CUGE
CENTRE FOR URBAN GREENERY AND ECOLOGY

WS SINGAPORE WORKFORCE SKILLS QUALIFICATIONS

Turf Maintenance (Level 2)

LNS-GNM-2016-1.1

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Safety Briefing

In the unlikely event of an emergency; remain calm and take instruction from the trainer.

Take note of the following:

- ❑ Exit door locations
- ❑ Location of first aid equipment
- ❑ Location of fire extinguishers and fire alarms
- ❑ Assembly area

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About the Trainer

Ice Breaker

Participants to think of their favorite plant; what is it and why do you like it?

- Introduce yourself
- Tell us what the plant is
- Tell us why you like this particular plant

Workforce Skills Qualifications

The Singapore Workforce Skills Qualification (WSQ) is a national credential system that trains, develops, assesses and certifies skills and competencies for the workforce.

As a CET system, WSQ supports the SkillsFuture movement to

- promote recognition of skills and competencies to facilitate progression, mastery and mobility,
- promote holistic development of the workforce through technical and generic skills and competencies,
- support economic development by professionalising skills and competencies to drive industry transformation, productivity and innovation efforts, and
- encourage lifelong learning.

Source: SkillsFuture Singapore

WSQ Key Features

Relevance	Accessible	Progression	Authority
A competency-based system, designed to develop job role-specific skills and competencies, as well as generic skills and competencies that are required across job roles.	Does not require academic pre-requisites for entry and recognises prior learning. Available in bite-size modules leading to the award of a Statement of Attainment, which an individual may acquire leading up to a full WSQ qualification.	Makes available skills and qualification pathways which align to the Skills Frameworks for the respective sectors.	Statements of Attainment and qualifications are quality assured and awarded by SSG and/or in partnership with established awarding bodies.

Source: SkillsFuture Singapore

LO1: Implement control measures for pest, diseases and invasive species on turf

Inclusive of Learning Outcome 5: Manage hazards and risks associated with turf maintenance

At the end of the course, participants will have the following knowledge:

K1: Threat to turf health, including pests, diseases, decay or invasive species
K3: Biological and chemical means for removing invasive species

A competent individual must be able to perform the following:

A2: Inspect turf for weeds, soil irregularities, adequacy of moisture and nutrients, and pest infestation
A3: Apply chemicals to control invasive species over turfed area
A7: Apply chemicals to prevent pest, disease or infestation or invasive species

LG 2

Common Types of Turfgrasses

Turfgrasses undergo various stress factors especially in an urban environment. These environmental stresses cannot be changed and can only be overcome by species selection and special management practices.

Below mentioned are common types of turfgrass which can withstand both wet soil and flooded condition.

Implement control measures for pest, diseases and invasive species on turf

LG 2

Common Types of Turfgrasses

Axonopus compressus (Cow grass)

St. Augustine Grass (Buffalo Grass)

Implement control measures for pest, diseases and invasive species on turf

LG 3

Common Types of Turfgrasses

Cynodon dactylon (Bermuda Grass)

Zoysia matrella (Manila Grass)

LG 3

Common Types of Turfgrasses

Paspalum vaginatum
(Seashore Paspallum)

LG 4

Threats to Turf Health

The health of turf is under regular attack from common threats such as:

1. Weeds
2. Diseases
3. Pests

These threats can cause the turf to look unsightly and bare, become unhealthy and even die.

LG 4

Threats to Turf Health

Weeds

- Weeds are fast-growing plants that become invasive if not treated.
- They compete for food and nutrition with other plants.
- They outgrow the grass and often appear before it is time to mow the grass.

LG 4

Threats to Turf Health

Common Weeds

1. **Mimosa (**Touch-me-not or Shame plant)

Mimosa pudica

- Able to spread fast
- A sensitive plant will close or fold its leaves inwards when touched
- It usually only grows 15-50cm tall, but can reach up to 1M or more in height when supported by other vegetation

LG 4

Threats to Turf Health

Common Weeds

2. Lalang

Imperata cylindrica

- Common weed in unmanaged grass and bush
- Its long blade can extend up to a person's height
- It grows in spreading clumps to 0.6 to 1.2M tall

LG 5

Threats to Turf Health

Common Weeds

3. Broadleaf Plantain

Plantago major

- Common invasive species found all over turf or lawn in Singapore
- Difficult to remove
- It grows up to 15-45cm tall. Oval-shaped leaves (15cm long, 10cm wide) are arranged in a rosette which lies close to the ground

LG 5

Threats to Turf Health

Common Weeds

4. Virginia Buttonweed

Diodia virginiana

- Deep-rooted weed with spreading branches
- Able to spread fast and can withstand mowing
- It grows up to 0.1 – 0.8M tall.

LG 5

Threats to Turf Health

Common Weeds

5. Love grass

Chrysopogon aciculatus

- Seed dispersal and ‘hooks’ on to nearby surfaces (e.g., clothes, shoes, tools, and equipment)
- Able to spread fast and can withstand mowing
- It grows up to 15 - 25cm tall.

LG 6

Threats to Turf Health

Pests and Diseases

Pests

Pests attack turf in different ways. Some pests eat away the grass' blades while others chew on the roots. Digging pests can destroy the turf’s root system as they can move underground.

LG 6

Threats to Turf Health

Pests and Diseases – Common Turf Pest

1. Sod webworm

Herpetogramma licarsisalis

- Sod webworms are the larvae of the sod webworm moth.
- They feed on grass blades and entire stems, leaving behind brown patches.
- Their damages are very fast and wide turf area.
- Young larvae feed in the night and hide during the day in the burrows they create in the soil

LG 7

Threats to Turf Health

Pests and Diseases – Common Turf Pest

2. Armyworm

Spodoptera Mauritia

- The larvae are a soft bodied caterpillar with a dark coloured body up to 45mm long
- Larvae often appear in groups when feeding, bundle around stems and foliage of the turf plant.
- The larvae of the armyworm are usually most active in the evening or at night
- They attack leaves, stems and seed heads infestations to turf on golf surfaces

LG 8

Threats to Turf Health

Pests and Diseases – Common Turf Pest

3. African Black Beetle

Heteronychus arator

- African black beetle can grow into 12mm to 15mm in size
- The beetle damage root of turf and the plant loses ability to access moisture in the soil
- During severe damage, large patches of turf lose root structure and turf can actually be peeled back exposing large number of feeding larvae
- The biggest turf damage can occur from birds digging turf up to feed on larvae

LG 9

Threats to Turf Health

Pests and Diseases – Common Turf Pest

4. Black Cutworm

Agrotis ipsilon

- Black Cutworm caterpillar pest found mainly on golf greens
- Cutworm larvae usually feed during the night and typically cut off young plants at the crown level and pull them into a burrow
- This result bald patch of turf surrounding the burrow.

LG 10

Threats to Turf Health

Pests and Diseases – Common Turf Pest

5. Ants

Lasius flavus

- Ants are not generally considered dangerous pest, but they can pose significant health and damaged to turf grass
- Tunnel underground, causing soil to dry out fast. Resulting in dried and dead patches on turf
- Their hill building causes root damage to grass and unsightly mounds
- These colony pests build in large numbers cause damage in grass root systems
- Ant hills in grass may pose a hazard to foot travellers and mower blades
- They bite human or animal on the turf

LG 11

Threats to Turf Health

Pests and Diseases – Common Turf Fungus

Diseases

Disease can cause extensive damage or death to grass as they can spread across a large turf area. Most turf diseases are caused by fungus.

LG 11

Threats to Turf Health

Pests and Diseases – Common Turf Fungus

1. Brown Patches

Rhizoctonia solani

- Rings or patches of blighted turfgrass
- Harm only blade of grass not the roots
- Caused by heat, humidity and excessive nitrogen

LG 11

Threats to Turf Health

Pests and Diseases – Common Turf Fungus

2. Dollar Spot

Sclerotinia homoeocarpa

- Sunken, circular patches
- Patches turn from brown to hay colour
- More severe in dry soil

LG 11

Threats to Turf Health

Pests and Diseases – Common Turf Fungus

3. Powdery Mildew

Erysiphe graminis

- The leaves have a greyish-white or powdery appearance.
- Severely infected turf turns yellow, then tan and brown
- Severely infected turf, especially in shaded areas, can become thin and eventually die

LG 12

Threats to Turf Health

Pests and Diseases – Common Turf Fungus

4. Fairy Ring

Marasmius oreades.

- It has outer rings that are either dark-green or brown in colour
- The shape and size of rings vary depending on the species
- Above ground mushroom may appear

LG 12

Methods to Control and Prevent Pests, Diseases and Invasive Species

Common Methods to Treat Turf	
Mechanical	• Physically pull-out weeds. • Manual weeding is often ineffective on weeds as they have underground roots that continuously produce new weed plants.
Biological	• Use of natural enemies to control pests, not common in Singapore. • For example, the use of parasitic wasps to control aphids, wasps lay eggs in the aphids. As the wasp grows, the aphid will die.
Chemical	• Use of chemical: herbicide, insecticide and fungicide.

LG 13

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Contact Chemicals

- Chemical that kills pest directly upon contact and deadly to the target pests and insects.
- Example of contact chemicals are:
  - **Fungicides** – Inhibits the growth of fungi
  - I**nsecticides** – Treat insect infestations

Systemic Chemicals

- Chemicals that are absorbed by a plant when applied to seeds, soil, or leaves.
- The chemical then circulates through the plant's tissue, killing the insects that feed on them
- Example of systemic chemical are:
  - **Herbicides** – Systemic and translocated into plant system to kill weeds

LG 14 **Chemical Application to Control and Prevent Pests, Diseases and Invasive Species**

Commonly used Horticultural Chemicals

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White Summer Oil
Kills aphids, mealybugs, scales, whiteflies</td>
<td> 

Diazinon
Treat leaf spots</td>
</tr>
<tr>
<td> 

Malathion
Kills aphids, mealybugs, mites</td>
<td> 

Captan
Treat leaf spots, fruit rots</td>
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</table>

LG 14

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Commonly used Horticultural Chemical – Types of Herbicide

Types of Herbicides for treating Invasive Species	
Selective Herbicide	Herbicide that targets specific weed species
Non-selective Herbicide	Herbicide that kills all plants when comes into contact

LG 14

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Off-Target Chemical Spraying

Off-target spraying can cause damage or injury to plants, the environment and can also affect human health. Misused of chemical is the main factor for off-target spraying.

Manufacturers' labelled instruction and safety precautions:

- Recommended dosage
- Date of manufactured
- Date of expiry

LG 15&16

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Off-Target Chemical Spraying

The Globally Harmonised System of Classification and Labelling of Chemicals, GHS pictograms would be the most commonly used on pesticide labels

Flammables, Self Reactives, Pyrophorics, Self-Heating, Emits Flammable Gas, Organic Peroxides

Burns Skin, Damages Eyes, Corrosive to Metals

Acutely Toxic (severe)

Explosives, Self Reactives, Organic Peroxides

LG 17

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Handle and Storage of Chemicals

Handle and store chemicals appropriately as required by WSH regulations:

- Appropriate containers in the approved area (under lock and key)
- Above ground level
- At room temperature
- Properly labelled

LG 18

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Preparing for Chemical Spraying

- Face and Eye protection
  - Face shield
  - Face Mask
- Body Protection – Raincoat
- Hand Protection – Rubber gloves
- Feet Protection – Rubber safety boots

LG 20

Tools and Equipment for Mixing and Applying Horticultural Chemicals

Measuring Jug

Horticultural Chemicals

Pail

Backpack sprayer

Hand-held sprayer

LG 20

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Steps of Chemical Spraying – Pre-start

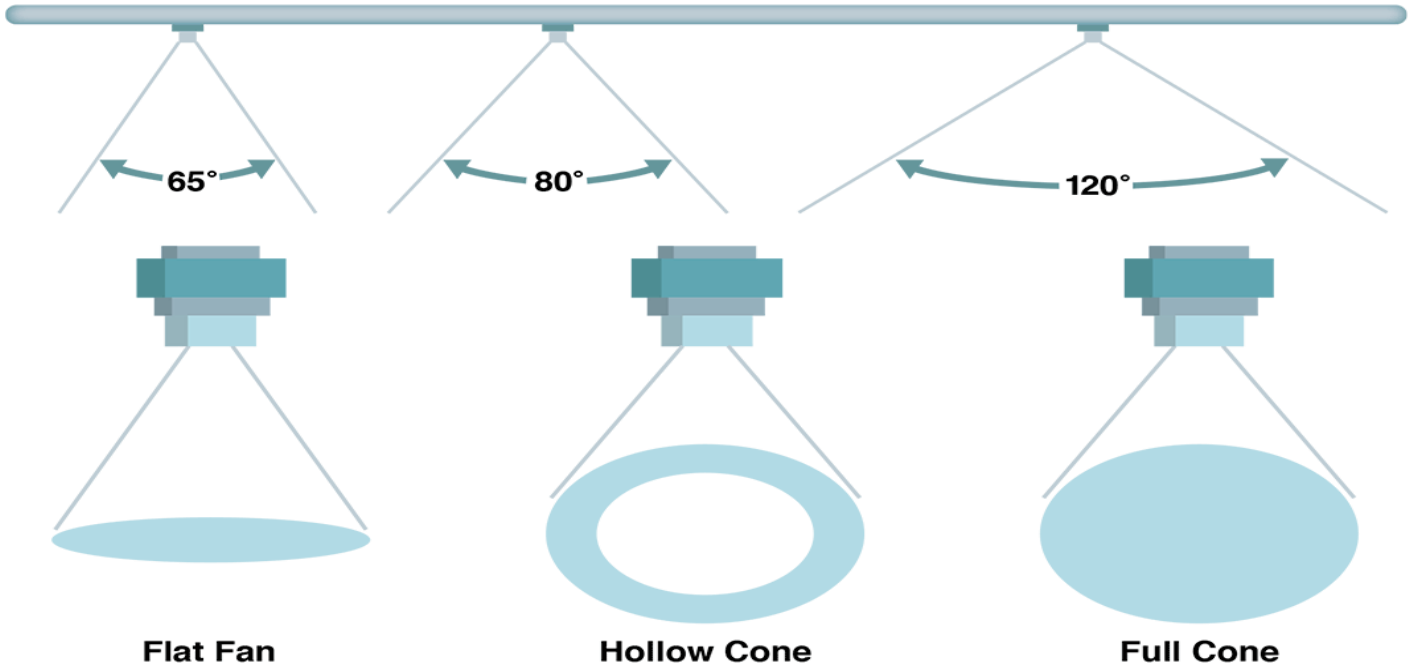
1. Wear appropriate PPE at all times during application of chemicals.
   - Check all equipment are safe for the task

2. Inspect the turf grass:
   - Identify the symptom of the weeds on the turf
   - Identify the location of weeds within workzone
   - Assess the turf environment, e.g., poor drainage and compaction of ground, signs of yellow or brown leaves of grass

LG 45

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Steps of Chemical Spraying – Pre-start



3. Pick the right nozzle for the backpack sprayer for spraying

The nozzle tips look like this:

LG 20&21

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Steps of Chemical Spraying – Pre-start

4. Pour some water into sprayer before mixing chemical into sprayer

5. Used recommended quantity of chemical as per bottle label.

6. Use a measuring jug / cup to measure required quantity.

7. Chemical is diluted with water and add into the sprayer.
   - If unclear, always check with supervisor for correct types and dosages.

8. Pump the sprayer 10 to 15 time before start spraying

9. To ensure uniform coverage, pump the handle every 5 seconds to ensure constant pressure.

LG 21

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Steps of Chemical Spraying – Pre-start

10. Target only at the designated area and spray evenly from waist height.
    - Avoid spraying off target as this will cause damage or injure the turf

11. After completed spraying, avoid walking on areas that you have just sprayed.
    - You may risk carrying chemicals on your shoes into other areas.

LG 21

Chemical Application to Control and Prevent Pests, Diseases and Invasive Species

Steps of Chemical Spraying – Pre-start

12. Rinse sprayers after each use.
    - Do not pour the rinsed water into sinks, drains or hard surfaces.
    - Pour the rinsed water in the designated pail.
    - All chemical waste will be send to NEA (National Environment Agency) designated waste collection centre

13. After spraying, wash hand thoroughly with soap.

LG 22

Learning Activity 1

In groups, cordon worksite,

1. Assess turf condition and share the findings
2. Perform chemical spraying targeting the turf condition.

Learners to perform the following:

- Cordon worksite area
- Inspect the assigned turf plot for the exact location of weeds
- Dress in PPE for chemical spraying
- Mix of chemical according to the given ratio
- Target weeds and spray evenly from waist height
- After complete spraying of chemical, rinse sprayer at the dedicated location
- Wash hands thoroughly after all have completed

LO2: Perform mowing to maintain the finish and aesthetic of turf

Inclusive of Learning Outcome 5: Manage hazards and risks associated with turf maintenance

At the end of the course, participants will have the following knowledge:

K2: Operation techniques for specialised turf equipment and machinery
K6: Methods and techniques to maintain the finish and aesthetics of turf

A competent individual must be able to perform the following:

A4: Mow turf using specialised turf tools and machinery

Perform mowing to maintain the finish and aesthetic of turf

LG 23

Mowing is important to maintain the look and health of the turf. Mowing stimulates the growth of turf, making it stronger to fight against the pests, diseases and invasive species.

PPE

- Soft hat
- Safety glasses
- Earplug
- Long sleeve shirt / tee shirt
- Cotton gloves
- Long pants
- Safety boots

LG 24

Setup Work Zone for Grass Cutting in Open Spaces

- Carry out grass cutting operations in parks during specified times.
- Areas with high human traffic should be barricaded.
- Always place the warning on the brush cutter or mower to caution other vehicles and persons.

LG 24

Setup Work Zone for Grass Cutting in Open Spaces

- Check working environment for any hazards, e.g., stones, glass, nails or other unwanted items.
  - Remove them to avoid items flying off and hit others when cutting.

Perform mowing to maintain the finish and aesthetic of turf

LG 25

Tools and Equipment for Mowing

Walk-behind Rotary Mower

Knapsack Brush cutter

Bunker Rake

Clam Shell Shaped Basket (Pungkes)

LG 26

Mowing Methods

1. Using Knapsack Brush Cutter

- A brush-cutter (nylon trimmers) is a petrol-powered hand-held machine that uses a flexible thin strand nylon line for cutting grass.
- It is used in areas where mowers cannot reach (such as the edge of footpaths, drains, road kerbs, or bases of trees).
- If used in an unsafe manner, the brush cutter can cause serious injuries to workers and other people in the vicinity.

LG 26

Mowing Methods

1. Using Knapsack Brush Cutter – Pre-start check

1. Check the brush cutter for any defects before use.
   - Make sure that the safety guards are in place before operation
   - Adjust the harness and handles to suit your height

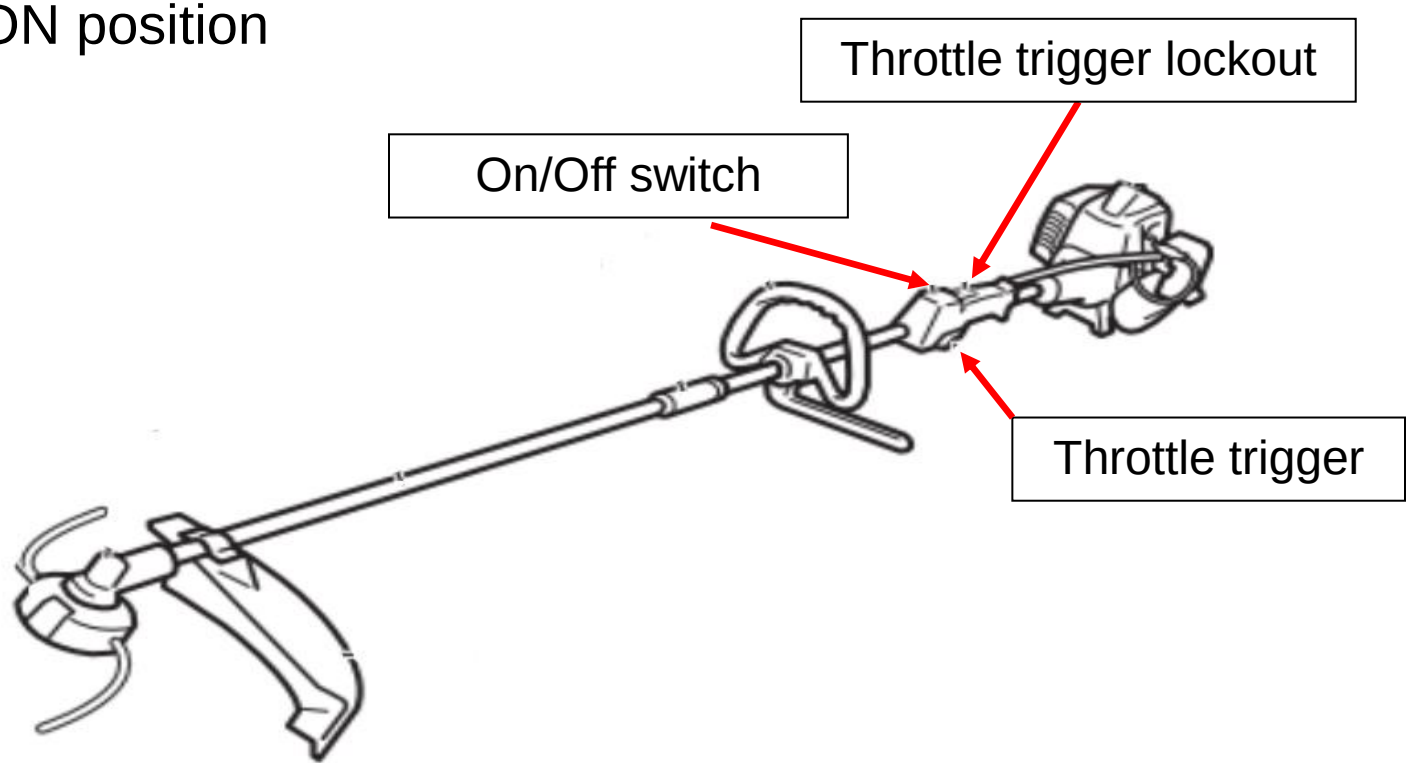
2. Make sure the attachments are mounted correctly and securely.

LG 27

Mowing Methods

1. Using Knapsack Brush Cutter – Pre-start check

3. Start the engine for the brush cutter
   a. Turn the switch to ON position



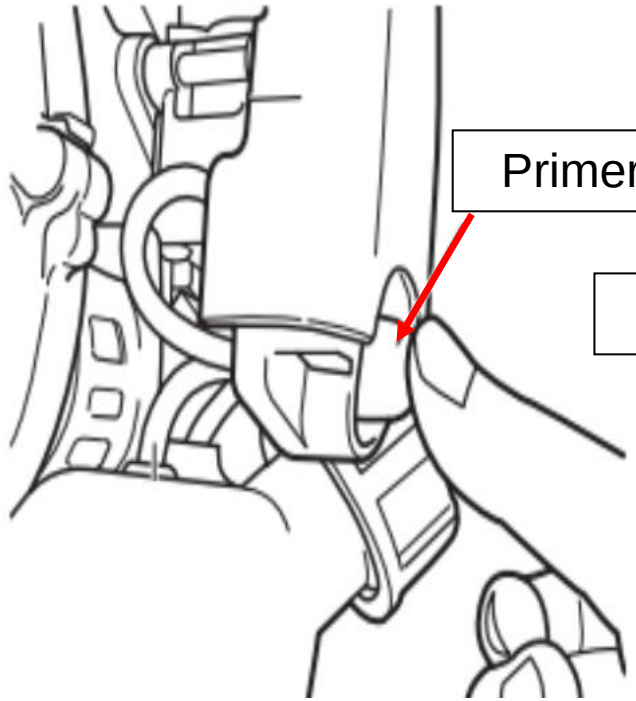
LG 27

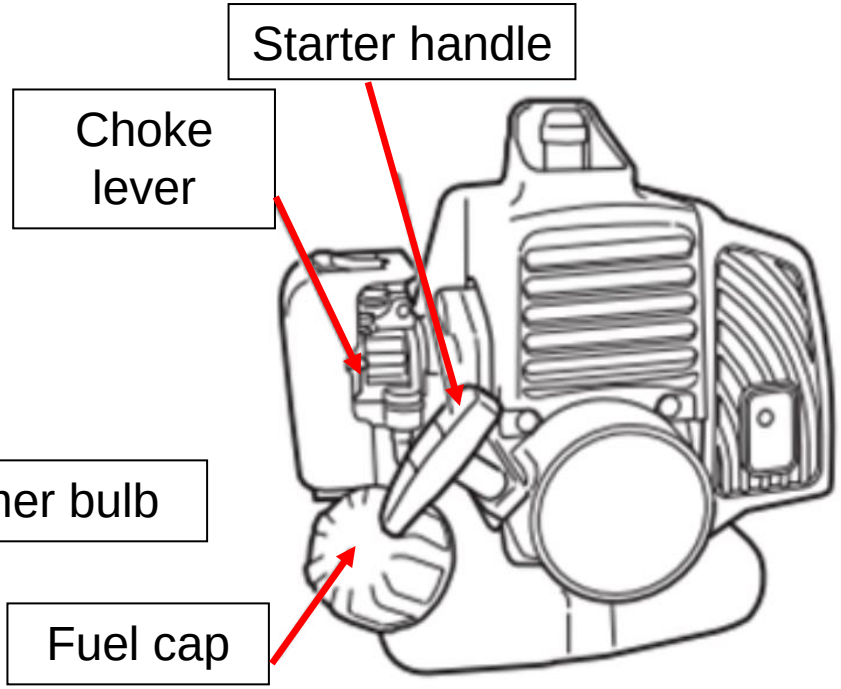
Mowing Methods

1. Using Knapsack Brush Cutter – Pre-start check

b. Push primer bulb few times for fuel to flow to return pipe
c. Set choke to CLOSED position
d. Pull starter handle
e. Set choke to RUN position
f. Allow engine to run 2 -3 minute before any cutting

4. Keep a safe distance from other people (15 meters or more) when operating.





LG 28

Mowing Methods

1. Using Knapsack Brush Cutter – Steps to operate

1. Start in a well-ventilated area e.g., open turfed or lawn space.
2. Make sure that the safety guard is in place before operation.
3. Always keep both hands on the control handle
4. Maintain good control of the brush cutter.
   - Do not strike its cutting head against any solid objects, e.g., concrete, rocks, woods).
5. Keep the cutting head below the waist and do not operate it above head level.
6. Keep hand, feet and other body parts away from the nylon string.
7. Switch off the engine and let the nylon line come to a stop before lifting the brush cutter to a new position.
8. Make sure the brush cutter is well-maintained and without alteration, to minimise the level of noise generated.
9. After completion of cutting, use a rake to redistribute the clippings evenly over turf

LG 28

Mowing Methods

1. Using Knapsack Brush Cutter – Steps to operate

Maintain good control of brush cutter, keep cutting head below waist level and keep body away from nylon

LG 29

Mowing Methods

2. Using Walk-behind Rotary Mower (Push-Behind Lawn Mowers)

- Another cutting machine that only requires workers to walk behind and guide the movement is the Walk-behind Rotary Mowers.
- They are easy to move in compact spaces hence used usually in small turf area only.

LG 29

Mowing Methods

2. Using Walk-behind Rotary Mower (Push-Behind Lawn Mowers) – Pre-Start check

1. Make sure that the starter cable is connected to the spark plug.

LG 29

Mowing Methods

2. Using Walk-behind Rotary Mower (Push-Behind Lawn Mowers) – Pre-Start check

2. Stand behind the mower.
3. Start the engine start/stop lever with one hand.
4. The other hand must be on the starter handle
5. Start the engine using the starter handle and then start with a sharp quick pull.
   - If the engine does not start, pull the handle again.

LG 30

Mowing Methods

2. Using Walk-behind Rotary Mower (Push-Behind Lawn Mowers) - Steps to operate

1. Maintain a proper balance and secure footing
2. Calibrate mower to correct cutting height of 25 to 30 mm for Axonopus compresses (Cowgrasss)
3. Mow in a forward direction, straight lines for a nice, clean cut.
4. Keep hands and feet away from rotating parts.

LG 30

Mowing Methods

2. Using Walk-behind Rotary Mower (Push-Behind Lawn Mowers) - Steps to operate

5. Keep a distance away from the mower in case of slip accident.
6. Turn off the engine before doing any check on the blades.
   - Always remember that the blade continues to rotate for a few seconds after the engine has been turned off.
   - Do not attempt to manually stop the blade.
7. If the blade hit on an object, turn off the mower immediately and wait for complete stop.
8. Always keep the underside of the mower deck clean and remove grass clipping that have built up and place into a clam shell shaped basket (pungkes) for distribution on turf.
9. Use a rake to even out the grass clipping.

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Mowing Methods

Other types of mowers

1. Robotic lawn mower

- The machines, which operate like robotic vacuum cleaners were tested for safety and battery life.
- It is able to cut the grass continuously, the grass clippings would be small and would fall and be left on the ground to act as fertiliser, reducing the need for someone to manually clear the grass clipping.
- The mower can be tracked with its in-built GPS (global positioning system), and can be controlled remotely through the user's smartphone application.

LG 31

Mowing Methods

Other types of mowers

2. Ride-on lawnmower or a tractor lawnmower

- Designed to mow large areas of lawn at high speed in the shortest time possible
- Multi-gang (multi blade_ mowers are mounted on tractors and are designed for large area of grass such as golf courses and community parks.
- Persons using a mower should wear safety footwear, eye protection and hearing protection in the case of engine-powered mowers.

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Learning Activity 2

Learners to cordon work site and demonstrate grass cutting in an open space using both Knapsack Brush Cutter and Walk-behind Rotary Mower.

Learners to perform the following:

- Cordon worksite area
- Inspect the assigned turf and remove any hazard (stone, nails) that could hinder mowing safety
- Dress in PPE for mowing
- Use Walk-behind Rotary Mower to mow larger space
- Use Knapsack Brush Cutter for tight spaces (Near rocks, slope or corners the mower unable to reach)
- Remove grass clipping from Walk-behind Rotary Mower after mowing activity
- Redistribute the clipping on the turf, use a rake to even the clippings out

LO3: Apply horticultural practices on turfs

At the end of the course, participants will have the following knowledge:

K4: Fertilisers used for turf maintenance
K5: Functions of automated irrigation systems for turf

A competent individual must be able to perform the following:

A5: Perform routine maintenance of automated irrigation systems for turf
A6: Apply fertilisers to maintain nutrition levels of turf
A8: Apply topdressing to maintain the aesthetics of the turf

LG 33

Types of Fertilisers for Turf

Fertilisers are used on turf to help it stays green and grow strong and dense. Strong turf is able to resist the invasion of weeds and diseases.

Fertilisers can be categorised as:

- Organic Fertilisers
- Inorganic Fertilisers

LG 33

Types of Fertilisers for Turf

Organic

- Compost
- Plant extracts
- Seaweed
- Chicken manure
- Bone meal
- Blood meal
- Soybean meal

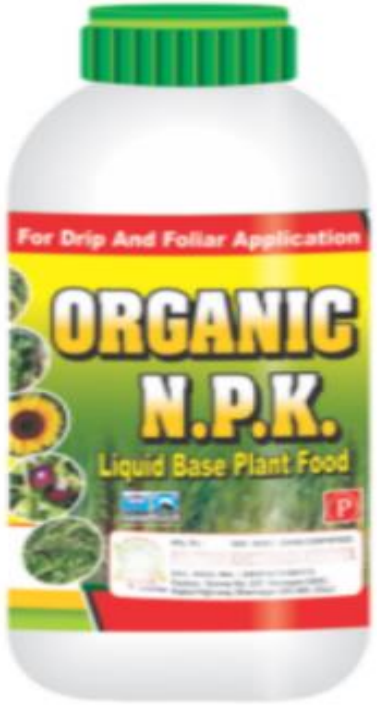
LG 34

Types of Fertilisers for Turf

Inorganic

15 parts **N** - Nitrogen
15 parts **P** – Phosphorus
15 parts **K** - Potassium

Granule N.P.K.



Liquid N.P.K.

Powder N.P.K.

LG 35

Types of Fertilisers for Turf

PPE for Fertilising and Topdressing

- Soft Hat
- Safety glasses
- Earplugs
- Long sleeve shirt / tee shirt
- Cotton gloves
- Long pants
- Safety boots

LG 36

Types of Fertilisers for Turf

Tools and Equipment for Fertilising Turf

Fertiliser

Topdressing

Clam Shell Shaped Basket (Pungkes)

Watering Can

Bunker Rake

LG 37

Types of Fertilisers for Turf

Steps for Fertilising Turf

1. Wear appropriate PPE for the work.
2. Select the fertilisers to be used for feeding the turf.
3. Check for wind direction. Manually spread (broadcast) fertilisers on turf in the direction of the wind.
4. Follow similar to the mowing pattern, feed your turf by walking back and forward in straight lines.
5. Once you have finished feeding your turf, return any unused fertiliser and store it for future uses.

Topdressing for Turf

Topdressing is an organic turf care method, the process of adding a thin layer of material over the turf, normally about 3mm of compost or other soil amendment / conditioner. The use of topdressing is to improve drainage and ease the breakdown of grass clippings.

Topdressing material may include:

- Washed sand
- Sandy loam
- Compost

Topdressing for Turf – Steps for topdressing turf

1. Apply up to a 3mm layer of topdressing material over the fertilised area.
2. Use the bunker rake to level the topdressing material evenly on the turf.
3. Always remember to water the fertilised turf area thoroughly so that the roots can absorb the nutrients effectively.
4. After completion fertilising and/or topdressing, avoid walking on area that you have just fertilised.

LG 39

Automated Irrigation System

An automatic irrigation system is a watering system with a timer and sensor to ensure the turf receives enough water. As turf irrigation usually covers large areas, the system can distribute the right amount of water to each turf area.

The systems also have rain sensors that can turn the sprinklers off during periods of heavy rains and then starts again when needed.

3 common types of systems used locally:

- **Traditional Spray System** – ground level and pop-up heads that spray water in a full, half or quarter circle.
- **Drip System** - water is dripped in slowly into the soil, allowing it to absorb at its own pace.
- **Rotor System** – used for commercial properties such as golf courses.

LG 39&40

Automated Irrigation System

Maintenance of irrigation systems involved many technical procedures such as:

- Turning on and off the main control for checking of irrigation system
- Checking of water pressure from irrigation sprinkler
- Check for damages on sprinkler head and other damage or leakages
- Adjust angle of irrigation sprinkler heads so that they cover the correct area to water and adjust water schedule depending on season

The above-mentioned maintenance work should ideally be carried out by irrigation professionals. A landscape maintenance technician can however carry out some basic checks on the irrigation system to help it function optimally:

LG 40

Automated Irrigation System

Basic Checks for Automated Irrigation System

1. Remove plant materials that grown over or near the sprinkler heads
2. Remove any dirt covering sprinkler valves.
3. Report to supervisor if the sprinkler is clogged, damaged or not working correctly..

LG 41

Learning Activity 3

Learners to cordon work site and demonstrate application of fertiliser and topdressing of allocated turf.

Learners to perform the following:

- Cordon worksite area
- Dress in PPE for fertilising turf
- Perform fertilising and topdressing using the steps above

LO4: Perform post-maintenance activities

At the end of the course, participants will have the following knowledge:

K7: Maintenance procedures for tools, equipment and machinery

A competent individual must be able to perform the following:

A9: Report maintenance problems and issues to supervisors

LG 42

Clean Tools, Equipment and Machinery

It is important to clean all tools, equipment and machinery after use.

Cleaning can prolong the equipment's lifespan and reduce the possibility of a disease or weed contamination when using equipment on different turf areas.

LG 42

Clean Tools, Equipment and Machinery

Post-Operational Maintenance for Knapsack Brush Cutter

1. Make sure that the equipment are turned off before cleaning.
2. Place the equipment on a flat ground
3. Use a cloth, wipe down the dirt on the brush cutter.
    - Be extra careful when you get to the engine as they may still be warm
4. Remove the dirt and debris stuck in the ventilation holes with a soft brush.
    - This will prevent the engine from overheating.
5. Use a hard brush to clean all the bits of grass, dirt and debris under the protective cover and line feed area.
6. Clean and wipe all tools and equipment.
7. Worksite must be cleaned, tidied and reinstated.

LG 43

Clean Tools, Equipment and Machinery

Post-Operational Maintenance for Walk-behind Rotary Mower

1. Unplug the spark plug to avoid any possible machinery
2. movement during cleaning that can cause injury
3. Dispose all grass clippings from the back deck/ grass catcher of lawn mower.
4. Turn the mower on its side and use a water hose to spray sway soil, grass and clipping build up under the mower
5. Use a brush and soapy water to scrub off balance build up
6. Use water hose to rinse off all soap and remaining loosen dirt
7. Dry mower before storing

LG 44

Clean Tools, Equipment and Machinery

Reporting Faulty Equipment

If you find a faulty equipment, or one with missing or loose parts, use a repair tag to indicate the fault. If the repair tag is not available, tie a red/white tape on the equipment to inform other people not to use the equipment.

Report the faulty equipment to the supervisor as soon as possible.

LG 44

Learning Activity 4

Learner to perform post-operation maintenance for knapsack brush cutter and walk-behind rotary lawn mower.

LO5: Manage hazards and risks associated with turf maintenance

At the end of the course, participants will have the following knowledge:

K8: Personal Protective Equipment (PPE) used in turf maintenance
K9: Relevant Workplace Safety and Health (WSH) guidelines

A competent individual must be able to perform the following:

A1: Wear appropriate PPE before commencing turf maintenance work
A10: Adhere to relevant WSH guidelines

LG 45

Personal Protective Equipment in Turf Maintenance

Head Protection – Safety Helmet

Depending on the location of the work site, safety helmet provides extra protection especially at location with many tall trees where there is a possible risk of fallen brunches.

Soft hats provide better shade for head, face and also eyes.

LG 45

Personal Protective Equipment in Turf Maintenance

Eye Protection – Safety Goggles/Glasses

Protect eyes again flying grass clipping during mowing and face shield protects eyes when performing any chemical spraying.

LG 46

Personal Protective Equipment in Turf Maintenance

Face Protection - Face Shield and Face Mask.

Essential when performing chemical spraying by protecting face against exposure to chemical hazards. and inhalation of chemicals.

LG 46

Personal Protective Equipment in Turf Maintenance

Ears Protection – Earplugs/Earmuffs.

To protect our ears against the noise from machinery like the knapsack brush cutter or walk-behind rotary mower.

LG 47

Personal Protective Equipment in Turf Maintenance

Body Protection – Long Sleeve clothing and Safety Reflective Vest.

Long sleeve clothing can reduce the sun contact with our body, protect again the flying grass clippings, soil or dirt during mowing. Safety Reflective vest will increase the visibility especially important when working near roadside.

LG 47

Personal Protective Equipment in Turf Maintenance

Hand Protection – Cotton Gloves and Rubber Gloves.

Cotton gloves is the basic hand protection for almost all horticulture work without chemical. For any chemical spraying, rubber glove will be a must to protect hands against any possible contact with chemical.

LG 48

Personal Protective Equipment in Turf Maintenance

Leg Protection – Long Pants of Heavy Material

Protect legs against machinery/equipment from cutting.

LG 48

Personal Protective Equipment in Turf Maintenance

Foot Protection – Safety Boots

Non-slip sole and steel-toes are recommended to protect feet from machinery and fallen objects. Rubber Safety boots (Yellow) is more advisable for chemical spraying..

LG 49

Other Hazards and Risks associated in Turf Maintenance

Vibration

The continuous use of vibrating hand-held equipment, including like a hedge trimmer, can result in Hand-Arm Vibration Syndrome (HAVS).

The most commonly observed HAVS is Vibration White Fingers (VWF), which is due to intermittent lack of blood supply to the fingers.

LG 49

Other Hazards and Risks associated in Turf Maintenance

Vibration

To prevent Hand-Arm Vibration Syndrome

- Take frequent short breaks
- Keep machine in proper working order, do not attempt to use damaged machine/equipment
- Do not use machinery continuously, depending on the acceleration of the user on the machinery, following table shows the recommended exposure time.

LG 50

Other Hazards and Risks associated in Turf Maintenance

Vibration

Vibration generated by hedge trimmer is around 2.3 to 4.5m/s2. As per the ACGIH (American Conference of Governmental Industrial Hygienists), it is recommended to operate the hedge trimmer for no more than 4 to 8 hours daily.

Vibration for Common Landscape Machinery

Machinery	 Chainsaw	 Lawn Mower	 Brush Cutter	 Hedge Trimmer
Vibration (m/s^2)	6	3.9 to 4.9	5 to 9	2.3 to 4.5

LG 51

Other Hazards and Risks associated in Turf Maintenance

Noise

Prolonged exposure to excessive noise can cause noise-induced hearing loss leading to noise-induced deafness (NID).

Earplugs can reduce **up to** 35dB(A)

LG 51

Other Hazards and Risks associated in Turf Maintenance

Noise

Noise Level for Common Landscape Machinery				
Machinery	 Chainsaw Tree Pruning	 Hedge Trimmer Shrub Trimming	 Brush Cutter Grass Cutting	 Lawn Mower Lawn Mowing
Noise Level dB(A)	91 - 107	92	85 - 90	86
Household Appliance	 Food Processor	 Hairdryer	 Electric Mixer	 Vacuum Cleaner

LG 51

Other Hazards and Risks associated in Turf Maintenance

Noise

Sound Pressure Level dB(A)	Maximum Duration per Day
85	8 hours
88	4 hours
91	2 hours
94	1 hour
97	30 minutes
100	15 minutes
103	7.5 minutes
106	4 minutes
109	2 minutes
111	1 minute

Permissible Exposure Limits for Noise extracted from WSH (Noise) Regulations 2011

LG 52

Other Hazards and Risks associated in Turf Maintenance

Noise

Noise Prevention and Control Methods

- Use hearing protectors (Earmuffs or earplugs) properly.
- Reduce noise exposure by limiting the duration of machinery usage.
- Keep sufficient distance from your co-workers when operating a hedge trimmer.
- Minimise the number of noisy machineries running at any one time.
- Proper usage of earplugs can reduce up to 35dBA, which allow safe work greater than 8 hours if required.

LG 52

Other Hazards and Risks associated in Turf Maintenance

Chemical Exposure

Improper handling or application of chemicals can also cause irritation, burns and even affect internal organs.

It is important to observe the following when handling chemicals:

- Read the chemical label and follow manufacturers' instruction on usage, quantity, storage and disposal.
- Wear relevant PPE especially when dealing with liquid chemicals.
- Ensure there is a first aid box available at the worksite.

LG 53

Other Hazards and Risks associated in Turf Maintenance

Working at Roadside

Working on expressway

LG 54

Other Hazards and Risks associated in Turf Maintenance

Working at Roadside

The following control measures in LTA's Code of Practice must be adhered to while working along the roadside:

- Cordon off the work area.
- Re-direct traffic flow.
- Install TMA (for expressway) and placement of warning lights and signages.
- Workers must wear luminous vests to enhance their visibility.
- Establish the work zone and its removal, especially near fast lanes, expressways, and major roads.

LG 54

Other Hazards and Risks associated in Turf Maintenance

Heat Stress

It is important to protect yourself from extreme heat and solar radiation by:

- Drinking plenty of water.
- Wearing cooling and protective clothing.
- Wear soft hat and sunglasses to block out direct sunlight contact.
- Monitoring yourself and your co-workers for symptoms of dehydration or heat exhaustion.

Assessment Information

LG 10

1. Participants will need to take the assessment at assigned assessment sites.

2. The assessment consists of
   - Practical Performance
   - Oral Questioning

3. Candidates will be assessed on performance criteria and knowledge items stated in competency standard.