



## **What are competencies?**

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

## **How were these competencies developed?**

Beginning in 2015, to build a competency-based continuing education curriculum for turf equipment managers, GCSAA enlisted subject matter experts to conduct a job task analysis (JTA) and define the body of knowledge (BOK) a successful turf equipment manager possesses. Based on those findings, a comprehensive list of competencies was identified in eight domains. Later, a second level of the career path was created based on advanced competencies in all eight domains and adding business, communication, leadership, and environmental management.

## **How are the competencies organized?**

The competencies identified through the initial 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

To develop the next level of the turf equipment management career path, competencies were identified in four additional domains:

- Business
- Communication
- Leadership
- Environmental Management



### **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 Equipment Management 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)

## **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



## **Business**

### **Management**

Manage purchasing systems  
Manage inventory control system  
Manage accounting duties and budget

## **Communication**

### **Communication**

Manage conflicts

## **Leadership**

### **Leadership**

Promote ethics and values

## **Environmental Management**

### **Environmental Management**

Comprehend environmental impacts

### **Best Management Practices**

Best management practices – equipment management  
Best management practices – understand pest management  
Best management practices – manage primary turfgrass practices