



LEARNER GUIDE

Plant Pruning (Level 2)

LNS-GNM-2016-1.1

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TABLE OF CONTENTS

Course Overview	1
Learning Outcome 1: Identify Contingency Pruning Requirements arising from Abnormalities and Defects	2
Common Plant Type and their Characteristics	2
Identification of Abnormalities and Defects in Plants	4
Reasons for Pruning	5
To Remove Water Sprouts, Suckers and Invasive Weeds	5
To Remove Infested Parts of Plants.....	6
To Remove Dieback and Fallen Dried Branches	7
To Remove Dried and Overhanging Fronds	8
For Aesthetic Reasons	8
To Shape and Thin Plants.....	9
Learning Activity 1	9
Learning Outcome 2: Perform Pruning and Shaping of Plants	10
Prepare for Pruning	10
Tools and Equipment required for Pruning	10
Set up Safe Worksite.....	13
Clarify Work Instruction before Performing Pruning Activity	14
Pruning Guidelines and Techniques	15
General Pruning Guidelines	15
Techniques of Cutting Stems and Branches.....	16
Perform Pruning and Shaping for Different Plant Types	17
Herbaceous Plants	17
Hedges	19
Report Abnormalities in Pruning	23
Learning Activity 2	23
Learning Outcome 3: Clear Site after Completion of Pruning Works	24
Clear Worksite	24
Post-Operational Housekeeping	26
Clean Tools and Equipment after Completion of Pruning.....	26
Storage of Tools and Equipment.....	27
Reporting Faulty Equipment.....	28
Learning Activity 3	28
Learning Outcome 4: Manage Hazards and Risks associated with Plant Pruning	29
Other Hazards and Risks associated with Plant Pruning	29
Vibration	29
Noise	30
Heat Stress.....	32
Working at Roadside	32
Learning Activity 4	33
Assessment Information	34
Appendix 1 – Tools, Equipment and Material Checklist	35
Reference Material	37

Course Overview

Code:	LNS-GNM-2016-1.1
Name:	Plant Pruning (Level 2)
Duration:	18 hours, inclusive of 2 hours of assessment

WSQ Framework

Landscape

Technical Skills and Competencies (TSC)

Plant Pruning

TSC Proficiency Description

Level 2

LNS-GNM-2016-1.1

Identify pruning requirements on site and execute plant pruning for routine and contingency plant requirements

Learning Outcomes

On successful completion of this unit, the participant will be able to:

1. Identify contingency pruning requirements arising from abnormalities and defects
2. Perform pruning and shaping of plants
3. Clear site after completion of pruning works
4. Manage hazards and risks associated with plant pruning

Teaching Methodologies

- Lecture
- Discussion
- Demonstration
- Practical
- Feedback

Assessment Methodologies

- Practical Exam (90 minutes)
- Oral Questioning (30 minutes)

Learning Outcome 1: Identify Contingency Pruning Requirements arising from Abnormalities and Defects

Incorporating Learning Outcome 4: Manage Hazards and Risks associated with Plant Pruning

Common Plant Type and their Characteristics

Plant form, also known as plant habit, is the characteristics form in which a given plant species grow. The plant habits of common plant species are below.

Common Plant Types	
<p>Trees</p> <p>Trees are plants with thick, woody and hard stems known as trunk. The trunk has many branches that bear leaves, flowers and fruits.</p> <p>The rough skin layer of trees is as known as bark.</p>	
<p>Palms</p> <p>Palms have stems that are long cylinder tubes. Many stems of palms do not have branches. The leaf, or leaflike part of a palm is known as fronds. The shape of the fronds can be pinnate or palmate.</p> <p>Palms do not have barks. Some stems of palms have smooth texture.</p>	

Shrubs

Shrubs are woody plants with several large stems from the base. Shrubs are usually less than 1.5 metre in height.

A group of closed spaced shrubs is known as a hedge.



Herbaceous Plants

Herbaceous plants have soft, fleshy stems instead of hard, woody ones found on trees and shrubs. Most herbaceous plants are small and low growing.



Groundcovers

Groundcovers are plants that grow over an area of ground. They protect against soil erosion and excessive soil moisture loss.



Identification of Abnormalities and Defects in Plants

To accurately identify problems in a plant may require the expertise of plant disease specialists. However, before turning to the experts, you can try to make an identification yourself, or at the very least, gather evidence of the symptoms and signs of plant stress. The process to identify plant health problems may look like this:

1. Accurately identify the host plant

First, you need to identify the host plant. The characteristics of a plant often provide important clues to identifying the source of the plant's health problems. If you are unable to identify the plant, take photos of the infested plant or bring a stem with several leaves on it to seek help with the identification.

2. Look for symptoms and signs that indicate defects, decays or diseases

Understanding the difference between symptoms and signs will help you with the diagnosis.

- Symptoms are the plant's response to infection, or the signals that a plant is not functioning properly. Typical symptoms include leaf injury, discoloration or defective plant tissues are injured or damaged.
- Signs are the visible parts of the pathogen or pest that caused the symptoms. Signs of a pathogen may include mold on the plant surface, spores, bacteria e.g., leaf spots of leaves or virus e.g., display different patterns like mosaic or ringspot of leaves.

Observe the surrounding of an infected plant carefully to determine whether the plant problem had been caused by pests, diseases or other factors such as chemical spraying, fallen branches, weeds or human traffic

3. Confirming a diagnosis

You can report to your supervisor after you have collected evidence of the symptoms and signs of a plant during stress. If further expertise is required, diagnostic labs use a variety of techniques to identify the plant diseases and disorders.

Reasons for Pruning

Pruning can be done on a routine or contingency basis.

Routine (Scheduled) Pruning is done to:

- Control the shape and development of plants
- Improve air circulation
- Allow light penetration to prevent the growth of algae and fungi
- Promote growth and production of flowers, buds and fruits

Contingency (Ad-hoc) Pruning is done to:

- Remove dead, diseased or damaged plant parts as these may harbour pests and diseases
- Remove parts that have overgrown and are obstructing the growth or aesthetic of the plant

These reasons are expanded below:

To Remove Water Sprouts, Suckers and Invasive Weeds

Water sprouts appear from the trunk or branches of a mature plant. Invasive weeds are unwanted plants that compete for nutrients and water with plants

They are active vegetative growth and need to be removed because:

- They will grow fast in number and size and remove necessary nutrients from the plants.
- They reduce the air and light circulation on the inner branches of a tree or shrubs where the water sprouts usually grow.
- If left to grow on a branch, the branch will naturally become weaker and can break, damage, or spread disease to other parts of the plant.



Remove
invasive weeds
from shrub



Remove water
sprouts/suckers
from tree trunk

To Remove Infested Parts of Plants

Prune and remove infested parts of plants to avoid contamination to other parts of plants



Prune and
remove
infested
parts of
plant



To Remove Dieback and Fallen Dried Branches

- Cut and remove dieback to avoid cross-contamination of diseases to other parts of plants.
- Remove dried fallen branches from the tree as these can cause the decline of flowering due to insufficient sunlight.



Cut right to the base of stem and remove dieback



Remove dried fallen branches from tree

To Remove Dried and Overhanging Fronds

- Remove infested and dried palm fronds to minimise the spread of diseases.
- Do not remove too many green healthy fronds as this can worsen existing problems and weaken the palm.



Remove fallen frond of palm

For Aesthetic Reasons

- Pruning allows plants to take shape over time to enhance their natural forms.
- Proper pruning will stimulate plant growth and improve the aesthetic and health of plants.

Aesthetic Pruning of Plants

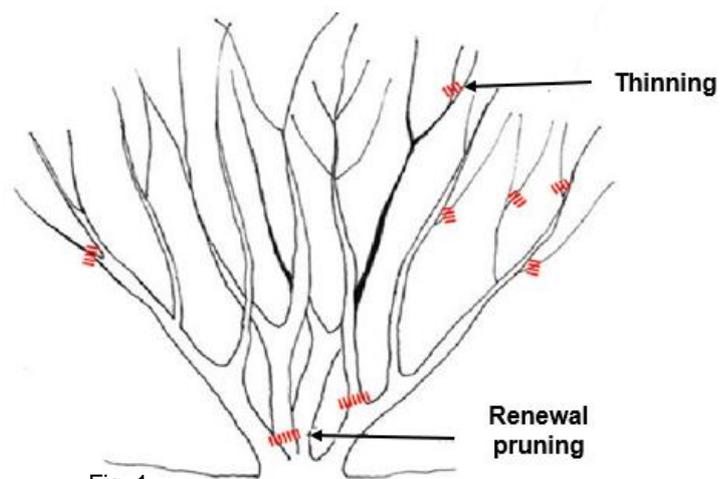


Fig. 1

Aesthetic pruning

To Shape and Thin Plants

Thinning of plants by removing small, individual twigs from the larger stem allow sunlight to penetrate and better air circulation which can decrease pest infestations and diseases

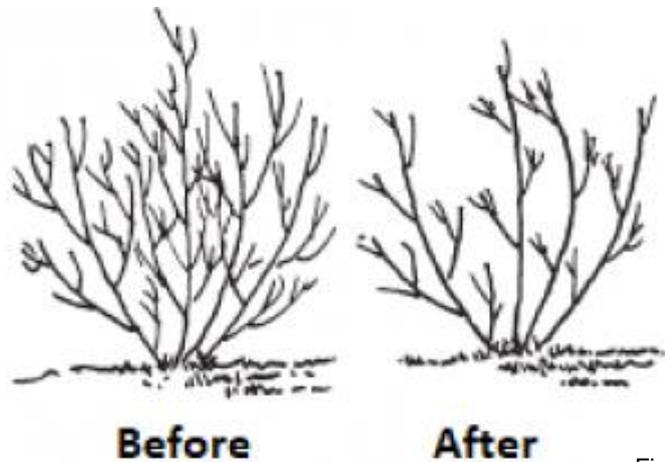


Fig. 2

Before and after pruning



Learning Activity 1

Form group of three. In your group, identify plants that require pruning. Share your findings, which should include the reasons why pruning is required, with the class.

Learning Outcome 2: Perform Pruning and Shaping of Plants

Incorporating Learning Outcome 4: Manage Hazards and Risks associated with Plant Pruning

This course will cover the techniques for pruning shrubs and hedges.

Prepare for Pruning

Tools and Equipment required for Pruning

Types of Pruning Tools and their Functions	
Secateurs For pruning of small branches and stems of up to 2cm thick.	
Garden Shear For touching-up of hedges to improve their shapes.	
Lopper Strong secateurs with long handles to cut thicker branches of up to about 4cm in diameter.	
Hedge Trimmer / Bush Trimmer Gardening machinery used for trimming, cutting, or pruning of hedges or small shrubs.	

Fig. 3

Personal Protective Equipment (PPE) for Pruning

Head Protection – Safety Helmet

Protect the head from falling branches when working in area with trees.



Eye Protection – Safety Glasses

Protect the eyes from flying branches/clippings when pruning.



Ears Protection – Earplugs

Protect the ears from excessive noise exposure when using noisy machinery like hedge trimmer.



Body Protection – Safety Reflective Vest

Increase visibility when working near roadside or in places with human traffic.



Hand Protection – Cotton Gloves

Protect the hands from cuts by plants, tools and equipment when pruning.



Foot Protection – Safety Boots with steel toe caps

Protect the feet from injury caused by dropping tools and equipment



Set up Safe Worksite

Check that the worksite is cleared of obstacles, obstructions and hazards, which may include:

- Poor accessibility or physical obstructions blocking access to the plant.
- Too close to public pathway which may cause danger to public onlookers or result in disturbance by onlookers.
- Presence of dangerous insects' hives or nests (e.g., beehive, ant nest) or animal (e.g., snake hiding in the shrub/hedges). If so,
 - Inform your supervisor
 - Do not disturb the dangerous animal or insect
 - Move away from the worksite

After you have finished checking the worksite, place barricades around it to prevent members of the public from entering. Put up safety and warning signages to warn the public to stay away from the worksite.



Cordon off worksite before pruning



Red/White Tape



Safety Cones



Warning Signs

Clarify Work Instruction before Performing Pruning Activity

Before commencing work, clarify instructions with your supervisor, which may include:

- The location and extent of pruning (trimming, light pruning or heavy pruning) to be carried out.
- The type of plants to prune.
- Timing restriction, if any

All pruning activities must follow regulations such as Environmental Protection and Management Act, Singapore.

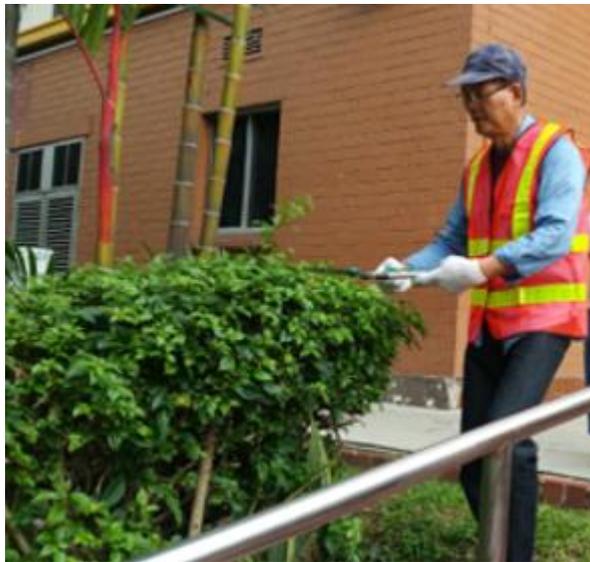


Example of location: greenery space at HDB block, Town Council

Pruning Guidelines and Techniques

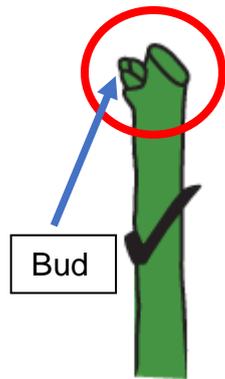
General Pruning Guidelines

- Pruning should be limited to removing dead or diseased branches or simple shaping to keep shrubs in their proper shape.
- Do not over-pruned as over pruning may damage the plants or stunt their growth. Prune about 1/3 of the overall plant during any pruning session.
- Remove cross branches. Crossed branches will rub against the bark of another branch or trunk, eventually causing damage to the plant. Cross branches also spoil the aesthetic of the plant.

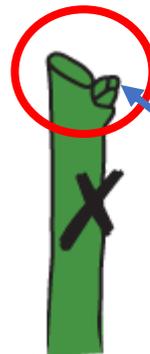


Light pruning to achieve perfect shape of a shrubs and hedges

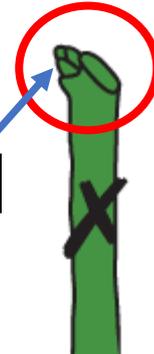
Techniques of Cutting Stems and Branches



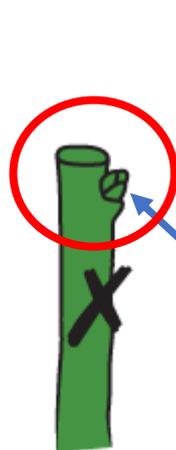
Correct
Water runs off easily. Wound heals quickly



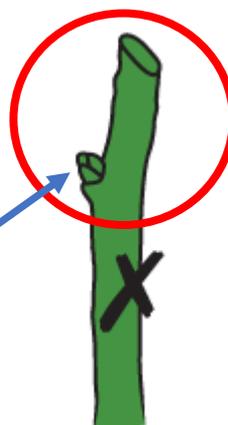
Wrong direction
Water will run onto bud causing rotting



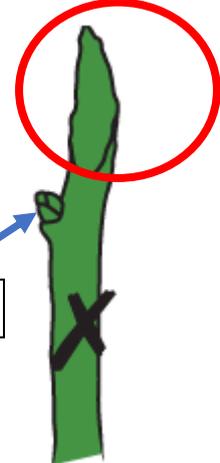
Too close to bud
The bud may die



Too flat
Hold water which can rot bud



Too much stub
Die back occurs as wound does not heal easily. Infection can occur



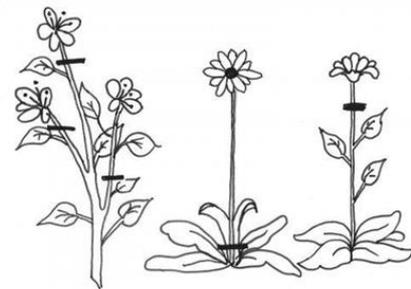
Too large a wound
Infection enters wound easily

Perform Pruning and Shaping for Different Plant Types

Before you commence pruning, inspect the plants for infestations or damages; take notes for easy recollection later. Take photos or collect samples of the affected parts to show your supervisor after you have completed pruning.

Herbaceous Plants

Deadheading, pinching back, heading back, cutting back and thinning are all necessary pruning techniques for herbaceous plants to encourage the plants to bloom for longer periods of time and improve the overall plant appearance and health.



Deadheading declined flowers of plant



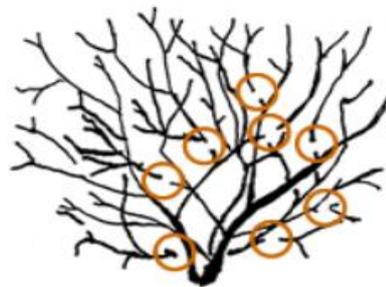
Pinching back of plant to produce more leaves



Heading back plants stimulates new, attractive growth



Cutting back shrubs by 1/3 to rejuvenate fresh growth



Thinning plants increase air circulation and light levels between stems to prevent pests and diseases infestation

Hedges

The steps to prune hedges are:

1. Install a levelling string to act as a height guide:
 - Stake four wooden stakes into the ground, one at each of the hedge's corners to guide the levelling string; use a mallet to assist in the staking if required.
 - Tie a levelling string around the wooden stakes.



Tie a levelling string around the wooden stakes

Pruning using Hedge Trimmer

2. Check the condition of the hedge trimmer and ensure there is sufficient fuel for the pruning activity.
3. Start the hedge trimmer.

Steps to Start the Hedge Trimmer
1. Set the choke control to choke position.
2. Push the air purge bulb approximately 6 times or until the bulb fills with fuel.
3. Turn on the hedge trimmer.
4. Hold the body of the hedge trimmer on the ground with your left hand.
5. Pull the starter rope with your right hand till the engine starts
6. After the engine starts, push the choke control back.
7. Use the throttle to control the engine speed.

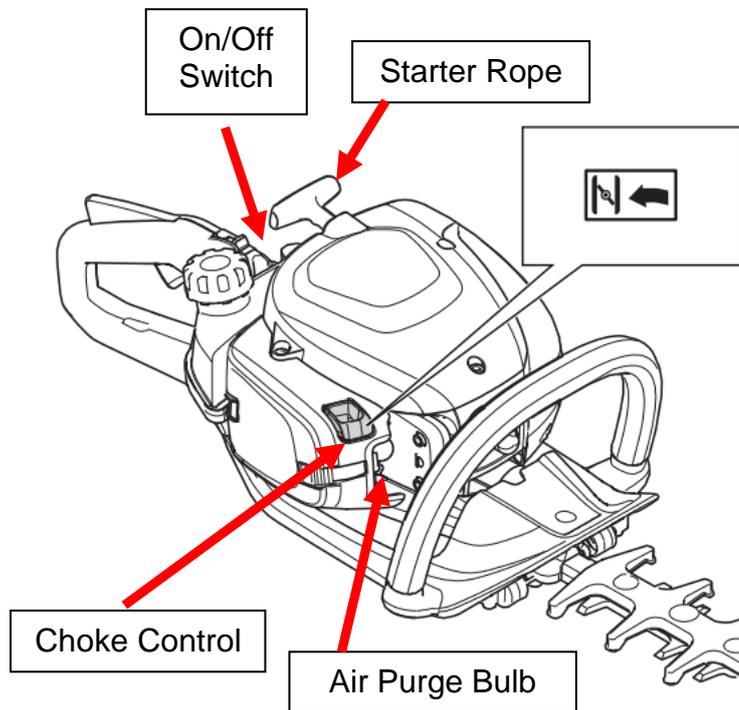


Fig. 4

How to Start a Hedge Trimmer

4. Check the work area to ensure there are no obstructions which may restrict hand and movement when pruning or pose a hazard.
5. Start pruning. Stand firmly on two feet slightly apart when trimming. Trim the tops of the hedges by using a wide, sweeping motion with a slight downward tilt.



Stand with both feet slightly apart for better balance

6. Avoid trimming any branches with a diameter of 2cm or more as the machine is not suitable for thicker branches.



Pruning using a Hedge Trimmer

Pruning using Garden Shears

7. Touch-up with a garden shear to improve the shape of the hedge.



Use of garden shear to improve the shape of hedge

Pruning using Lopper

8. Use a lopper to remove thicker branches of up to 4cm in diameter, e.g., dead branches, cross branch, and infested parts at the hedge base.



Fig. 5

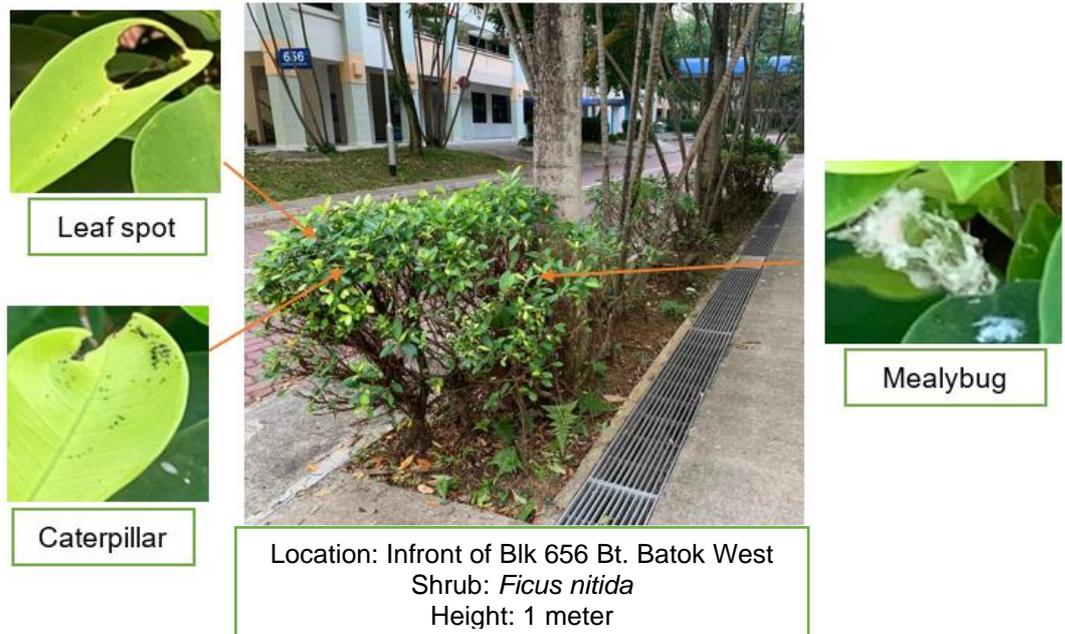
Using a lopper to remove thicker branches

Report Abnormalities in Pruning

If you had observed abnormalities during pruning, such as plants that are dangerous to the public or plants that are too diseased or damaged to retain, you must report these to your supervisor.

The disorder can be reported using photographs and the following information should be provided:

1. Location of plants - provide landmarks, park or road name.
2. Plant's name - if you do not know the species, take photos of the leaves, flowers and fruits to help in the identification.
3. Plant disorders/abnormalities - zoom in on the signs of disorders or visible pests.
4. Surroundings - observe the area around that plants that could have caused its health problems.



Some plant problems are not easily diagnosed using photographs. In such cases, a live specimen of the plant should be collected in a sample bag to show your supervisor.



Learning Activity 2

Perform pruning of assigned plants using secateurs, garden shears, lopper and hedge trimmer.

Learning Outcome 3: Clear Site after Completion of Pruning Works

Clear Worksite

1. Use a rake to sweep all cut stems and branches within the work area.



Sweep cut branches/clippings using a rake

2. Place horticultural waste into disposal bags. Tie the bags to secure them to avoid contamination to other plants.



Clear all horticultural waste into disposal bag

3. Untie the levelling string and remove the four wooden stakes.



Untie string and roll up neatly

4. Remove all safe zone equipment.

- Roll up red/white tape neatly
- Stack the safety cones



Remove all safe zone equipment

Post-Operational Housekeeping

Clean Tools and Equipment after Completion of Pruning

- Remove dirt to prevent the spread of diseases to other tools.
- Rinse your tools with water and wipe dry.
- Sanitise with alcohol if the tools were in contact with diseased plants.
- Oil tools to prevent rust such as WD-40.



Clean all the tools and equipment before storage

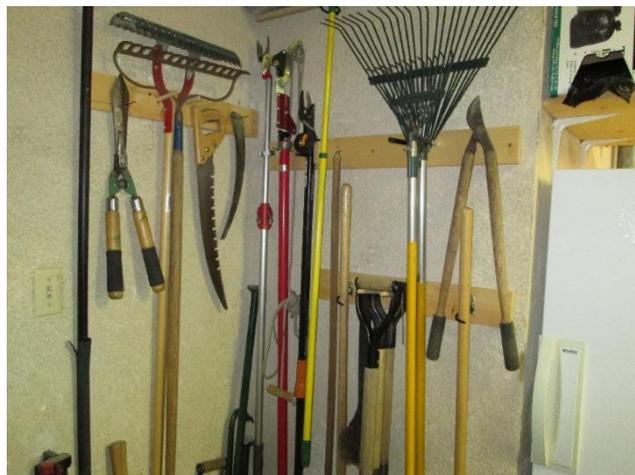
Storage of Tools and Equipment

- After cleaning, place all tools and equipment on the landscape trolley. Depending on the organisation, other transportation equipment, such as a wheelbarrow, can be used instead.



Place tools and equipment on the landscape trolley and push it to the designated store

- Keep all tools and equipment at the designated store, which should be:
 - a dry and well-ventilated area away from sunlight, and
 - under lock and key so that items are out of reach of others.



Store tools and equipment in a storage space away from sunlight

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.

REPAIR TAG
No. 32000
FILL IN, TEAR OFF TOP COPY AND
GIVE TO MAINTENANCE DEPARTMENT
EQUIPMENT ID _____
LOCATION _____
PROBLEM _____
SIGNED BY _____ DATE _____
WORK COMPLETED
BY _____ DATE _____
RETURN THIS TAG TO MAINTENANCE DEPT.
WHEN REPAIR WORK IS COMPLETED

An example of a repair tag
to put on faulty machine



Learning Activity 3

1. Clear worksite, clean and store tools after completion of pruning.
2. Report faulty equipment, if any.

Learning Outcome 4: Manage Hazards and Risks associated with Plant Pruning

Other Hazards and Risks associated with Plant Pruning

Vibration

The continuous use of vibrating hand-held equipment, such as the hedge trimmer, can result in Hand-Arm Vibration Syndrome (HAVS).

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



Fingers turned white due to poor circulation, resulting in numbness and poor control of machines.

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; follow the recommended exposure time in the table below.

Vibration for Common Landscape Machine			
Landscape Machine		Vibration (m/s ²)	Maximum Exposure Time (Per Day)
	Chainsaw	6	4 hours
	Lawn Mower	5	5.5 hours
	Brush Cutter	7	4 hours
	Hedge Trimmer	7	4 hours

Table 1: Result from HSE (Health and Safety Executive), UK

Noise

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

To prevent noise-induced hearing problems:

- Use hearing protectors (earmuffs or earplugs); the proper use of earplugs can reduce noise level by up to 35dBA
- Reduce noise exposure by limiting the duration of machinery usage.
- Keep a distance from your co-workers who are also operating the hedge trimmer.
- Minimise the number of noisy machineries running at any one time.

Activity	Noise Level dB(A)	Maximum Exposure Time Per Day (Minutes)
Tree Pruning	91 – 107	3 - 120
Shrub Trimming	92	120
Grass Cutting	85 – 90	240
Lawn Mowing	86	240

Table 2: Noise level for common landscape machinery activity
Singapore Standard, SS549:2009
Workplace Safety and Health (Noise) Regulations 2011

N.B. For noise levels that are above 100 dB(A), workers should be provided with both ear plugs and ear muffs, as stipulated in Singapore Standards 549.

The operation of a hedge trimmer produces a noise level of 92 dB(A), which is slightly louder than a running kitchen blender or hairdryer (around 80 – 90 dB). At this level, workers should not be exposed for more than 2 hours a day. The use of earplugs can reduce the noise level by up to 35 dB(A), which will allow the users to operate the machine for a longer duration as compared to without the earplugs.

To protect exposed employees from the adverse effects of noise, every workplace with a noise hazard should implement a comprehensive Hearing conservation Programme (HCP) as part of the company's workplace safety and health (WSH) programme.

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.

Working at Roadside

Working at the roadside can be dangerous. Safe work practices in high traffic work area include:

- Rotating and/or flashing lamps need to be placed at regular intervals along work zone on roadside
- Use larger direction sign
- Use Truck Mounted Attenuator (TMA) when working on expressways and roads with a speed limit above 70km/h.



Working on expressway



Fig. 8

Truck Mounted Attenuator (TMA) - Mount blinking beacon lights on the top and warning signs on the rear of vehicles

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
- Securing the work zone and its removal, especially near fast lanes, expressways, and major roads



Learning Activity 4

Share your personal experience with hazards associated with plant pruning at the workplace. How did you and your organisation manage those hazards?

Assessment Information

The assessment methodology for this course is Practical Exam and Oral Questioning.

Practical Exam

For the Practical Exam, you will be given **90 minutes** to perform the following tasks to demonstrate your competence for the learning outcomes:

- a. Identify a plant that requires pruning
- b. Put on the appropriate PPE to perform pruning
- c. Set up a safe worksite
- d. Stake around a hedge and use levelling string as a guide
- e. Prune the hedge using a hedge trimmer and perform finishing touches with a garden shears, lopper and secateurs
- f. Report abnormalities in pruning, if any, to the assessor
- g. Reinststate the worksite and dispose of horticultural waste properly
- h. Clean and store tools and equipment properly

Oral Questioning

For Oral Questioning, you will be given **30 minutes** to answer 10 questions that check your knowledge in accordance to the learning outcomes.

Appendix 1 – Tools, Equipment and Material Checklist

Personal Protective Equipment			
			
Safety Helmet <input type="checkbox"/>	Safety Glasses <input type="checkbox"/>	Earplugs <input type="checkbox"/>	Cotton Gloves <input type="checkbox"/>
			
Safety Vest <input type="checkbox"/>	Safety Boots <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work Zone Requirements			
			
Red/White Tape <input type="checkbox"/>	Safety Cones <input type="checkbox"/>	Warning Signs <input type="checkbox"/>	<input type="checkbox"/>
Tools, Equipment and Machinery			
			
Secateurs <input type="checkbox"/>	Garden Shears <input type="checkbox"/>	Lopper <input type="checkbox"/>	Hedge Trimmer <input type="checkbox"/>
			
Wooden Stakes <input type="checkbox"/>	String <input type="checkbox"/>	Mallet <input type="checkbox"/>	<input type="checkbox"/>

Housekeeping Items

 <p>Rake</p> <input data-bbox="411 488 483 555" type="checkbox"/>	 <p>Dustpan</p> <input data-bbox="737 488 801 555" type="checkbox"/>	 <p>Disposal Bag</p> <input data-bbox="1034 488 1104 555" type="checkbox"/>	 <p>Cloth</p> <input data-bbox="1337 488 1402 555" type="checkbox"/>
 <p>Landscape Trolley</p> <input data-bbox="411 801 483 889" type="checkbox"/>	<input data-bbox="721 801 801 889" type="checkbox"/>	<input data-bbox="1024 801 1104 889" type="checkbox"/>	<input data-bbox="1337 801 1402 889" type="checkbox"/>

Reference Material

WSH Council, Workplace Safety and Health Guidelines, Landscape and Horticulture Management, Singapore, Second revision:2018

Hand-arm vibration of horticultural machinery Part 1
Prepared by the Health and Safety Laboratory for the Health and Safety Executive
2011
RR884 Research Report

Hand-arm vibration of horticultural machinery Part 2
Prepared by the Health and Safety Laboratory for the Health and Safety Executive
2011
RR894 Research Report

Land Transport Authority, Code of Practice, Traffic Control at Work Zone
February 2018 Edition

Health and Safety Executive (UK) - <https://www.hse.gov.uk/index.htm>

Fig. 1: Aesthetic pruning <https://madisonessentials.com/galleries/Issues/2015-11/ZDA/Pruning-Diagram.v/inline.jpg> Accessed on 08 Feb 2021

Fig. 2: Before and after pruning
https://extension.umd.edu/sites/extension.umd.edu/files/resize/_images/programs/hgic/Pruning/Thinning_pruning-325x235.PNG Accessed on 08 Feb 2021

Fig. 3: Hedge Trimmer
https://img.greenindustrypros.com/files/base/acbm/gip/image/2019/04/Husqvarna_522HD60S.5cb75857339f4.png?auto=format&h=615&q=70&w=1280 Accessed on 23 Feb 2021

Fig. 4 How to Start a Hedge Trimmer
Husqvarna Hedge Trimmer Operating manual for 522HD60X, 522HDR60X, 522HDR75X
864-001-24.10.2018

Fig. 5: Using a lopper to remove thicker branches <https://empire-s3-production.bobvila.com/articles/wp-content/uploads/2020/03/best-loppers-for-pruning.jpg> Accessed on 23 Feb 2021

Fig. 6: Fingers turned white due to poor circulation, resulting in numbness and poor control of machines
Workplace Safety and Health Guidelines
Landscape and Horticulture Management, Second revision: 2018

Fig. 7: Working on expressway

<http://www.pioneertrainingcentre.com/wp-content/uploads/2017/06/BTCC-8.jpg>

Accessed on 17 Feb 2021

Fig. 8: Truck Mounted Attenuator (TMA) - Mount blinking beacon lights on the top and warning signs on the rear of vehicles

<https://www.singhengahoe.com/assets/Services/3960cf1964/machinery-truck-mounted-attenuator.jpg> Accessed 17 Feb 2021