



What are competencies?

Competencies are the knowledge, skills and abilities needed to perform successfully in a job, in this case as a turf equipment technician.

How were these competencies developed?

Beginning in 2015, to build a competency-based continuing education curriculum for turf equipment technicians, GCSAA enlisted subject matter experts to conduct a job task analysis (JTA) and define the body of knowledge (BOK) a successful turf equipment technician possesses. Based on those findings, a comprehensive list of competencies was identified in eight domains.

How are the competencies organized?

The competencies identified through the JTA fall into eight separate domains. Each domain contains several categories of competencies. The eight domains are:

- Cutting Units
- Drivetrain Systems
- Electrical Systems
- Engine Systems
- Fundamentals of Turfgrass Operations
- Hydraulics
- Metalworking and Fabrication
- Spray Systems

How does GCSAA use these competencies?

All GCSAA education content is driven by competencies. With this information, gaps can be identified in the curriculum and education content developed in alignment with the competencies. Through this process, GCSAA ensures its education in equipment management addresses the real-world needs of turf equipment managers. The competencies also drive the Turf Equipment Technician Certificates by determining what is tested in the exams.

How does an individual use these competencies?

Competencies can be used as a benchmark for career planning. Any turf industry professional can use the competencies to gauge their level of knowledge, skills and abilities in equipment management, and to identify areas of improvement. When pursuing achievement of a certificate, the competencies serve as a guide to aid in preparation for the exams.



Cutting Units

(domain)

Reel Fundamentals *(category)*

Understand relationship between grass type and cutting unit setup

(competency)

Understand the fundamental of a reel mower

Understand factors affecting Height of Cut

Understand the fundamentals of a reel mower

Components

Understand operation of bearings

Understanding the fundamentals of a reel mower

Understanding the agronomic application of a reel mower

Attachments

Understanding the agronomic application of a reel mower

Settings and Adjustments

Understanding the fundamentals of reel mower setup

Understand calibration equipment

Sharpening and Maintenance

Understanding reel mower sharpening techniques

Understand calibration equipment

Identifying and Troubleshooting After Cut Appearance

Understanding the fundamentals of reel mower setup

Rotary Mower Fundamentals

Understand rotary mower setup

Rotary Mower Components

Understand rotary mower setup

Rotary Mower Sharpening

Understand rotary mower sharpening techniques



Safety

Understand safety issues



Drivetrain Systems

Drivetrain

Diagnose and repair all drivetrain types
Understand gear ratios

Manual Transmissions

Diagnose and repair manual transmissions
Diagnose and repair synchronizers
Measure and adjust transmission shaft endplay

CVT-Belt Drive System

Diagnose and repair turf equipment CVT-belt drive clutch systems
Understand how the CVT-Belt Drive clutch system operates

Mechanical Clutches

Diagnose, repair, and maintain mechanical clutches

Differentials

Diagnose and repair differentials

Axle Bearings

Diagnose and repair axle bearings

CV Joints

Diagnose and repair CV joints

Universal Joints

Diagnose and repair universal joints

Brakes

Diagnose and repair typical hydraulic brake systems



Gear Boxes

Diagnose and repair gear boxes

Planetary Drives

Diagnose and repair planetary drives

Safety

Follow safety procedures



Electrical Systems

Basic Concepts of Electricity

Understand alternating current and direct current

Voltage and Current in Practical Circuits

Understand different types of circuits

Understand Ohm's law

Batteries

Test a battery

Generators (including Alternators), Starter Generators, and Motors

Identify components of AC generators

Test a charging system

Identify characteristics of a DC motor

Identify operation of components in a starter generator

Understand function of a starter generator

Identify the functions of the regulator/rectifier

Circuit Control, Protection and Conductors

Identify electrical symbols

Understand the function of circuits on a schematic

Identify the function of potentiometers

Understand the concepts of electron control modules

Identify the fuse on a schematic

Identify electrical components

Identify the condition of a fuse

Understand fuse ratings

Understand function of circuit breakers

Repair wiring systems



Troubleshooting

Troubleshoot electrical systems

Using Test Equipment

Use multimeter

Safety

Understand safe electrical system repairs and identify potential hazards



Engine Technology

Internal Combustion

Understand engine calculations
Understand the components and construction of an engine

2 Cycle Gasoline Engines

Understand the operation of a two-stroke cycle gasoline engine
Diagnose and repair a two-stroke cycle gasoline engine

4 Cycle Gasoline Engines

Diagnose and repair a four-stroke cycle gasoline engine

Diesel Engines

Understand diesel fuel systems including pump types and injection nozzles
Understand diesel starting aids
Understand injection nozzles

Safety Spark and Compression Ignitions

Understand the different types of ignition systems
Understand characteristics of sparkplugs

Gasoline Fuel Systems

Understand the characteristics and function of carburetors
Understand components and function of gasoline electronic fuel injection

Fuels

Understand the characteristics of different fuels including gasoline, diesel, biodiesel, ethanol, propane, and mixed oil and gas

Air Intake and Turbochargers

Understand the characteristics and function of air intake systems
Understand the characteristics and function of turbo chargers



Diesel Combustion and Emissions (Tier 4)

- Understand diesel Tier 4 regulations on emissions
- Understand High-Pressure Common Rail Fuel System (HPCR)
- Understand Diesel Particulate Filters (DPF)

Lubrication System

- Understand the different lubricating oil systems

Rebuilding/Reassembly

- Rebuild/reassemble different types of engines.

Testing, Troubleshooting and Tools

- Test and troubleshoot combustion issues in various engines.
- Troubleshoot combustion issues based on smoke analysis
- Use measuring tools properly

Safety

- Follow safety procedures



Fundamentals of Turfgrass Operations

Understand Plant Biology

Understand basic turfgrass plant structure and anatomy, species identification and characterization, morphology, adaptation, metabolism and plant growth mechanics

Understand basic genetics and have a basic awareness of turfgrass cultivars

Understand the role nutrients play with plant growth and health

Identify the impact of maintenance operations on plant growth, health and metabolism

Manage Fertilization

Interpret fertilizer labels

Understand fertilization application techniques and turfgrass requirements for healthy turfgrass and playability as they relate to soils and plant nutritional requirements

Manage Irrigation

Identify major soil types on the turf, learn about the properties of these soil types

Manage Primary Turfgrass Practices

Identify the impact of height of cut, frequency of clip and cutting unit setup on playability and plant health (sharpness)

Identify the height of cut that will impact after cut appearance issues

Given a scenario, determine maintenance procedures to deal with turfgrass health, playability and stress problems

Manage Supplementary Turfgrass Practices

Understand and use supplementary turfgrass cultural practices including coring, drilling, slicing, spiking, vertical mowing, rolling, topdressing, matting, wetting agents, soil amendments, colorants, plant growth regulators and water-injection on the turf

Understand, and where applicable, plan and correctly utilize seasonal overseeding practices



Construct and Renovate

Identify the purpose and operation of construction and renovation equipment (e.g., chain saws, rock pickers, root rakes, graders, loaders, scrapers, skid steer loader, bulldozer, landscape rakes, backhoes, etc.)

Understand Pest Management

Interpret fertilizer and plant protectant labels, MSDS, restrictions, target species, etc.

Understand compatibility of ingredients for tank mixes and incorporate the jar test method in conjunction with label instructions

Instruct staff in proper use and disposal of plant protectants and packaging

Understand drift, volatilization, runoff and leaching and how best to reduce risk

Manage Equipment

Apply proper calibration techniques and tools for turf equipment (tape measure, weight scales, volume measurement equipment, calculators)

Apply recommended procedures for safe operation of turf equipment

Understand and ensure compliance with any regulations pertaining to equipment storage and maintenance operations

Understand and manage noise and air pollution generated by turf equipment, its environmental impact and potential health issues

Conduct Safe Operation

Resolve safety problems on the turf and in the workplace

Ensure safety policies and procedures for equipment maintenance operation are followed

Develop a Crisis Management Plan

Identify required actions and objectives of an emergency response plan (warning systems)

Develop a Crisis Management Plan Communicate Effectively

Understand and relay written and oral business and technical information necessary for job performance



Comprehending Environmental Impacts

Understand the components of air pollution (particulate matter, carbon dioxide, etc.) and explore ways to minimize impacts

Environmental Management

Ensure that the maintenance facility employees are aware and properly trained in the environmental safety plan

Management of Hazardous Materials

Train employees to handle hazardous materials safely

Understand Climate and Atmosphere

Develop a basic understanding of meteorology



Hydraulics Systems

Hydraulic Principles and Fluid

- Understand the hydraulic principles of flow and pressure
- Understand the properties of hydraulic fluids
- Understand the function of hydraulic fluid in a hydraulic system
- Identify hydraulic system contaminants
- Understand function of filters in a hydraulic system

Pumps

- Identify hydraulic pumps types

Actuators

- Understand function of hydraulic cylinders
- Identify hydraulic motor types

Valves and Controls

- Troubleshoot and repair hydraulic systems
- Identify types of hydraulic spool valves
- Identify the function of hydraulic system relief valves
- Identify the function of hydraulic system logic cartridges
- Identify the function of hydraulic system directional flow valves

Additional Components

- Identify characteristics of hydraulic system strainers and filters

Seals and O-Rings

- Repair hydraulic systems

Schematics

- Understand the function of hydraulic system components from a schematic

Lines and Fittings

- Understand different types of hydraulic fittings



Systems

Identify a hydrostat
Identify the function of a Mono-Block

Test Tools

Troubleshoot and repair hydraulic systems

Safety

Identify safety issues with hydraulic systems
Identify turf issues with hydraulic fluids



Metalworking and Fabrication

Metals and other materials

Understand how to select materials for metalworking projects
Understand the properties of types of metals

Design, Measurement and Layout

Design a metalworking project with tolerances
Use measurement tools (protractors, squares, rules, calipers, straight edge and surface plate, V-blocks, dial indicator, Vernier scale, etc.)
Lay out the metalworking project

Cutting

Select the drill bit and procedure based on the materials (drill bit, hand drill motor, drill press)
Select the tap and procedure based on materials (thread type, drill speed, fluids, sharpening bits)

Welding

Use welding techniques (stick, mig, gas, and tig) based on materials
Use brazing based on materials

Grinding

Use grinding to remove material (bench, angle, maintenance, tuning, use, die grinding)

Files

File the material (filing, using, selecting correct file, using correct technique, file maintenance)

Forming

Form the material using the proper tools (bend, curve, form, vice, hammer, anvil, Arbor press, English wheel, brake, etc.)



Machining

Understand the capabilities of different types of machining tools
Understand keyways

Finishing

Finish a metalworking product (surface preparation, abrasive blasting, priming, and painting)

Safety

Follow safety procedures



Spray Systems

Mathematics

Identify how to calculate a speed (meters per second and miles per hour)

Calibration

Identify the calibration process of spray systems

Given a scenario about a sprayer, identify proper calibration procedures and tools to calibrate the equipment

Components

Identify the characteristics, advantages, and disadvantages of centrifugal pumps

Identify the problems caused by cavitation in a centrifugal pump

Given a scenario, identify how to properly install centrifugal pump seals

Given a scenario, identify how to properly install diaphragms and valves

Identify the steps to prepare a pump for short-term storage

Given a graphic of a spray system, identify the components

Identify the functions of a spray monitor

Identify the functions of spray controllers

Identify the nozzle spray pattern that is operating correctly

Given a scenario, identify how to check that a check valve is operating correctly

Given a scenario about a faulty control valve, identify how to troubleshoot and repair the problem

Identify the individual parts of a control valve

Identify the advantages and disadvantages of manual and electric control valves

Identify the function of flow control valves

Identify the function of a flow meter

Identify the function of foam markers

Identify the function of pulsation dampeners

Spreader Calibration

Identify the calibration process for spreaders



Maintenance and Troubleshooting

- Identify sprayer preventative maintenance checks
- Identify the steps needed to winterize a sprayer system
- Identify the characteristics of the pressure change of agitation on the spray system

Safety

- Given a scenario about storing a sprayer, identify courses of action that should followed to prevent runoff and leaching
- Identify safety concerns when working with chemicals in a spray system
- Given a scenario, identify the personal protective equipment is required