

POWER EQUIPMENT TECHNOLOGY BLUEPRINT

This Blueprint contains the subject matter content of this Skill Connect Assessment. This Blueprint does **NOT** contain the information one would need to fully prepare for a SkillsUSA Championships contest. Please refer to the *SkillsUSA Championships Technical Standards* CD-ROM for the current year or purchase and download the relevant "Contest Singles." Both are available through www.skillsusa.org > Shop > Educational Materials Catalog.

Standards and Competencies

Ignition, Charging, Fuel and Governor Systems

- Ignition and Charging Systems
 - Understand and be able to disassemble ignition system, inspect and test ignition components
 - Show proficiency in testing coil/ignition modules
 - Repair/replace electronic ignition components
 - Test and troubleshoot equipment related switches and harnesses along with stators, regulators and any related wiring harnesses
- Fuel Systems
 - Explain and be able to inspect, service, repair and adjust carburetors, gaseous fuel regulators and mixers
 - Inspect, clean and replace filters
 - Check fuel tanks and service and repair fuel pumps and solenoids
 - Test equipment-related fuel tanks, lines and related systems and understand the procedures for testing for compliance systems as they are related to emission requirements and standards
- Governor Systems
 - Understand and be able to explain the various governor systems
 - Inspect, service and reassemble governors
 - Be able to understand and explain which components cause engines to increase or decrease in the number of revolutions per minute

Starter, Cooling and Lubrication Systems

- Starter Systems
 - Recognize and be able to demonstrate the ability to inspect, service and adjust the various starting systems; use wiring schematics of related equipment systems
- Cooling Systems
 - Recognize, test and troubleshoot both liquid and air-cooled cooling systems of both engines and equipment
 - Understand and recognize signs of heat related failures or problems
- Lubricating Systems
 - Define and understand the various styles and types of lubrication systems
 - Demonstrate the ability to check oil levels and fuel/oil mixtures
 - Demonstrate the method of checking oil pressurized systems with the use of required tools
 - Understand and explain the various grades of oils and uses in the proper engines/equipment

Valves, Exhaust and Engine Block Systems

- Valves
 - Be able to identify and service various types and styles of valve train components as well; explain why the sealing of these components is important
- Exhaust Systems

- Identify the various types of exhaust systems and explain how they relate to the engine and or equipment
- Inspect and service exhaust and understand the procedures for testing for compliance systems as they are related to emission requirements and standards
- Engine Block Components
 - Understand, identify and provide the necessary service/repair techniques to the various manufacturers within the industry; this could include disassembly, inspection and measuring of crankshafts, connecting rod bearings, journals, cylinders, piston and rings
 - Complete repairs to correct torque of critical fasteners and replace any gaskets and/or sealants

Diagnostic and Failure Analysis

- Demonstrate the proper use of the various specialized tools of the industry. Be able to test crankcase vacuum, compression gauge, leak down testers, voltmeters/multimeters and any other required tools
- Analyze failed engine components to determine the correct type of failure; determine best method to repair and estimate cost of repair

Shop Procedures

- Demonstrate the proper techniques in the care and use of tools and equipment
- Demonstrate the ability to work accurately with precision instruments
- Use proper safety procedures; demonstrate ability to use service manuals and/or bulletins
- Perform tasks within assigned time limits
- Give a verbal response to a customer and answer customer-related problematic questions
- Prepare equipment for delivery

Business Operation

- Demonstrate the ability to look up proper part numbers by using paper, microfiche and/or electronic means available
- Prepare both shop repair tickets and warranty claims
- Demonstrate the ability to calculate costs accurately
- Understand and operate equipment within equipment manufacturer's guidelines
- Understand effective customer interaction and professional customer communications and relations

Transmission/Power Train

- Understand the theory of transmission and transaxle components
- Disassemble power train components, assemble power train components and diagnose and correct a potential problem
- Understand the different types of transmissions and what types of lubrication systems are necessary for each

General Competencies

- Basic reading and comprehension
- Understand basic two- and four-stroke theory
- Understand electrical theory
- Understand carburetion theory and other related fuel systems
- Read and follow schematics for hydraulics, electrical, etc.
- Communicate effectively to others
- Demonstrate basic computer skills

Additional Resources and Notes

Additional source material can be found on the manufacturers' Web sites, through the local central distributors, dealers or manufacturers within each state. Those manufacturers are:

- Briggs & Stratton Corp.

- www.briggsandstratton.com
- Kohler Engines
 - www.kohlerengines.com
 - www.kohlerplus.com
- Tecumseh Products
 - www.tecumsehproducts.com
- Shindiawa
 - www.shindiawa.com
- MTD
 - www.mtdproducts.com
- Simplicity
 - www.simplicity.com
- Miller Welders
 - www.millerwelds.com
- John Deere
 - www.johndeere.com

Demonstrate professional development skills in a simulated customer-service or employment situation. Examples may include:

- Job interview
- Customer service scenario
- Communications
- Decision making, problem solving and/or critical thinking

Committee Identified Academic Skills

The SkillsUSA national technical committee has identified that the following academic skills are embedded in the power equipment technology training program and assessment:

Math Skills

- Use proportions and ratios to solve practical problems
- Use scientific notation
- Solve practical problems involving percents
- Measure angles
- Find surface area and perimeter of two-dimensional objects
- Find volume and surface area of three-dimensional objects
- Make predictions using knowledge of probability
- Make comparisons, predictions and inferences using graphs and charts
- Organize and describe data using matrixes
- Find slope of a line

Science Skills

- Plan and conduct a scientific investigation
- Use knowledge of patterns of cellular organization (cells, tissues, organs, systems)
- Describe basic needs of organisms
- Describe and recognize elements, compounds, mixtures, acids, bases and salts
- Describe and recognize solids, liquids and gases
- Describe characteristics of types of matter based on physical and chemical properties
- Use knowledge of classification of elements as metals, metalloids and nonmetals

- Describe and demonstrate simple compounds (formulas and the nature of bonding)
- Understand Law of Conservation of Matter and Energy
- Predict chemical changes to matter (types of reactions, reactants and products; and balanced equations)
- Use knowledge of potential and kinetic energy
- Use knowledge of mechanical, chemical and electrical energy
- Use knowledge of heat, light and sound energy
- Use knowledge of temperature scales, heat and heat transfer
- Use knowledge of sound and technological applications of sound waves
- Use knowledge of the nature and technological applications of light
- Use knowledge of speed, velocity and acceleration
- Use knowledge of Newton's laws of motion
- Use knowledge of work, force, mechanical advantage, efficiency and power
- Use knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices
- Use knowledge of principles of electricity and magnetism
- Use knowledge of static electricity, current electricity and circuits
- Use knowledge of magnetic fields and electromagnets
- Use knowledge of motors and generators

Language Arts Skills

- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures using interviewing techniques to gain information
- Analyze mass media messages
- Demonstrate comprehension of a variety of informational texts
- Use text structures to aid comprehension
- Identify words and phrases that signal an author's organizational pattern to aid comprehension
- Understand source, viewpoint and purpose of texts
- Organize and synthesize information for use in written and oral presentations
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases and online resources to access information in books and articles
- Demonstrate narrative writing
- Demonstrate persuasive writing
- Demonstrate informational writing
- Edit writing for correct grammar, capitalization, punctuation, spelling, sentence structure and paragraphing

Connections to National Standards

State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards

- Numbers and operations
- Measurement
- Problem solving
- Reasoning and proof
- Communication
- Connections
- Representation

Source: NCTM Principles and Standards for School Mathematics. To view high school standards, visit: standards.nctm.org/document/chapter7/index.htm. Select “Standards” from menu.

Science Standards

- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry

Source: McREL compendium of national science standards. To view and search the compendium, visit: www.mcrel.org/standards-benchmarks/.

Language Arts Standards

- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.