechanical Skills – Tools & Test Equipment #5 2) Unit 7 3) Module 26103, 26112
7. Operation of Generators	1) Electrical Skills – Electrical Theory #4 – Motors & Generators #1 2) Unit 1, 7 4) Module 58107
8. Operation of Transformers	1) Electrical Skills – Electrical Theory #5 2) Unit 1, 7 4) Module 80201
9. Motors	1) Electrical Skills – Electrical Theory #4 – Motors & Generators #1 2) Unit 7 6) Module 26202
10. Relays	1) Electrical Skills – Electrical Theory #4 2) Unit 7 4) Module 58106
11. Motor Starters	1) Electrical Skills – Electrical Theory #4 – Motors & Generators #1 2) Unit 7 6) Module 26202
12. Batteries	1) Electrical Skills – Electrical Theory #4
13. Electrical Sensors	1) Operational Skills – Turbine Fundamentals #1 -- Maintenance Operations #5 2) Unit 7 3) Module 58101
14. Basic Fundamentals of PLCs	1) Operational Skills – Turbine Fundamentals #1 Electrical Skills – PLC – Basic Fundamentals #1 2) Unit 7 3) Module 58104
15. Basic Fundamentals of SCADA basics	1) Operational Skills – Turbine Fundamentals #1 Electrical Skills – SCADA Basics #1 2) Unit 7 3) Module 58104
16. Basic Wiring Skills	1) Electrical Skills – Basic Wiring #1-6 2) Unit 7 3) Module 58104
17. Read and Interpret Electrical Schematics	1) Electrical Skills – Basic Wiring #6 2) Unit 4, 7 3) Module 58104

<b>Module Name — Objective</b>	<b>Unit/Module</b>
18. Perform Electrical Troubleshooting/Diagnostics	1) Electrical Skills – Basic Wiring #3 2) Unit 4, 7 3) Module 58104
19. Situational Awareness	4) Module 58107
<b>Hydraulic Processes</b>	1) Operational Skills, Mechanical Skills 2) Unit 8 4) Module 58110
1. Hydraulic Safety Equipment	1) Operational Skills – Turbine Fundamentals #1 Mechanical Skills – Hydraulic Systems #1 2) Unit 8 4) Module 58110
2. Hydraulic Principles	1) Operational Skills – Turbine Fundamentals #1 Mechanical Skills – Hydraulic Systems #1 2) Unit 8 4) Module 58110
3. Safe Usage of Hydraulic Tools	1) Mechanical Skills – Hydraulic Systems #3 2) Unit 8 4) Module 58110
4. Hydraulic Components	1) Mechanical Skills – Hydraulic Systems #3-4 2) Unit 8 4) Module 58110
5. Hydraulic Fluids	1) Mechanical Skills – Hydraulic Systems #4 – Lubrication #1-3 2) Unit 8 4) Module 58110
6. Read and Interpret Hydraulic Schematics	1) Mechanical Skills – Hydraulic Systems #2 2) Unit 8 4) Module 58110
7. Hydraulic Leak Detection and Repair	1) Mechanical Skills – Hydraulic Systems #4 2) Unit 8 4) Module 58110
8. Perform Hydraulic Troubleshooting/Diagnostics	1) Mechanical Skills – Hydraulic Systems #4 2) Unit 8 4) Module 58110

## **Additional Resources**

For a more in-depth breakdown of objectives, job sheets, and assignment sheets for the MAVCC curriculum, please see the following crosswalks:

- (1) MAVCC – Wind Turbine Technician  
[www.mavcc.com/pdffiles/WTCWtoAWEA.pdf](http://www.mavcc.com/pdffiles/WTCWtoAWEA.pdf)

## Abbreviations, Symbols and Acronyms

The following is a list of abbreviations, symbols, and acronyms used in the Wind Technology study guide and on the Wind Turbine Technician assessment.

°	Degree
°F	Degree Fahrenheit
Ω	Ohms
AC	Alternating Current
ANSI	American National Standards Institute
AWEA	America Wind Energy Association
DC	Direct Current
HAZCOM	Hazard Communication
kW	Kilowatt
mW	Megawatt
NEC	National Electric Code
NCCER	National Center for Construction Education and Research
NFBR	National Federation of Biological Recording
NFPA	National Fire Protection Association
OSHA	Occupation Safety and Health Act
PLC	Programmable Logic Controller
PPE	Personal Protection Equipment
PT	Platinum
SCADA	Supervisory Control and Data Acquisition
SDS	Safety Data Sheet
SSP	Standards Service Program
TP	Throttle Position

## Test Taking Strategies

This section of the study guide contains valuable information for testing success and provides a common-sense approach for preparing for and performing well on any test.

### General Testing Advice

1. Get a good night's rest the night before the test — eight hours of sleep is recommended.
2. Avoid junk food and “eat right” several days before the test.
3. Do not drink a lot or eat a large meal prior to testing.
4. Be confident in your knowledge and skills!
5. Relax and try to ignore distractions during the test.
6. Focus on the task at hand — taking the test and doing your best!
7. Listen carefully to the instructions provided by the exam proctor. If the instructions are not clear, ask for clarification.

### Testing Tips

1. Read the entire question before attempting to answer it.
2. Try to answer the question before reading the choices. Then, read the choices to determine if one matches, or is similar to your answer.
3. Do not change your answer unless you misread the question or are certain that your first answer is incorrect.
4. Answer questions you know first, so you can spend additional time on the more difficult questions.
5. Check to make sure you have answered every question before you submit the assessment for scoring — unanswered questions are marked incorrect.







