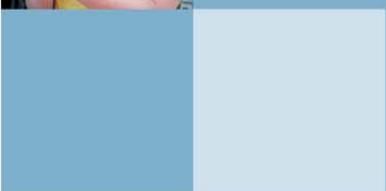
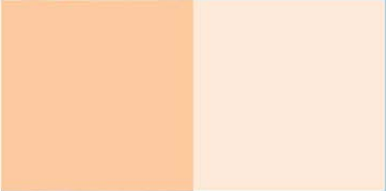
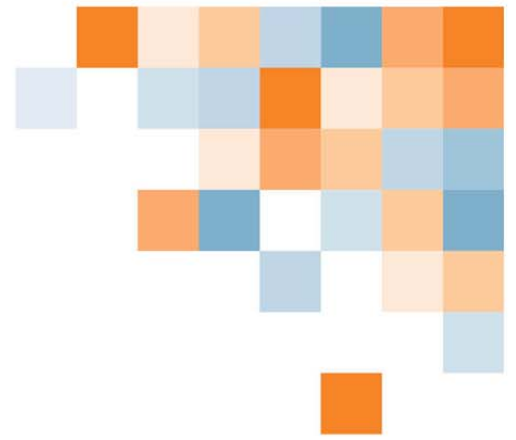


**ita**  
**YOUR TICKET.**



## PROGRAM OUTLINE

PRODUCTION HORTICULTURIST



The latest version of this document is available in PDF format on the ITA website  
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# **PRODUCTION HORTICULTURIST PROGRAM OUTLINE**

**APPROVED BY INDUSTRY  
DECEMBER 2013**

**Developed by  
Industry Training Authority  
Province of British Columbia**



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# **Section 1**

## **INTRODUCTION**

### **Production Horticulturist**



## Foreword

The Program Outline presented in this document outlines the Production Horticulturist Apprenticeship Program. This program represents the new standard for horticulture apprenticeship training in British Columbia. This document will be used as a guide for instructors in the classroom, laboratories and for practical training.

Since this is a practical trade it is expected that demonstration and student participation will be integrated into all learning activities.

Safe work practices are thematic in this program. Though they are not specified in all competencies and learning tasks, they are implied as part of the program and should be stressed throughout the apprenticeship training.

The program outline also provides facility, instructor, tools and equipment, and reference material requirements.

### **SAFETY ADVISORY**

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website:

<http://www.worksafebc.com>). Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.



## Acknowledgements

The Program Outline was prepared with the advice and direction of an industry steering committee convened initially by HortEducationBC (HEBC). Members include:

- *Annika Ingram*, HortEducationBC
- *Anne Kadwell*, CEO HortEducationBC
- *Bruce McTavish*, Bylands/Picketts and Kwantlen Polytechnic University
- *Shelley Murley*, Kwantlen Polytechnic University
- *Len Smit*, Kato's Nursery (2007) Ltd.
- *Nigel Taggart*, VanBelle Nursery

Industry Subject Matter Experts retained to assist in the development of Program Outline content:

- *Carol Barnett*, Kwantlen Polytechnic University
- *Bruce McTavish*, Bylands/Picketts and Kwantlen Polytechnic University
- *Shelley Murley*, Kwantlen Polytechnic University
- *Len Smit*, Kato's Nursery (2007) Ltd.
- *Nigel Taggart*, VanBelle Nursery

Industry Subject Matter Experts retained as outline reviewers:

- *Bruce McTavish*, Bylands/Picketts and Kwantlen Polytechnic University
- *Shelley Murley*, Kwantlen Polytechnic University
- *Len Smit*, Kato's Nursery (2007) Ltd.
- *Nigel Taggart*, VanBelle Nursery

Facilitators:

- J. Jankola and Associates Consulting

The Industry Training Authority would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Production Horticulturist occupation.



## How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
<b>Program Credentialing Model</b>	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
<b>OAC</b>	Communicate the competencies the industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate for certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
<b>Training Topics and Suggested Time Allocation</b>	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
<b>Program Content</b>	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measurable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individuals to check program content areas against their own knowledge and performance expectations against their own skill levels
<b>Training Provider Standards</b>	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; those supplied by the training provider and those the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating and which may be used or provided in a practical assessment





# **Section 2**

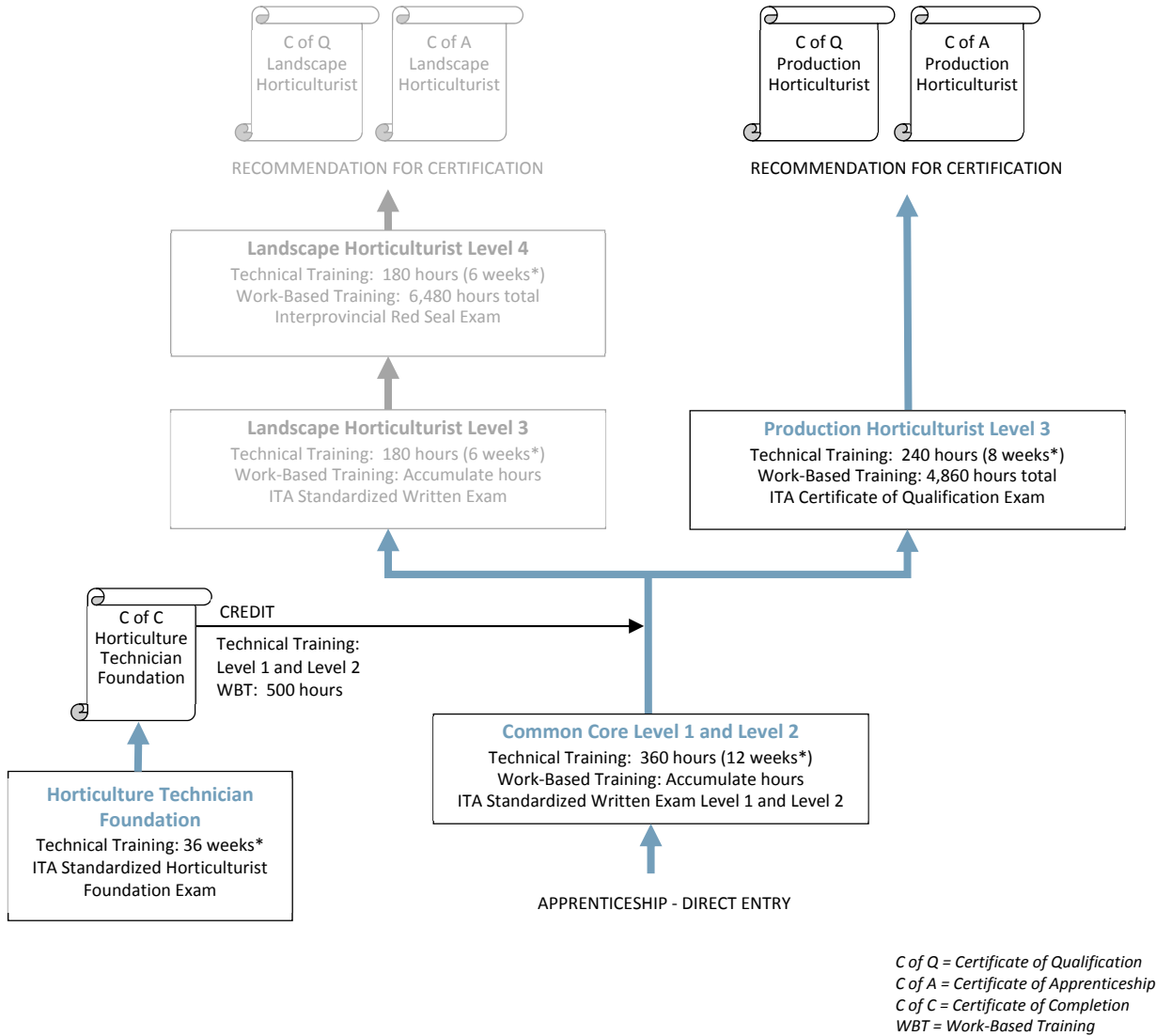
## **PROGRAM OVERVIEW**

### **Production Horticulturist**



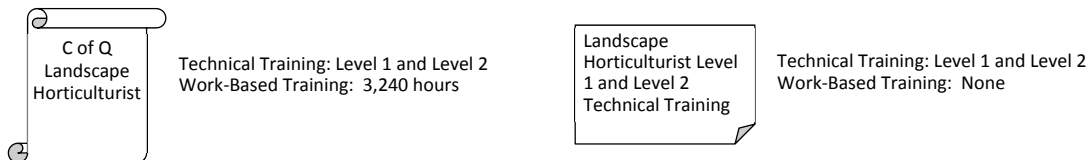
### Apprenticeship Pathway

This graphic provides an overview of the Production Horticulturist apprenticeship pathway.



**CROSS-PROGRAM CREDITS**

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program



### Program Credentialing Model

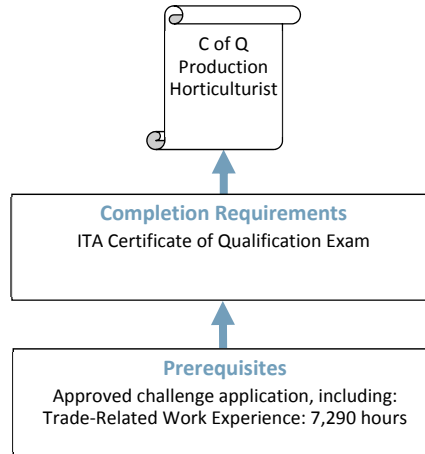




### Challenge Pathway

This graphic provides an overview of the Production Horticulturist challenge pathway.

*C of Q = Certificate of Qualification*




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**CREDIT FOR PRIOR LEARNING**

*Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program*





## Occupational Analysis Chart

### PRODUCTION HORTICULTURIST

**Occupation Description:** “Production Horticulturist” means a person who grows crops in both nursery and/or greenhouse environments. They prepare growing mediums, propagate, grow, grade, prune and prepare plants for distribution. They also control plants pests utilizing integrated pest management techniques.

<b>USES OCCUPATIONAL SKILLS</b> A	Use personal protective equipment (PPE) A1	Identify fire types and extinguishing methods A2	Use WHMIS A3	Recognize work hazards A4	Demonstrate basic horticulture skills A5	Identify relevant legislations, regulations and standards A6
	1   2	1	1	1	1   2	1
<b>USES AND MAINTAINS TOOLS AND EQUIPMENT</b> B	Use and maintain hand tools and power tools B1	Use and maintain measuring equipment B2	Operate vehicles and motorized equipment B3	Maintain vehicles and motorized equipment B4	Use and maintain equipment attachments B5	
	1   2	1	1   2	1   2	2	
<b>ORGANIZES WORK</b> C	Communicate with others C6	Organize plants, materials and equipment C9	Maintain safe work environment C10	Examine interpersonal and supervisory skills C11		
	1   2	2	1   2	1   2		
<b>MANAGES GROWING FACILITIES</b> D	Manage climate controls and components D1	Manage drainage, irrigation and fertigation systems D2	Manage sanitary environment D3			
	3	3	3			



<b>ANALYZES AND MAINTAINS PLANT HEALTH</b> E	Identify plants and plant requirements E1 1 2	Manage growing conditions E2 2	Manage pests and diseases E3 1 2 3	Describe plant science as it applies to horticulture E4 1 2	Describe physical and biological characteristics of soil and soilless media E5 1	Describe chemical characteristics of soil and soilless media E6 2
	Examine properties of soilless media and fertilizers in relation to container production E7 3	Identify and control weeds E8 3				
<b>MANAGES NURSERY, FIELD AND CONTAINER CROPS</b> F	Propagate nursery, field and container crops F1 3	Produce nursery, field and container crops F2 3	Harvest and ship nursery field crops F3 3	Process and ship nursery container crops F4 3		
	Analyze profitability, costs, efficiency, labour, and control of inventory G1 3	Oversee maintenance of nursery and greenhouse facilities G2 3	Describe industry standards, regulations and programs for managing phytosanitary risk G3 3	Manage production employees G4 3		



## Training Topics and Suggested Time Allocation

### Production Horticulturist – Level 1

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line A</b>	<b>USES OCCUPATIONAL SKILLS</b>	<b>15%</b>	<b>75%</b>	<b>25%</b>	<b>100%</b>
A1	Uses personal protective equipment (PPE)		✓	✓	
A2	Identify fire types and extinguishing methods		✓		
A3	Use WHMIS		✓		
A4	Recognize work hazards		✓		
A5	Demonstrate basic horticulture skills		✓	✓	
A6	Identify relevant legislations, regulations and standards		✓		
<b>Line B</b>	<b>USES AND MAINTAINS TOOLS AND EQUIPMENT</b>	<b>25%</b>	<b>40%</b>	<b>60%</b>	<b>100%</b>
B1	Use and maintain hand tools and power tools		✓		
B2	Use and maintain measuring equipment		✓	✓	
B3	Operate vehicles and motorized equipment		✓	✓	
B4	Maintain vehicles and motorized equipment		✓	✓	
<b>Line C</b>	<b>ORGANIZES WORK</b>	<b>10%</b>	<b>80%</b>	<b>20%</b>	<b>100%</b>
C6	Communicate with others		✓		
C10	Maintain safe work environment		✓		
C11	Examine interpersonal and supervisory skills		✓		
<b>Line E</b>	<b>ANALYZES AND MAINTAINS PLANT HEALTH</b>	<b>50%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
E1	Identify plants and plant requirements		✓		
E3	Manage pests and diseases		✓		
E4	Describe plant science as it applies to horticulture		✓		
E5	Describe physical and biological characteristics of soil and soilless media		✓		
<b>Total Percentage for Production Horticulturist Level 1</b>		<b>100%</b>			



## Training Topics and Suggested Time Allocation

### Production Horticulturist – Level 2

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line A</b>	<b>USES OCCUPATIONAL SKILLS</b>	<b>10%</b>	<b>25%</b>	<b>75%</b>	<b>100%</b>
A1	Uses personal protective equipment (PPE)		✓		
A5	Demonstrate basic horticulture skills		✓		
<b>Line B</b>	<b>USES AND MAINTAINS TOOLS AND EQUIPMENT</b>	<b>20%</b>	<b>40%</b>	<b>60%</b>	<b>100%</b>
B1	Use and maintain hand tools and power tools		✓		
B3	Operate vehicles and motorized equipment		✓	✓	
B4	Maintain vehicles and motorized equipment		✓	✓	
B5	Use and maintain equipment attachments		✓	✓	
<b>Line C</b>	<b>ORGANIZES WORK</b>	<b>20%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
C6	Communicate with others		✓		
C9	Organize plants, materials and equipment		✓	✓	
C10	Maintain safe work environment		✓		
C11	Examine interpersonal and supervisory skills		✓		
<b>Line E</b>	<b>ANALYZES AND MAINTAINS PLANT HEALTH</b>	<b>50%</b>	<b>60%</b>	<b>40%</b>	<b>100%</b>
E1	Identify plants and plant requirements		✓		
E2	Manage growing conditions		✓		
E3	Manage pests and diseases		✓		
E4	Describe plant science as it applies to horticulture		✓		
E6	Describe chemical characteristics of soil and soilless media		✓		
<b>Total Percentage for Production Horticulturist Level 2</b>		<b>100%</b>			



## Training Topics and Suggested Time Allocation

### Production Horticulturist – Level 3

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line D</b>	<b>MANAGES GROWING FACILITIES</b>	<b>15%</b>	<b>85%</b>	<b>15%</b>	<b>100%</b>
D1	Manage climate controls and components.		✓		
D2	Manage drainage, irrigation and fertigation systems.		✓		
D3	Manage sanitary environment.		✓		
<b>Line E</b>	<b>ANALYZES AND MAINTAINS PLANT HEALTH</b>	<b>30%</b>	<b>60%</b>	<b>40%</b>	<b>100%</b>
E3	Manage pests and diseases		✓		
E7	Examine properties of soilless media and fertilizers in relation to container production.		✓		
E8	Identify and control weeds.		✓	✓	
<b>Line F</b>	<b>MANAGES NURSERY, FIELD AND CONTAINER CROPS</b>	<b>35%</b>	<b>70%</b>	<b>30%</b>	<b>100%</b>
F1	Propagate nursery, field and container crops.		✓	✓	
F2	Produce nursery, field and container crops.		✓		
F3	Harvest and ship nursery field crops.		✓		
F4	Process and ship nursery container crops.		✓	✓	
<b>Line G</b>	<b>OVERSEES NURSERY PRODUCTION AND SYSTEM OPERATIONS</b>	<b>20%</b>	<b>90%</b>	<b>10%</b>	<b>100%</b>
G1	Analyze profitability, costs, efficiency, labour, and control of inventory.		✓	✓	
G2	Oversee maintenance of nursery and greenhouse facilities.		✓		
G3	Describe industry standards, regulations and programs for managing phytosanitary risk.		✓		
G4	Manage production employees.		✓		
<b>Total Percentage for Production Horticulturist Level 3</b>		<b>100%</b>			





# **Section 3**

## **PROGRAM CONTENT**

### **Production Horticulturist**



# Level 1

## Production Horticulturist



**Line (GAC):**        **A**    **USES OCCUPATIONAL SKILLS**  
**Competency:**       **A1**   **Use personal protective equipment (PPE)**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe and demonstrate personal safety in the workplace.
- Demonstrate proper use of PPE.

**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Select and use PPE as required for task, tools, equipment, machinery and environment</li> <br/> <li>2. Ensure safe use of PPE</li> <br/> <li>3. Store PPE to maintain its integrity</li> <br/> <li>4. Check PPE prior to use</li> <br/> <li>5. Check PPE inventory</li> <br/> <li>6. Recognize damaged and expired PPE</li> <br/> <li>7. Check and replace PPE components</li> </ol> | <ul style="list-style-type: none"> <li>• Ear protection</li> <li>• Eye protection</li> <li>• Hand protection</li> <li>• Foot protection</li> <li>• Safety vests</li> <li>• Respiratory protection</li> <li>• Fall protection</li> <br/> <li>• Inspect</li> <li>• Maintain</li> <br/> <li>• Dry area</li> <li>• Protected area</li> <br/> <li>• Operation</li> <li>• Condition</li> <br/> <li>• Ready supply</li> <br/> <li>• Expiration date</li> <li>• Integrity of PPE</li> <br/> <li>• According to manufacturers' specification</li> <li>• According to workplace requirements</li> </ul> |
|--|---|

**Achievement Criteria**

- Performance**    The apprentice will select PPE for specified tasks.
- Conditions**    The apprentice will be given the appropriate PPE commonly used in the trade.
- Criteria**        The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:
- Selected correct PPE required for specified tasks as designated by the instructor.



**Line (GAC):**        **A**    **USES OCCUPATIONAL SKILLS**  
**Competency:**       **A2**   **Identify fire types and extinguishing methods**

**Objectives**

To be competent in this area, the individual must be able to:

- Identify various types and classes of fires.
- Describe the procedure for using a fire extinguisher.

**LEARNING TASKS**

**CONTENT**

- |   |   |
|---|---|
| <p>1. Describe conditions necessary to support a fire</p>                   | <ul style="list-style-type: none"> <li>• Air</li> <li>• Fuel</li> <li>• Heat</li> <li>• Chemical chain reaction</li> <li>• Weather conditions</li> </ul>  |
| <p>2. Describe classes of fires according to the materials being burned</p> | <ul style="list-style-type: none"> <li>• Class A</li> <li>• Class B</li> <li>• Class C</li> <li>• Class D</li> <li>• Symbols and colours</li> </ul>   |
| <p>3. Describe the procedure for using a fire extinguisher</p>              | <ul style="list-style-type: none"> <li>• Extinguisher selection</li> <li>• P.A.S.S. <ul style="list-style-type: none"> <li>○ Pull</li> <li>○ Aim</li> <li>○ Squeeze</li> <li>○ Sweep</li> </ul> </li> </ul> |



**Line (GAC): A USES OCCUPATIONAL SKILLS**

**Competency: A3 Use WHMIS**

### Objectives

To be competent in this area, the individual must be able to:

- Summarize Workplace Hazardous Material Information System (WHMIS).
- Complete the online WHMIS certification.

### LEARNING TASKS

1. Describe WHMIS requirements

### CONTENT

- WHMIS certification
- WHMIS symbols
  - Compressed gas
  - Flammable and combustible material
  - Oxidizing material
  - Poisonous and infectious material
  - Poisonous and infectious material that will cause immediate or serious toxic effects
  - Poisonous and infectious material that will cause other toxic effects
  - Corrosive material
  - Dangerously reactive material
- WHMIS labels

**NOTE: WHMIS certification is mandatory to complete Level 1.**



**Line (GAC):           A    USES OCCUPATIONAL SKILLS**

**Competency:         A4   Recognizes work hazards**

**Objectives**

To be competent in this area, the individual must be able to:

- Identify workplace hazards.
- Identify how to mitigate the risk of workplace accidents and injuries.

**LEARNING TASKS**

**CONTENT**

- |  |  |
|--|--|
| <p>1. Identify workplace hazards and potential risks</p>                         | <ul style="list-style-type: none"> <li>• Electrical and utility</li> <li>• Working at heights</li> <li>• Gravitational (“slips, trips and falls”)</li> <li>• Thermal (heat and cold stress)</li> <li>• Motorized equipment/mechanical (pinch point, “struck against”, vehicle)</li> <li>• Public</li> <li>• Behavioural (fatigue, rushing, complacency, stress, substance abuse, ignorance, frustration)</li> <li>• Chemical</li> <li>• Compressed gas</li> <li>• Environmental (insects, plants, weather)</li> <li>• Hazardous trees</li> </ul> |
| <p>2. Identify how to mitigate the risks of workplace accidents and injuries</p> | <ul style="list-style-type: none"> <li>• Visual assessments</li> <li>• Safe work plan</li> <li>• Post-job inspection</li> </ul>  |



**Line (GAC):**        **A**    **USES OCCUPATIONAL SKILLS**  
**Competency:**       **A5**   **Demonstrate basic horticultural skills**

**Objectives**

To be competent in this area, the individual must be able to:

- Practice basic skills used in general horticulture.
- Use safe work habits.
- Identify, select, use and maintain appropriate hand tools for the task.
- Practice safe operation of common power equipment.
- Identify levels of landscape maintenance and plant standards stated in the BC Landscape Standard.

**LEARNING TASKS**

1. Demonstrate basic horticultural skills

**CONTENT**

- Range of workplace hazards
  - Hazards versus risks
- Hand tools used in basic horticulture
  - Refer to Level One *B1- Use and maintain hand tools and power tools*
- BC Landscape Standard
  - Objectives of the BC Landscape Standard
  - Guide to use
  - Format of the BC Landscape Standard
  - Scope of sections
- Basic horticultural tasks
  - Maintenance
  - Determining maintenance levels
  - Appropriate maintenance procedures
  - Common landscape maintenance tasks and tools
- Operating horticulture power equipment safely and efficiently
  - Refer to Level One *B1- Use and maintain hand tools and power tools*
- Safe work practices when lifting and bending
- Basic calculations
  - Landscape calculations
  - Calculating quantities: fertilizer application rates
  - Conversions
- Cooperative work methods



**Achievement Criteria**

- Performance The apprentice will maintain beds, borders, lawns, nurseries, and containers on campus.
- Conditions The apprentice will be given the appropriate materials, equipment and tools.
- Criteria The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:
- Performed tasks in a safe manner
  - Used tools and equipment safely and correctly
  - Performed tasks in a logical sequence





**Line (GAC):**        **A    USES OCCUPATIONAL SKILLS**  
**Competency:**       **A6   Identify relevant legislation, regulations and standards**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe and apply relevant legislation and regulations to activities that impact onsite activities.

**LEARNING TASKS**

**CONTENT**

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Identify applicable federal legislation and regulations</li> <li>2. Identify applicable provincial legislation and regulations</li> <li>3. Identify applicable local regulations</li> <li>4. Examine applicable regulations</li> <li>5. Examine relevant WorkSafeBC procedures</li> </ol> | <ul style="list-style-type: none"> <li>• Where to find standards</li> <li>• How specific federal requirements apply to horticulture activities</li> <li>• How specific provincial requirements apply to horticulture activities</li> <li>• How specific local requirements apply to horticulture activities</li> <li>• Applying regulations, standards, and procedures to the job</li> <li>• Applying WorkSafeBC accident and near miss reporting procedures</li> <li>• Applying accident investigation requirements</li> </ul> |
|---|---|



**Line (GAC): B USES AND MAINTAINS TOOLS AND EQUIPMENT**

**Competency: B1 Use and maintain hand tools and power tools**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe safe use and maintenance of hand and power tools.

**LEARNING TASKS**

**CONTENT**

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Identify hand and power tools for basic horticultural tasks</li> <li>2. Describe hand tool maintenance</li> <li>3. Describe power tool maintenance</li> </ol> | <ul style="list-style-type: none"> <li>• (See the list of <i>Tools and Equipment</i> for Level One, detailed in the <i>Training Provider Standards</i> of this Program Outline)</li> <li>• Cleaning and disinfecting hand tools to ensure proper operation and to prevent transfer of contaminants</li> <li>• Lubricating hand tools such as secateurs and shears</li> <li>• Checking tools regularly for damage, excessive wear and proper operation</li> <li>• Storing hand tools for organization, safety and security</li> <li>• Sharpening hand tools such as secateurs, shears and shovels</li> <li>• Replacing components in tools such as secateurs and loppers due to damage and wear</li> <li>• Lubricating power tools according to manufacturers' specifications</li> <li>• Adjusting power tools such as chain saws, mowers and power washers</li> <li>• Checking tools for wear, damage and malfunction</li> <li>• Following recommended maintenance schedule according to manufacturers' specifications</li> <li>• Checking fluid levels and air pressure</li> <li>• Greasing nipples on motorized equipment</li> <li>• Sharpening and balancing mower blades</li> <li>• Sharpen tools such as chainsaws and power edgers according to manufacturers' specification</li> <li>• Disinfecting tools to prevent cross-contamination from site to site</li> <li>• Storing power tools for organization and security</li> </ul> |
|---|---|



**Line (GAC):**        **B    USES AND MAINTAINS TOOLS AND EQUIPMENT**  
**Competency:**      **B2   Use and maintain measuring equipment**

**Objectives**

To be competent in this area, the individual must be able to:

- Safely use and maintain measuring equipment.

**LEARNING TASKS**

**CONTENT**

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Select and use appropriate measuring equipment for the task</li> <br/> <li>2. Maintain measuring equipment</li> </ol> | <ul style="list-style-type: none"> <li>• (See the list of <i>Measuring Equipment</i> for Level One, detailed in the <i>Training Provider Standards</i> of this Program Outline)</li> <br/> <li>• Clean and disinfect measuring equipment to ensure proper operation and to prevent transfer of contaminants</li> <li>• Calibrate measuring equipment such as thermometers, pH meters, levels and EC meters</li> <li>• Check and replace batteries on measuring equipment</li> <li>• Check tools for damage, excessive wear and proper operation</li> <li>• Store measuring equipment for organization, safety and security</li> </ul> |
|---|---|

**Achievement Criteria**

- Performance**    The apprentice will calibrate measuring equipment.
- Conditions**     The apprentice will be given thermometers, pH meters, levels and EC meters.
- Criteria**         The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:
- Calibrated to manufacturers' specifications.



**Line (GAC):**        **B**    **USES AND MAINTAINS TOOLS AND EQUIPMENT**  
**Competency:**      **B3**   **Operate vehicles and motorized equipment**

**Objectives**

To be competent in this area, the individual must be able to:

- Identify engine designs and functions of motorized equipment.
- Apply safe work practices as related to motorized horticulture equipment.

**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Identify engine components of motorized equipment engines</li> </ol>   | <ul style="list-style-type: none"> <li>• Differences between a two-stroke, four-stroke, and hybrid four-stroke engines</li> <li>• Carburetor</li> <li>• Ignition system</li> <li>• Starter components</li> <li>• Piston</li> <li>• Compression</li> </ul> |
| <ol style="list-style-type: none"> <li>2. Demonstrate personal safety in the workplace</li> </ol>  | <ul style="list-style-type: none"> <li>• Safety procedures</li> <li>• Use of PPE</li> </ul>   |
| <ol style="list-style-type: none"> <li>3. Demonstrate safe operating procedures for motorized horticulture equipment such as starting, stopping and adjusting</li> </ol> | <ul style="list-style-type: none"> <li>• String trimmers</li> <li>• Lawnmowers</li> <li>• Backpack blowers</li> </ul>   |

**Achievement Criteria**

- Performance**    The apprentice will start, stop and adjust power equipment.
- Conditions**     The apprentice will be given string trimmers, lawnmowers and backpack blowers.
- Criteria**         The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:
- Started, stopped and adjusted power equipment to manufacturers' specifications.



**Line (GAC): B USES AND MAINTAINS TOOLS AND EQUIPMENT**

**Competency: B4 Maintain vehicles and motorized equipment**

**Objectives**

To be competent in this area, the individual must be able to:

- Maintain motorized equipment.
- Apply safe work practices as related to motorized horticulture equipment.

**LEARNING TASKS**

**CONTENT**

<ol style="list-style-type: none"> <li>1. Use hand tools to maintain horticulture equipment</li> <li>2. Perform and document circle check of vehicles and motorized equipment</li> <li>3. Inspect equipment</li> <li>4. Check position of safety features as applicable</li> <li>5. Check and replace fluids according to manufacturers' specifications</li> <li>6. Check and replace components</li> <li>7. Check and adjust air pressure in components</li> </ol>	<ul style="list-style-type: none"> <li>• Sockets and wrenches</li> <li>• Ignition tester</li> <li>• Tachometer</li> <li>• Torque wrench</li> <li>• Feeler gauges</li> <li>• Lights</li> <li>• Plates</li> <li>• Brakes</li> <li>• Inspect visually for:               <ul style="list-style-type: none"> <li>○ Damage and wear</li> </ul> </li> <li>• Lock-out and tag-out as necessary</li> <li>• Inspect equipment to ensure efficient functioning</li> <li>• Lock-out devices</li> <li>• Chutes</li> <li>• Trimmer and belt guards</li> <li>• Operator presence switches</li> <li>• Oil</li> <li>• Coolant</li> <li>• Hydraulic fluids</li> <li>• Spark plugs</li> <li>• Belts</li> <li>• Pull cords</li> <li>• Tires</li> <li>• Air compressors</li> </ul>
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|-----|---|---|
| 8.  | Check and tighten components            | <ul style="list-style-type: none"> <li>• Loose connections</li> <li>• Loose fittings</li> </ul>   |
| 9.  | Check cutting height and adjust         | <ul style="list-style-type: none"> <li>• According to client expectations</li> <li>• Turf needs</li> </ul>  |
| 10. | Apply preventive maintenance procedures | <ul style="list-style-type: none"> <li>• Equipment maintenance               <ul style="list-style-type: none"> <li>○ Clean fuel</li> <li>○ Clean air</li> <li>○ Clean lubricating oil</li> </ul> </li> <li>• Maintenance schedule</li> <li>• Maintain a lawn mower or edger: Every three months or 50 hours               <ul style="list-style-type: none"> <li>○ Change engine oil</li> <li>○ Replace or service air filter</li> <li>○ Sharpen blade</li> <li>○ Check spark plug</li> <li>○ Check and adjust controls and drive mechanisms</li> <li>○ Lube controls and drive mechanisms</li> <li>○ Clean cooling fins</li> <li>○ Tighten bolts</li> </ul> </li> <li>• Maintain a hedge or string trimmer</li> <li>• Mixing gas and oil</li> </ul> |

**Achievement Criteria**

- |             |   |
|-------------|---|
| Performance | The apprentice will service motorized equipment (at the instructor's discretion).   |
| Conditions  | <p>The apprentice will be given any of the motorized equipment listed:</p> <ul style="list-style-type: none"> <li>• Lawn mower</li> <li>• Edger</li> <li>• Dethatcher</li> <li>• Rototiller</li> <li>• String trimmer</li> <li>• Hedger</li> <li>• Chainsaw</li> <li>• Backpack blower</li> <li>• Aerator</li> </ul>  |
| Criteria    | <p>The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:</p> <ul style="list-style-type: none"> <li>• Inspected power equipment to manufacturers' specifications.</li> <li>• Checked position of safety features to manufacturers' specifications.</li> <li>• Checked and replaced fluids according to manufacturers' specifications.</li> <li>• Cleaned and/or replaced air and oil filters to manufacturers' specifications.</li> <li>• Cleaned and/or replaced spark plugs to manufacturers' specifications.</li> <li>• Adjusted carburetor, if required, to manufacturers' specifications.</li> </ul> |





**Line (GAC):** C ORGANIZES WORK  
**Competency:** C10 Maintain safe work environment

**Objectives**

To be competent in this area, the individual must be able to:

- Assess site hazards and apply appropriate safety procedures.

**LEARNING TASKS**

**CONTENT**

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|---|--|
| <ol style="list-style-type: none"> <li>1. Assess site hazards</li> <li>2. Identify PPE and safety equipment</li> <li>3. Maintain worksite to avoid injuries to self and others</li> </ol> | <ul style="list-style-type: none"> <li>• High voltage</li> <li>• Motorized equipment</li> <li>• Working at heights</li> <li>• For task</li> <li>• Clean</li> <li>• Tidy</li> </ul> |
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**Line (GAC):** C ORGANIZES WORK  
**Competency:** C11 Examine interpersonal and supervisory skills

**Objectives**

To be competent in this area, the individual must be able to:

- Describe the basic interpersonal and supervisory skills based on time stress management, ethics, communication, power and teams.

**LEARNING TASKS**

**CONTENT**

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|--|---|
| <ol style="list-style-type: none"> <li>1. Managing time</li> <li>2. Explain stress management</li> <li>3. Recognize ethical and social responsibility issues in the work place</li> <li>4. Communicate effectively</li> <li>5. Describe conflict management</li> <li>6. Examine the concept of power in an organization</li> <li>7. Describe characteristics of an effective team</li> </ol> | <ul style="list-style-type: none"> <li>• Role of the supervisor</li> <li>• Ability to effectively manage personal and work time</li> <li>• Individual</li> <li>• Organizational</li> <li>• How organizations can help manage stress</li> <li>• Ethical and social consequences of work place practices               <ul style="list-style-type: none"> <li>○ Personal experience</li> <li>○ Religious beliefs impact personal ethics</li> <li>○ Culture affects ethical norms</li> <li>○ Internal reflection</li> <li>○ Organizational ethics</li> <li>○ Legal responsibilities</li> <li>○ BC Acts</li> </ul> </li> <li>• Identify and use verbal and non-verbal communication techniques (review Level One C6 – <i>Communicate with others</i>)</li> <li>• Define conflict</li> <li>• Sources of conflict</li> <li>• Basic styles for managing conflict</li> <li>• Conflict management strategies</li> <li>• Guidelines of managing interpersonal conflict</li> <li>• Recognize power structure in the organization and how power is applied within the organization</li> <li>• Characteristics of a high performing crew/team</li> <li>• Recognizing ineffective work crews</li> <li>• Supervisory role</li> </ul> |
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| <p>4. Recognize and describe bud, bark, foliage, flower and fruit characteristics</p> | <ul style="list-style-type: none"> <li>• Plant morphology</li> <li>• Morphology descriptors for leaves</li> <li>• Leaf arrangement</li> <li>• Needles</li> <li>• Scales and awls</li> <li>• Patterns of inflorescence</li> <li>• Descriptors for flowers</li> <li>• Plant types</li> <li>• Descriptors for fruit</li> <li>• Woody stems</li> </ul> |
| <p>5. Use a dichotomous key for plant identification</p>                              | <ul style="list-style-type: none"> <li>• Limitations of plant keys</li> <li>• Conifer key</li> <li>• Deciduous key</li> </ul>  |
| <p>6. Identify and describe 50 woody and non-woody plants.</p>                        | <ul style="list-style-type: none"> <li>• Using botanical terms</li> <li>• According to its cultural and maintenance requirements</li> </ul>  |



**Line (GAC):** E ANALYZES AND MAINTAINS PLANT HEALTH  
**Competency:** E3 Manage pests and diseases

**Objectives**

To be competent in this area, the individual must be able to:

- Identify signs and symptoms of living and non-living factors that cause plant stress.

**LEARNING TASKS**

1. Define plant stress
2. Describe conditions that lead to plant stress
3. Categorize plant pest types and broadly associate the symptoms of biotic plant stress with type of plant
4. Describe the life stages of example pests

**CONTENT**

- Causes and symptoms
- Abiotic factors
  - Light temperature
  - Humidity
  - Air
  - Water supply
  - Mechanical damage
  - Nutrition
  - Other common symptoms of abiotic plant stress
- Distinguish between biotic and abiotic causes of plant stress
- Biotic plant stress
  - Common indicators
- Biotic plant stress factors
  - Common plant insect indicators
  - Common plant disease indicators
- Susceptibility to biotic stress factors (insects and diseases)
- Potential stress-inducing environmental conditions
- Major plant pest types including:
  - Plant feeding pests
  - Plant feeding animals
  - Diseases
  - Weeds
- Damage caused by various pests
- Lifecycle of typical pests
- Disease lifecycles



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|---|--|
| <p>5. Describe basic arthropod morphology and identify typical examples of arthropod to order</p> | <ul style="list-style-type: none"> <li>• Basic arthropod morphology</li> <li>• Eight orders of insects</li> </ul>  |
| <p>6. Identify the four types of plant-pathogens</p>  | <ul style="list-style-type: none"> <li>• Categories of pathogens               <ul style="list-style-type: none"> <li>○ Fungi</li> <li>○ Bacteria</li> <li>○ Viruses</li> <li>○ Nematodes</li> </ul> </li> </ul>   |
| <p>7. Describe the characteristics that make plants weeds</p>                                     | <ul style="list-style-type: none"> <li>• Define weeds               <ul style="list-style-type: none"> <li>○ Competition</li> <li>○ Common characteristics</li> </ul> </li> <li>• Classification of weeds by life histories               <ul style="list-style-type: none"> <li>○ Annuals</li> <li>○ Biennials</li> <li>○ Herbaceous perennials</li> <li>○ Woody perennials</li> </ul> </li> </ul>  |
| <p>8. Describe established methods for controlling pests (IPM)</p>                                | <ul style="list-style-type: none"> <li>• Integrated Pest Management (IPM)</li> <li>• Six steps of IPM               <ul style="list-style-type: none"> <li>○ Prevention</li> <li>○ Identification</li> <li>○ Monitoring</li> <li>○ Thresholds</li> <li>○ Treatments</li> <li>○ Evaluation</li> </ul> </li> <li>• Establishing methods for controlling pests               <ul style="list-style-type: none"> <li>○ Cultural</li> <li>○ Biological</li> <li>○ Chemical</li> </ul> </li> </ul> |



**Line (GAC):** E ANALYZES AND MAINTAINS PLANT HEALTH  
**Competency:** E4 Describe plant science as it applies to horticulture

**Objectives**

To be competent in this area, the individual must be able to:

- Explain plant morphological characteristics, life cycles, and adaptations as they apply to plant identification, plant propagation, arboriculture and turf maintenance.

**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Describe the external parts of herbaceous and woody stems</li> <li>2. Describe the parts of a leaf and variations in shape</li> <li>3. Describe parts of the flower</li> <li>4. Identify typical inflorescences</li> <li>5. Identify typical fruit</li> <li>6. Describe stages in the life cycle of a flowering plant</li> <li>7. Describe parts of a seed and seedling</li> </ol> | <ul style="list-style-type: none"> <li>• Plant identification using features of a stem             <ul style="list-style-type: none"> <li>○ Woody and herbaceous stems</li> </ul> </li> <li>• Parts of a simple leaf</li> <li>• Leaf shapes</li> <li>• Leaf tips</li> <li>• Leaf margins</li> <li>• Leaf surfaces</li> <li>• Pattern of veins within the leaf blade</li> <li>• Simple and compound leaves</li> <li>• Flower structure             <ul style="list-style-type: none"> <li>○ Complete and incomplete flowers</li> <li>○ Perfect vs. imperfect flowers</li> <li>○ Monoecious vs. dioecious plants</li> <li>○ Flower symmetry</li> </ul> </li> <li>• Inflorescence types</li> <li>• Placing fruit types             <ul style="list-style-type: none"> <li>○ Fleshy fruits</li> <li>○ Dry fruits</li> </ul> </li> <li>• Dehiscent and indehiscent fruits</li> <li>• Reproduction</li> <li>• Monocot seed development</li> <li>• Dicot seed development</li> <li>• Dicot seedling development</li> <li>• Monocot seedling development</li> </ul> |
|--|---|



8. Identify stem, root, and leaf modifications
  - Roots
    - Root systems
    - Specialized underground storage structures
  
9. Identify plant adaptations to environmental effects
  - Plant adaptations
  - Stem modifications for protection
  - Stems specialized for colonizing
  
10. Describe basic growth responses to plant hormones
  - Response to hormones
    - Auxins
    - Gibberellins (GA)
    - Cytokinins
    - Ethylene
    - Abscisic acid (ABA)



**Line (GAC):** E **ANALYZES AND MAINTAINS PLANT HEALTH**  
**Competency:** E5 **Describe physical and biological characteristics of soil and soilless media**

**Objectives**

To be competent in this area, the individual must be able to:

- Recognize soil and soil management as keys to the successful practice of horticulture.
- Examine soil formation, the physical and biological properties of soils, and soilless media as they relate to use, soil quality, and plant growth.

**LEARNING TASKS**

**CONTENT**

- |   |   |
|---|---|
| <p>1. Define soil</p>   | <ul style="list-style-type: none"> <li>• Soil</li> <li>• Soil formation</li> <li>• Parent material</li> <li>• Biotic – living organisms</li> <li>• Topography</li> <li>• Time</li> </ul>                                |
| <p>2. Define soil quality</p>   | <ul style="list-style-type: none"> <li>• Soil quality and the importance of soil quality, relative to plant growth and environmental sustainability</li> </ul>  |
| <p>3. Describe a soil profile</p>                                     | <ul style="list-style-type: none"> <li>• Soil profiles               <ul style="list-style-type: none"> <li>○ LFH horizon</li> <li>○ A horizon</li> <li>○ B horizon</li> <li>○ C horizon</li> </ul> </li> </ul>         |
| <p>4. Explain the physical properties of soil and soilless medias</p> | <ul style="list-style-type: none"> <li>• Texture</li> <li>• Structure</li> <li>• Density</li> <li>• Porosity</li> <li>• Soil compaction</li> <li>• Soil structure and plant growth</li> <li>• Soilless media</li> </ul> |





5. Describe the behaviour of water in soil
  - Water in soils
  - Soil water holding capacity
  - Available water
  - Water movement through soil
  - Wetting front
  - Hydraulic conductivity of a soil
  - Water retention and flow in layered soils
  - Water movement in urban soils
  - Managing soils in the urban landscape
  
6. Examine the key soil biological processes and their effects on plant growth and soil quality
  - Biological process in soil
  - Plants
  - Soil animals
  - Other organisms
  - Role of soil organisms in soil quality
  - Promoting beneficial soil organisms
  
7. Explain the role of organic matter in soil
  - Basic composition of soil organic matter
  - Key roles of soil organic matter relative to soil chemical and physical behaviour
  
8. Describe composting methods
  - Composting processes
  - Aerobic vs. anaerobic microorganisms
  - Food web of the compost pile
  - Use of compost



# Level 2

## Production Horticulturist





**Line (GAC):           A    USES OCCUPATIONAL SKILLS**

**Competency:         A5   Demonstrate basic horticultural skills**

**Objectives**

To be competent in this area, the individual must be able to:

- Assess plant quality.
- Demonstrate plant-handling requirements.

**LEARNING TASKS**

**CONTENT**

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|--|--|
| <ol style="list-style-type: none"> <li>1. Perform plant-grading according to the Canadian Standard for Nursery Stock and British Columbia Landscape Standard</li> <br/> <li>2. Identify containers used for growing and shipping ornamental plant material</li> <br/> <li>3. Describe standards for root ball sizing</li> <br/> <li>4. Prepare balled and burlapped plants</li> <br/> <li>5. Securely load plant material</li> <br/> <li>6. Prepare plant materials</li> </ol> | <ul style="list-style-type: none"> <li>• Assessing and grading plants according to standards for plant</li> <li>• Foliage density             <ul style="list-style-type: none"> <li>○ Caliper</li> <li>○ Height</li> <li>○ Width ratios</li> </ul> </li> <li>• Calculating container volume and comparing results to the standards</li> <br/> <li>• Calculating root ball sizes for             <ul style="list-style-type: none"> <li>○ Containers</li> <li>○ Field grown stock</li> </ul> </li> <li>• Rootballs             <ul style="list-style-type: none"> <li>○ Digging</li> <li>○ Wrapping</li> <li>○ Tying</li> </ul> </li> <li>• Safely and efficiently lifting and carrying plant material to avoid physical damage to self and plants</li> <li>• Methods of harvesting plant material for field grown stock</li> <br/> <li>• Safety</li> <li>• Loading</li> <li>• Unloading</li> <li>• Securing plant material to a truck</li> <br/> <li>• Removal of containers</li> <li>• Scarifying root ball</li> </ul> |
|--|--|



7. Demonstrate proper planting procedures for bare root stocks
  - Appropriate depth and width of the planting hole
  - Placing the plant in hole and back filling with appropriate material
  - Appropriate post-planting maintenance requirements
  - Appropriate storage of dormant and non-dormant plant material
  - Appropriate storage onsite
  
8. Operate truck and trailer
  - Safety
  - Coupling the truck/tractor and trailer
  - Operating either combination in reverse
  - Securely parking the vehicle
  - Compliance to guidelines established in Certified Horticulture Technician Program (CHT)



**Line (GAC):           B   USES AND MAINTAINS TOOLS AND EQUIPMENT**

**Competency:         B1   Use and maintain hand tools and power tools**

**Objectives**

To be competent in this area, the individual must be able to:

- Demonstrate safe use and maintenance of hand tools.
- Demonstrate safe use and maintenance of power tools.

**LEARNING TASKS**

1. Identify hand and power tools for basic horticultural tasks for Level Two technical training
2. Demonstrate hand tool maintenance
3. Demonstrate power tool maintenance

**CONTENT**

- (See the list of *Tools and Equipment* for Level Two, detailed in the *Training Provider Standards* of this Program Outline)
- Review Level One *B1 - Use and maintain hand tools and power tools.*
- Review Level One *B1 - Use and maintain hand tools and power tools.*



**Line (GAC):           B    USES AND MAINTAINS TOOLS AND EQUIPMENT**  
**Competency:         B3   Operate vehicles and motorized equipment**

**Objectives**

To be competent in this area, the individual must be able to:

- Examine vehicle and motorized equipment designs and functions.
- Operate and apply safe work practices as related to horticulture task requirements.

**LEARNING TASKS**

**CONTENT**

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|--|--|
| <ol style="list-style-type: none"> <li>1. Identify horticulture vehicle and motorized equipment engine components and function</li> <br/> <li>2. Describe and demonstrate personal safety as related to large multiple cylinder equipment</li> <br/> <li>3. Describe and demonstrate safe operating procedures for horticulture equipment</li> </ol> | <ul style="list-style-type: none"> <li>• Differences between gas and diesel engines</li> <li>• Carburetor</li> <li>• Alternator</li> <li>• Radiator</li> <li>• Piston</li> <li>• Compression</li> <br/> <li>• Safe lifting and moving techniques</li> <li>• Entry onto and exit from machinery using the three point contact</li> <li>• Appropriate personal protective equipment</li> <li>• Work place hazards and mitigation of the risk of accident and injury</li> <li>• General shop safety</li> <br/> <li>• General points for safe tractor operation</li> <li>• Tractor precautions               <ul style="list-style-type: none"> <li>○ Starting, speed and slopes</li> <li>○ Hitch attachments</li> <li>○ Transfer of tractors and equipment</li> <li>○ Tractor transfer warnings</li> </ul> </li> <li>• Operating a skid steer loader and zero turn walk behind machine</li> <li>• Power take-off precautions</li> <li>• Connecting attachments</li> </ul> |
|--|--|



**Achievement Criteria**

**Performance** The apprentice will safely operate a vehicle.

**Conditions** The apprentice will be given a skid steer and specified attachments (e.g. bucket, forks).

**Criteria** The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:

- Performed a circle check
- Used three point contact when entering and exiting
- Hooked up appropriate attachments
- Started and maneuvered machine and attachments safely





**Line (GAC):           B    USES AND MAINTAINS TOOLS AND EQUIPMENT**  
**Competency:         B4   Maintain vehicles and motorized equipment**

**Objectives**

To be competent in this area, the individual must be able to:

- Perform basic maintenance on larger multiple cylinder engines and equipment as applied to horticulture.
- Apply safe work practices as related to horticulture equipment.

**LEARNING TASKS**

**CONTENT**

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|--|---|
| <ol style="list-style-type: none"> <li>1. Use hand tools to maintain horticulture equipment</li> </ol>                     | <ul style="list-style-type: none"> <li>• Sockets and wrenches</li> <li>• Ignition tester</li> <li>• Multimeter</li> <li>• Battery charger</li> <li>• Tire gauge</li> <li>• Hydrometer</li> </ul>  |
| <ol style="list-style-type: none"> <li>2. Practice preventive maintenance and troubleshooting procedures</li> </ol>        | <ul style="list-style-type: none"> <li>• Tune up equipment</li> <li>• Diagnose work or defective parts</li> </ul>   |
| <ol style="list-style-type: none"> <li>3. Perform and document circle check of vehicles and motorized equipment</li> </ol> | <ul style="list-style-type: none"> <li>• Lights</li> <li>• Plates</li> <li>• Brakes</li> </ul>  |
| <ol style="list-style-type: none"> <li>4. Inspect equipment</li> </ol>   | <ul style="list-style-type: none"> <li>• Inspect visually for               <ul style="list-style-type: none"> <li>○ Damage and wear</li> <li>○ Lock out and tag out as necessary</li> </ul> </li> <li>• Inspect equipment to ensure efficient functioning</li> </ul> |
| <ol style="list-style-type: none"> <li>5. Check position of safety features</li> </ol>                                     | <ul style="list-style-type: none"> <li>• Lockout devices</li> <li>• Chutes</li> <li>• Trimmer and belt guards</li> <li>• Rollover protection devices (ROP)</li> <li>• Operator presence switches</li> </ul>   |
| <ol style="list-style-type: none"> <li>6. Check and replace fluids according to manufacturers' specifications</li> </ol>   | <ul style="list-style-type: none"> <li>• Oil</li> <li>• Coolant</li> <li>• Hydraulic fluids</li> </ul>  |
| <ol style="list-style-type: none"> <li>7. Check and replace components</li> </ol>  | <ul style="list-style-type: none"> <li>• Spark plugs</li> <li>• Belts</li> <li>• Pull cords</li> </ul>  |



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| 8. Check and adjust air pressure in components | <ul style="list-style-type: none"> <li>• Tires</li> <li>• Air compressors</li> </ul>   |
| 9. Check and tighten components                | <ul style="list-style-type: none"> <li>• Loose connections</li> <li>• Loose fittings</li> </ul>  |
| 10. Check cutting height and adjust components | <ul style="list-style-type: none"> <li>• According to client expectations</li> <li>• Turf needs</li> </ul>   |
| 11. Develop a preventive maintenance plan      | <ul style="list-style-type: none"> <li>• Performing preventive maintenance every three months or 50 hours               <ul style="list-style-type: none"> <li>○ Checking engine oil</li> <li>○ Changing engine oil</li> <li>○ Checking air filter</li> <li>○ Oil-bathing air filter</li> <li>○ Greasing fittings</li> <li>○ Checking hydraulic oil</li> <li>○ Checking tire pressures</li> <li>○ Testing coolant</li> <li>○ Checking belts</li> <li>○ Checking hoses</li> </ul> </li> </ul> |

**Achievement Criteria**

- |             |   |
|-------------|---|
| Performance | The apprentice will practice preventive maintenance on vehicles and motorized equipment.  |
| Conditions  | The apprentice will be given: <ul style="list-style-type: none"> <li>• Skid steer loader</li> <li>• Gear tractor</li> <li>• 3 - reel turf mower</li> <li>• Gas powered utility vehicle (Gator)</li> <li>• Electric powered utility vehicle</li> </ul>   |
| Criteria    | The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria and in accordance with manufacturers' specifications: <ul style="list-style-type: none"> <li>• Checked engine oil</li> <li>• Changed engine oil</li> <li>• Checked air filter</li> <li>• Oil-bathed air filter</li> <li>• Greased fittings</li> <li>• Checked hydraulic oil</li> <li>• Checked tire pressures</li> <li>• Tested coolant</li> <li>• Checked belts</li> <li>• Checked hoses</li> </ul> |



**Line (GAC): B USES AND MAINTAINS TOOLS AND EQUIPMENT**

**Competency: B5 Use and maintain equipment attachments**

**Objectives**

To be competent in this area, the individual must be able to:

- Safely use equipment attachments for the appropriate task.
- Maintain equipment attachments.

**LEARNING TASKS**

1. Identify, select and use the appropriate equipment attachments for the task
  
2. Maintain equipment attachments

**CONTENT**

- (See the list of *Equipment Attachments* for Level Two, detailed in the *Training Provider Standards* of this Program Outline)
  
- Grease fittings on equipment such as trailers, aerators and cultivators
- Inspect attachments for damage and wear and lock-out and tag-out as necessary
- Adjust attachments for parking, travel and operation
- Check hydraulic fluids to ensure optimum and safe operation of equipment
- Clean and disinfect attachments such as drop spreaders, sprayers and mowers
- Replace damaged and worn components such as bushings, blades and tines
- Perform a circle check of equipment attachments to check for items such as lights, plates and brakes
- Check operation of safety brake pin on trailers

**Achievement Criteria**

Performance	The apprentice will inspect and service equipment.
Conditions	The apprentice will be given equipment such as trailers, aerators and rototillers.
Criteria	<p>The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:</p> <ul style="list-style-type: none"><li>• Greased fittings on equipment</li><li>• Inspected attachments for damage and wear and locked-out and tagged-out as necessary</li><li>• Adjusted attachments for parking, travel and operation</li><li>• Checked hydraulic fluids to ensure optimum and safe operation of equipment</li><li>• Cleaned and disinfected attachments such as drop spreaders, sprayers and mowers</li><li>• Replaced damaged and worn components such as bushings, blades and tines</li><li>• Performed a circle check of equipment attachments to check for items such as lights, plates and brakes</li><li>• Checked operation of safety brake pin on trailers</li></ul>





**Line (GAC): C ORGANIZES WORK**  
**Competency: C9 Organize plants, materials and equipment**

**Objectives**

To be competent in this area, the individual must be able to:

- Inspect and verify plants, materials and equipment.
- Receive, unload, record, protect and store plants, materials and equipment.
- Lay out plants on site.
- Perform final checks of plants, materials and equipment.

**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Inspect and verify plants and materials</li> <br/> <li>2. Remove and inspect monitoring devices when necessary</li> <br/> <li>3. Receive, unload, record and protect materials and products in an organized fashion</li> <br/> <br/> <br/> <br/> <br/> <br/> <br/> <br/> <li>4. Allocate specified storage areas for equipment and hazardous materials</li> <br/> <br/> <br/> <br/> <br/> <br/> <br/> <br/> <br/> <br/> <li>5. Lay out plants on site</li> </ol> | <ul style="list-style-type: none"> <li>• Accuracy</li> <li>• Quality</li> <li>• Quantity</li> <br/> <li>• Temperature recorders</li> <li>• Environmental recorders</li> <br/> <li>• Plant materials <ul style="list-style-type: none"> <li>○ Group/match plants by size and species</li> <li>○ Place received products in designated areas to maintain product quality</li> </ul> </li> <li>• Other materials <ul style="list-style-type: none"> <li>○ Wood chips</li> <li>○ Soil</li> <li>○ Aggregates</li> <li>○ Store in designated areas to avoid contamination</li> </ul> </li> <li>• Products <ul style="list-style-type: none"> <li>○ Soils</li> <li>○ Seed</li> <li>○ Plugs</li> <li>○ Roots</li> <li>○ Labels</li> <li>○ Containers</li> </ul> </li> <br/> <li>• Equipment</li> <li>• Hazardous materials</li> <br/> <li>• According to landscape plans</li> </ul> |
|--|---|



- 6. Perform final check onsite
  - Required
    - Plants
    - Materials
    - Equipment
  
- 7. Process substandard materials
  - Quarantine
  - Reject
  - Dispose of

**Achievement Criteria**

- Performance The apprentice will organize plant materials and equipment onsite.
- Conditions The apprentice will be given the appropriate plants, materials and equipment to handle a range of ornamental plant material.
- Criteria The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:
  - Sourced and selected plants
  - Laid out plants according to landscape plans
  - Performed final check
  - Processed substandard materials



**Line (GAC):** C ORGANIZES WORK  
**Competency:** C10 Maintain safe work environment

**Objectives**

To be competent in this area, the individual must be able to:

- Assess site hazards and follow specified safety procedures.

**LEARNING TASKS**

**CONTENT**

1. Coordinate tasks with other workers	<ul style="list-style-type: none"> <li>• Avoid injury to               <ul style="list-style-type: none"> <li>○ Self</li> <li>○ Co-workers</li> <li>○ Others</li> </ul> </li> </ul>
2. Follow safety procedures when working in high traffic areas	<ul style="list-style-type: none"> <li>• Flagging</li> <li>• Pylons</li> <li>• Signage</li> </ul>
3. Handle hazardous materials in accordance with government regulations and WHMIS procedures	<ul style="list-style-type: none"> <li>• Disposal</li> <li>• Labelling</li> <li>• Use of PPE</li> </ul>
4. Participate in safety meetings and discussion	<ul style="list-style-type: none"> <li>• Ensure that information is recorded and distributed to all team members</li> </ul>
5. Report unsafe conditions to supervisor	<ul style="list-style-type: none"> <li>• Recognize</li> <li>• Report</li> </ul>
6. Recognize safety warning signals	<ul style="list-style-type: none"> <li>• Back-up signals</li> <li>• Back-up alarms</li> <li>• Warning lights</li> </ul>
7. Contain and dispose of spill contaminants	<ul style="list-style-type: none"> <li>• According to regulations</li> </ul>
8. Coordinate with other agencies	<ul style="list-style-type: none"> <li>• Private and public line locators</li> <li>• Emergency response teams</li> </ul>





**Line (GAC):** C ORGANIZES WORK  
**Competency:** C11 Examine interpersonal and supervisory skills

**Objectives**

To be competent in this area, the individual must be able to:

- Demonstrate supervisory skills based on leadership, motivation, and delegation.
- Describe safety management and managing in a diverse workplace.

**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Describe leadership in the organization</li> <br/> <li>2. Describe leadership skills</li> <br/> <li>3. Describe safety culture</li> <br/> <li>4. Describe managing a diverse workplace</li> <br/> <li>5. Interpret the employment standards</li> </ol> | <ul style="list-style-type: none"> <li>• Definition of leadership</li> <li>• Role of leaders</li> <li>• Characteristics of leaders</li> <br/> <li>• Motivational theories</li> <li>• Delegation learning</li> <li>• Skills needed for effective delegation</li> <li>• Setting goals for effective delegation and employee commitment</li> <li>• Team management: coaching and training</li> <br/> <li>• Role of WorkSafeBC</li> <li>• Safety culture in the workplace</li> <br/> <li>• Managing diversity               <ul style="list-style-type: none"> <li>○ Characteristics of culture</li> <li>○ Elements of cultural difference</li> <li>○ Cultural orientation</li> </ul> </li> <li>• Legal Requirements               <ul style="list-style-type: none"> <li>○ Canadian Charter of Rights And Freedoms</li> <li>○ Canadian Human Rights Act of 1985</li> <li>○ BC Human Rights Code</li> </ul> </li> <li>• Enforcement of Human Rights</li> <br/> <li>• Impacts of the Employment Standards Act on horticultural operations</li> </ul> |
|--|---|





4. Identify weeds and invasive plants
  - Introduction of aliens
  - Characteristics of invasive and weed plants
  
5. Recognize and describe bud, bark, foliage, flower, and fruit characteristics
  - Bud characteristics such as
    - Morphology
    - Type (vegetative or flower)
    - Arrangement
  - Bark characteristics such as
    - Furrowed
    - Smooth
    - Plate-like
    - Others
  - Describe leaves using botanical terminology and distinguish a range of inflorescence type and fruit to aid in plant identification
  
6. Identify and describe 75 woody and non-woody plants
  - Using botanical terms
  - According to its cultural and maintenance requirements



**Line (GAC):** E ANALYZES AND MAINTAINS PLANT HEALTH  
**Competency:** E2 Manage growing conditions

**Objectives**

To be competent in this area, the individual must be able to:

- Describe managing a variety of growing conditions.

**LEARNING TASKS**

1. Describe managing growing conditions as applicable to interior and exterior horticulture operations

**CONTENT**

- Determining exposure to conditions such as
  - Light
  - Wind
  - Heating
  - Ventilation
  - Air conditioning (HVAC) systems
  - Moisture
  - Reflective heat load based on location
- Using light meters for measuring light level for interior plants
- Collecting growing media samples using core samplers
- Checking growing media samples manually or by lab analysis for
  - Texture
  - Drainage
  - pH
  - Nutrients
  - Contaminants
- Determining air quality that might affect interior and exterior plants
- Taking corrective measures such as
  - Fertilization
  - Liming
  - Adding organics
  - Neutralizing water
  - Correcting drainage



**Line (GAC):**        **E   ANALYZES AND MAINTAINS PLANT HEALTH**  
**Competency:**      **E3   Manage pests and diseases**

**Objectives**

To be competent in this area, the individual must be able to:

- Examine biological characteristics of weeds, plant feeders and pathogens.
- List control strategies.

**LEARNING TASKS**

**CONTENT**

- |   |  |
|---|--|
| <p>1. Describe and distinguish between the major plant pest types</p> | <ul style="list-style-type: none"> <li>• Weeds as pests</li> <li>• Invertebrates as pests</li> <li>• Vertebrates as pests</li> <li>• Pathogens as pests</li> </ul>   |
| <p>2. Describe characteristics that make plants weeds</p>             | <ul style="list-style-type: none"> <li>• Review what is a weed</li> <li>• Weeds as competitors</li> <li>• Weed classification</li> <li>• Hidden effects of weeds</li> <li>• Seeds of weedy plants</li> </ul>   |
| <p>3. Describe characteristics that make vertebrates pests</p>        | <ul style="list-style-type: none"> <li>• Wildlife management</li> <li>• Vertebrate plant-feeding pests <ul style="list-style-type: none"> <li>○ Birds</li> <li>○ Deer</li> <li>○ Rodents</li> </ul> </li> </ul>  |
| <p>4. Describe characteristics that make invertebrates pests</p>      | <ul style="list-style-type: none"> <li>• Pest ecology</li> <li>• Insect pest success</li> <li>• Common invertebrate pests <ul style="list-style-type: none"> <li>○ Aphids</li> <li>○ Leafhoppers</li> <li>○ Scales</li> <li>○ Weevils and beetles</li> <li>○ Caterpillars and moths</li> <li>○ Lacebugs</li> <li>○ Sawflies</li> <li>○ Thrips</li> <li>○ Mites</li> <li>○ Fungus gnats</li> <li>○ Leaf miners</li> <li>○ Slugs and snails</li> </ul> </li> </ul> |



- |   |  |
|---|--|
| <p>5. Describe the characteristics that make pathogens pests</p>  | <ul style="list-style-type: none"> <li>• Pathogen success</li> <li>• The disease triangle</li> <li>• The disease cycle</li> <li>• Common diseases               <ul style="list-style-type: none"> <li>○ Diseases caused by bacteria</li> <li>○ Fungal diseases</li> <li>○ Diseases caused by nematodes</li> <li>○ Diseases caused by viruses</li> </ul> </li> </ul>   |
| <p>6. Describe the principles of cultural control methods as applied to horticultural plant pests</p>   | <ul style="list-style-type: none"> <li>• Cultural methods of controlling weeds               <ul style="list-style-type: none"> <li>○ Organic mulches</li> <li>○ Non-organic mulches</li> <li>○ Weed control in established plantings</li> </ul> </li> <li>• Cultural control of plant feeding pests</li> <li>• Cultural control of pathogens</li> </ul>   |
| <p>7. Describe the principles of biological control methods as applied to horticultural plant pests</p> | <ul style="list-style-type: none"> <li>• Biological control of weeds</li> <li>• Biological control of plant-feeding pests</li> <li>• Beneficial organisms</li> <li>• Biological agents</li> <li>• Biological control of pathogens</li> </ul>   |
| <p>8. Describe the principles of chemical control methods as applied to horticultural plant pests</p>   | <ul style="list-style-type: none"> <li>• Chemical control of plant pests               <ul style="list-style-type: none"> <li>○ Pesticides</li> </ul> </li> <li>• Chemical control of weeds               <ul style="list-style-type: none"> <li>○ Herbicides</li> </ul> </li> <li>• Chemical control of plant feeding pests               <ul style="list-style-type: none"> <li>○ Horticultural oil</li> <li>○ Botanicals</li> <li>○ Inorganics</li> <li>○ Insecticidal soaps</li> <li>○ Synthetic pesticides (organic)</li> </ul> </li> </ul> |
| <p>9. Describe the integrated strategies and tactics for control of viruses</p>                         | <ul style="list-style-type: none"> <li>• Integrated control strategies for common plant viral diseases</li> <li>• Methods for the exclusion and eradication of plant pest vectors</li> <li>• Management of virus-infected plants</li> </ul>  |
| <p>10. Describe integrated strategies and tactics for the control of bacteria</p>                       | <ul style="list-style-type: none"> <li>• Biological control</li> <li>• Cultural control method</li> </ul>  |
| <p>11. Describe integrated strategies and tactics for the control of fungi</p>                          | <ul style="list-style-type: none"> <li>• Biological control</li> <li>• Cultural control</li> <li>• General prevention</li> </ul>   |



12. Describe the integrated strategies and tactics for the control of plant-feeding pests
  - Biological control
  - Cultural control
  - Plant-feeding pests
  - Invertebrates
  - Nematodes (invertebrates)
  - Arthropod plant feeding pest (invertebrates)
  - Vertebrate plant feeding pests and control



**Line (GAC):** E ANALYZES AND MAINTAINS PLANT HEALTH  
**Competency:** E4 Describe plant science as it applies to horticulture

**Objectives**

To be competent in this area, the individual must be able to:

- Examine the internal anatomy of stems, roots and leaves as they relate to photosynthesis, respiration, and transpiration.

**LEARNING TASKS**

**CONTENT**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Describe the internal anatomy of stems, roots, and leaves</li> </ol>                                       | <ul style="list-style-type: none"> <li>• The plant cell</li> <li>• Cell types, tissues, and their functions</li> <li>• Primary growth</li> <li>• Secondary growth</li> </ul>   |
| <ol style="list-style-type: none"> <li>2. Describe plant part anatomy</li> </ol>   | <ul style="list-style-type: none"> <li>• Stems             <ul style="list-style-type: none"> <li>○ Herbaceous stems</li> <li>○ Woody stems</li> <li>○ Bark</li> </ul> </li> <li>• Roots             <ul style="list-style-type: none"> <li>○ Root apical meristems</li> <li>○ Root cap</li> <li>○ Epidermis</li> <li>○ Cortex</li> <li>○ Endodermis</li> <li>○ Pericycle</li> <li>○ Vascular tissue</li> <li>○ Adventitious roots</li> <li>○ Secondary growth</li> </ul> </li> <li>• Leaves             <ul style="list-style-type: none"> <li>○ Anatomy of a leaf</li> </ul> </li> </ul> |
| <ol style="list-style-type: none"> <li>3. Describe the movement of sap through a plant and the effects of environment on the rate of flow</li> </ol> | <ul style="list-style-type: none"> <li>• Water movement             <ul style="list-style-type: none"> <li>○ Diffusion</li> <li>○ Osmosis</li> <li>○ Capillary attraction</li> <li>○ Active transport</li> </ul> </li> </ul>   |
| <ol style="list-style-type: none"> <li>4. Describe the flow of sugars, produced in photosynthesis, through the plant</li> </ol>                      | <ul style="list-style-type: none"> <li>• Photosynthesis             <ul style="list-style-type: none"> <li>○ Chlorophyll</li> <li>○ Translocation for sugars</li> <li>○ Respiration</li> </ul> </li> </ul>   |





5. Explain the influence of temperature, water availability, and light on the rates of photosynthesis and respiration
  - Influence of environmental factors
  - Effect of light, carbon dioxide availability, water, and nutrient availability on the rate of photosynthesis
  - Environmental effects on the plant growth
  - Effect of temperature on plant development
  - Effect of water stress on plant growth
  
6. Describe the growth response to external stimuli
  - Photoperiod and flower production
    - Photoperiod
    - Tropisms and plant growth



**Line (GAC):** E ANALYZES AND MAINTAINS PLANT HEALTH  
**Competency:** E6 Describe chemical characteristics of soil and soilless media

**Objectives**

To be competent in this area, the individual must be able to:

- Examine soil and soil management in horticulture.
- Examine the chemical properties of soil and soilless media (soil reaction, soil salinity, soil fertility).
- Sample soils.

**LEARNING TASKS**

**CONTENT**

<ol style="list-style-type: none"> <li>1. Describe how soil colloids determine soil chemical properties</li> <li>2. Behaviour of nutrients in soil</li> <li>3. Acquisition of nutrients by plants</li> <li>4. Measure soil reaction (pH)</li> <li>5. Manage soil reaction</li> <li>6. Explain how soil reaction (pH) relates to soil fertility</li> <li>7. Measure and manage salinity and sodicity</li> <li>8. Describe soil salinity and sodicity and impact on soil properties</li> </ol>	<ul style="list-style-type: none"> <li>• Soil colloids</li> <li>• Soil pH and colloidal material</li> <li>• Cations and plant roots</li> <li>• Mineral nutrients</li> <li>• Primary macronutrients</li> <li>• Secondary macronutrients</li> <li>• Micronutrients</li> <li>• Nutrient uptake</li> <li>• The nitrogen cycle</li> <li>• Root absorption</li> <li>• Define pH</li> <li>• Testing soil for pH</li> <li>• Adjusting the pH of soil</li> <li>• Buffering capacity</li> <li>• Plant growth and pH tolerance               <ul style="list-style-type: none"> <li>○ Importance of pH to plant growth</li> <li>○ Phosphorus</li> <li>○ Pathogens and pH</li> </ul> </li> <li>• Salinity in soils</li> <li>• Measurement of salinity and sodicity</li> <li>• Measurement of electrical conductivity</li> <li>• Sodic soils</li> <li>• Impact of salinity and sodicity on soil physical and chemical characteristics</li> </ul>
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- 9. Discuss nutrient management
  - Nutrient management
    - Slow-release fertilizers
    - Water soluble fertilizers
  - Field stock and landscape fertilizer management
  - Turf fertilizer management
  - Organic fertilizers and amendments
  - Inorganic fertilizers
  
- 10. Sample soils
  - Soil testing
    - Collecting soil samples in field crops and on landscape sites
    - Procedures of soilless media samples
  - Limitations of soil nutrient analysis
  
- 11. Interpret soil test information
  - Interpreting basic soil test results
  - Calculate fertilizer application rates
  
- 12. Interpret fertilizer label information
  - Classifications of fertilizers
  - Fertilizer labeling

**Achievement Criteria**

Performance	The apprentice will examine soil samples and identify chemical properties.
Conditions	The apprentice will be given soil samples and testing equipment.
Criteria	<p>The apprentice will score a passing grade of 70% or better on a rating sheet according to the following criteria:</p> <ul style="list-style-type: none"> <li>• Performed sodic and salinity analysis</li> <li>• Performed pH analysis</li> <li>• Performed nutrient management analysis</li> </ul>



# Level 3

## Production Horticulturist





## LEARNING TASKS

### 3. Manage lighting control systems

## CONTENT

- Roll-up vents
- Forced-air vents
- Evaporative cooling systems
- Shade systems for nurseries
  - Liquid shading (e.g. Reduheat)
  - Shade blankets
  - Retracting roofs
  - Other cooling options (e.g. misting)
- Manual temperature monitoring
  - Air temperature thermometers
  - Thermographs
  - Soil temperature
  - Types of temperature sensors
- Computer control of nursery temperature
  - Normal setting schedules
  - Deadband control
  - Set point modifiers (light-humidity)
  - Response modifiers (light-temperature)
  - Vent setting considerations
- Computer control of automatic blanket systems
  - Blanket system functions
  - Operation (controls)
  - Overrides
- Supplemental lighting systems
  - Incandescent
  - Fluorescent
  - High intensity (photosynthetic)
  - Light-emitting diode (LED)
- High intensity discharge (HID) lighting
  - High pressure sodium (HPS)
  - Low pressure sodium (LPS)
  - Metal halide (MH)
  - Mercury (Hg)
- Factors used to select lighting
- Photoperiod control
  - Lighting
  - Blackout systems
- Manual light measurement
  - Photometer
  - Camera light meter



## LEARNING TASKS

### 4. Manage carbon dioxide control systems

## CONTENT

- Use of light sensors
  - Photocells
  - Radiometers
  - Quantum sensors
- Use of computers to control lighting
  - Lighting functions
  - Photoperiod control
  - Supplemental lighting
  - Photosynthetic lighting
- Operating control functions
  - Time window
  - Light threshold
  - Proving period
  - Minimum “on” time
  - Light accumulation
- CO<sub>2</sub> enrichment systems
  - Open-flame units
  - Forced-air units
  - Bulk liquid carbon dioxide
  - Recycled flue glass
- Use of CO<sub>2</sub> enrichment systems
- Distribution of CO<sub>2</sub> in nurseries
- Measurement of CO<sub>2</sub> levels
  - Hand-held testers
  - Carbon dioxide sensors
- Computer control of CO<sub>2</sub> levels
  - Time control
  - Light control
  - Concentration control
  - Cycle control
  - Overrides
- Types of controllers
  - Time clocks
  - Thermostats
  - Humidistats
  - CO<sub>2</sub> concentration meters
- Importance of sensor location
- Equipment regulated controllers
  - Motors
  - Pumps
  - Fans

**LEARNING TASKS**

5. Manage environmental controllers

**CONTENT**

- Valves
- Lights
- Types of environmental control systems
  - Digital control
  - Analog control
  - Computer control
  - Control system terminology
- Computer system components and features
  - Computer station (terminal)
  - Computer software and hardware
  - Types of sensors
  - Program features and functions
- Computer system service and performance requirements
- Weather effects on control systems







**LEARNING TASKS**

4. Perform basic repairs
  
5. Conduct regular inspections
  
6. Winterize irrigation and fertigation systems
  
7. Manage water recycling systems
  
8. Manage nursery drainage systems

**CONTENT**

- Replacing distribution and drip lines
- Irrigation systems
  - Nozzles and injectors
  - Solenoids
  - Pipes
  - Control cables
- Fertigation systems
  - Nozzles and injectors
- Drainage systems
- Ensure integrity of irrigation and fertigation systems
- Check lists
- Methods used to prevent freezing
- Restoring systems after freezing
- Capture and recycling systems
- Pumps and filters
- Disinfection
- Causes of poor drainage
- Function of each type of drainage system
- Sub-surface drainage methods and materials
- Maintenance of sub-surface drainage systems
- Builder's level to establish and check elevations



**Line (GAC): D MANAGES GROWING FACILITIES**

**Competency: D3 Manage sanitary environment**

**Objectives**

To be competent in this area, the individual must be able to:

- Inspect sanitary conditions in growing facilities.
- Maintain sanitary conditions in growing facilities.

**LEARNING TASKS**

1. Implement sanitation practices
  
2. Select appropriate method for sanitation
  
3. Perform regular maintenance activities

**CONTENT**

- Importance of sanitation
- Hand washing
- Foot baths
- Check lists
- Regular inspections
- Tool sanitation
- Equipment
- Work surfaces
  
- Cultural methods
- Physical and/or chemical methods
- Manage sanitation in nursery environments
- Protect adjacent buildings and properties
- Promote plant health



**Line (GAC):**        **E    ANALYZES AND MAINTAINS PLANT HEALTH**  
**Competency:**      **E3   Manage pests and diseases**

**Objectives**

To be competent in this area, the individual must be able to:

- Implement Integrated Pest Management (IPM) for control of:
  - Viral diseases
  - Bacterial diseases
  - Fungal diseases
  - Plant-feeding pests
- Identify crops that may not benefit from traditional control methods.

**LEARNING TASKS**

1. Implement IPM strategies for control of viral diseases
  
2. Implement IPM strategies for control of bacterial diseases
  
3. Implement IPM strategies for control of fungal diseases

**CONTENT**

- Types of viruses
- Viral vectors
- Common viral diseases of plants
- Virus disease control
  - Vector exclusion
  - Virus exclusion and eradication
- Management of virus infected plants
  
- Bacteria
  - Bacterial plant diseases
  - Control of bacterial diseases
- Biological control
- Mechanical control
- Chemical control
- Preventative measures
  
- Fungi
  - Common plant pathogenic fungi
  - Control of plant fungal diseases
    - Biological control
    - Mechanical control
    - Chemical control
- Preventative measures
- Disease-specific cultural recommendations

**LEARNING TASKS**

4. Implement IPM strategies for control of plant-feeding pests

**CONTENT**

- Natural control methods
  - Biological control methods
  - Mechanical control methods
  - Chemical control methods
- Types of plant-feeding pests
- Classification of plant feeding pests
- Biological control strategies for plant feeding pests
  - Invertebrate
  - Vertebrate



<b>Line (GAC):</b>	<b>E</b>	<b>ANALYZES AND MAINTAINS PLANT HEALTH</b>
<b>Competency:</b>	<b>E7</b>	<b>Examine properties of soilless media and fertilizers in relation to container production</b>

**Objectives**

To be competent in this area, the individual must be able to:

- Examine the maintenance requirements for container growing media.
- Examine the physical characteristics of a media.
- Examine how sand affects the physical characteristics of a media.
- Measure pH and electrical conductivity in irrigation water.
- Examine effect of controlled released fertilizer has on plant growth.

**LEARNING TASKS**

1. Examine physical characteristics of container growing media
  
2. Examine advantages and disadvantages of different components used in container mixes

**CONTENT**

- Characteristics of container growing media
- Drainage and aeration
- Volume of containers
- Perched water table
- Total porosity
- Aeration porosity (air-filled porosity)
- Water availability
- Wettability
- Properties of peat
- Types of peat moss
- Properties of components such as:
  - Bark
  - Sawdust
  - Sand
  - Vermiculite
  - Perlite
  - Pumice
  - Rice hulls
  - Coco fibre
  - Compost/organic material
  - Others



**LEARNING TASKS**

3. Examine nutrient management practices
  
4. Examine various types of fertilizer and methods used to apply to container crops
  
5. Examine the mixing and formulation of container media for specific crops
  
6. Examine the importance of water quality for container crop production

**CONTENT**

- Cation exchange capacity (CEC)
- Losses due to leaching
- Standard levels of nutrients for container crops
- Electrical conductivity measuring
- pH required for container mixes
- Adjusting pH of a mix after potting
- Measuring pH in container mixes
- Preventing injury due to excessive salt build up
  
- Controlled release fertilizers (CRFs)
- Methods of applying CRF
  - Incorporation
  - Top dressing
- Liquid feeding
  - Dissolving fertilizer
  - Fertilizer dyes
  - Fertilizer concentrations
  - Calculate fertilizer rates
  
- Mixing requirements
- Methods of mixing
- Formulation of the mix
  
- Guidelines for water quality
  - City water
  - Ground water
  - Rain water
  - Recycled



**Line (GAC):** E ANALYZES AND MAINTAINS PLANT HEALTH  
**Competency:** E8 Identify and control weeds

### Objectives

To be competent in this area, the individual must be able to:

- Identify common weeds in container and field crop production.
- Control weeds in container and field crop production.

### LEARNING TASKS

1. Implement effective weed management in nursery crops
  
2. Identify common weeds that affect nursery production

### CONTENT

- Weed control legislation
- Sanitary practices
- Cultural practices
- Strategic management of weeds
  - Weed control in containers
  - Weed control in fields
  - Weed control in non-crop areas
- Common weeds such as:
  - Annual Bluegrass (*Poa annua*)
  - Barnyardgrass (*Echinochloa crusgalli*)
  - Common Chickweed (*Stellaria media*)
  - Creeping Buttercup (*Ranunculus repens*)
  - Field Bindweed (*Convolvulus arvensis*)
  - Foxtail Barley (*Hordeum jubatum*)
  - Giant Hogweed (*Heracleum mantegazzianum*)
  - Groundsel (*Senecio vulgaris*)
  - Field Horsetail (*Equisetum arvense*)
  - Japanese Knotweed (*Polygonum cuspidatum*)
  - Common Mallow (*Malva neglecta*)
  - Mullein (*Verbascum thapsus*)
  - Nightshade (*Solanum species*)
  - Nodding Thistle, a.k.a. Musk Thistle (*Carduus nutans*)
  - Redroot Pigweed (*Amaranthus retroflexus*)
  - Scotch Broom (*Cytisus scoparius*)
  - Sheep Sorrel (*Rumex acetosella*)
  - Shepherd's-Purse (*Capsella bursa-pastoris*)
  - Witchgrass (*Panicum capillare*)





**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <p>3. Control weeds in container crop production</p> | <ul style="list-style-type: none"> <li>○ Snapweed/bittercress (<i>Cardamine hirsuta</i>)</li> <li>○ Liverwort (<i>Calypogeia</i> or <i>Lophocolea</i>)</li> <li>○ Oxalis or wood sorrel (<i>Oxalis</i>)</li> <li>○ Fireweed (<i>Chamerion angustifolium</i>)</li> <li>○ Willowherb (<i>Epilobium ciliatum</i>)</li> <li>○ Pearlwort (<i>Sagina subulata</i>)</li> <li>○ Purslane (<i>Portulaca oleracea</i>)</li> <li>○ Cottonwood (<i>Hibiscus tiliaceus</i>)</li> <li>○ Broad-leaved plantain (<i>Plantago major</i>)</li> <li>○ Narrow-leaved plantain (<i>Plantago lanceolata</i>)</li> </ul> |
| <p>4. Control weeds in field crop production</p>     | <ul style="list-style-type: none"> <li>● Preemergence and postemergence herbicides</li> <li>● Strategic plan for weed control</li> <li>● Mechanical methods of controlling weeds</li> <li>● Weed barriers</li> </ul>  |

**Achievement Criteria**

- |             |   |
|-------------|---|
| Performance | The apprentice will demonstrate the ability to identify common weeds associated with nursery field and container stock and recommend a plan of action for weed removal.   |
| Conditions  | The apprentice will be provided with samples of common nursery weeds.   |
| Criteria    | The apprentice will score a passing grade of 70% or better as determined by the Instructor's assessment of the apprentice's ability to identify common weeds associated with nurseries and recommend a plan for weed control. |



**Line (GAC):** F **MANAGES NURSERY, FIELD AND CONTAINER CROPS**  
**Competency:** F1 **Propagate nursery, field and container crops**

### Objectives

To be competent in this area, the individual must be able to:

- Implement propagation techniques.
- Apply environmental requirements for propagation.

### LEARNING TASKS

1. Implement propagation techniques

### CONTENT

- Propagate plants from
  - Softwood stem
  - Semi-ripe
  - Ripe
  - Hardwood
  - Root
  - Leaf stem
  - Leaf vein
  - Leaf bud
- Seeds
  - Vernalization
  - Stratification
  - Scarification
- "Hardening off"
  - Purpose
  - Scheduling
- Grafting techniques
  - Cleft
  - Bark
  - Bud
  - Whip or tongue
  - Care of the graft
- Layering techniques
  - How to layer
  - Layering climbing plants
  - Air layering
- Propagating nursery plants by division
  - Young perennials
  - Mature perennials
  - Tuberous plants
  - Rhizomatous plants
  - Shrubs
  - Tissue culture



## LEARNING TASKS

2. Apply environmental requirements for propagation
  
3. Describe cost and efficiency concerns in the propagation of nursery, field and container crops

## CONTENT

- Sticking cuttings in a medium other than water or mist
- Removing cuttings from the propagating area
- Adjusting timers for mist systems
- Spacing requirements for nursery-grown species during propagation
  
- Material and labour costs
- Process and production efficiency requirements

## Achievement Criteria

Performance	The apprentice will demonstrate the ability to implement propagation techniques.
Conditions	The apprentice will be provided with a typical nursery hardwood plant and sharp pruning shears along with the necessary materials for the purpose of demonstrating propagation techniques.
Criteria	<p>The apprentice will score a passing grade of 70% or better as determined by the Instructor's assessment of their propagation techniques, as per the following criteria:</p> <ul style="list-style-type: none"> <li>• Best time for hardwood propagation</li> <li>• Health of stock (parent) plant</li> <li>• Length of cuttings (as specified by the Instructor)</li> <li>• Buds pointed up</li> </ul>





**LEARNING TASKS**

4. Describe costs and efficiency concerns when growing nursery, field and container crops

**CONTENT**

- Material and labour costs
- Process and production efficiency requirements



**Line (GAC):**        **F**    **MANAGES NURSERY, FIELD AND CONTAINER CROPS**  
**Competency:**       **F3**   **Harvest and ship nursery field crops.**

**Objectives**

To be competent in this area, the individual must be able to:

- Identify ready-for-market crops according to order specifications.
- Select plants and label orders using recognized handling and protection techniques.
- Inspect plant material before shipping.

**LEARNING TASKS**

1. Identify ready-for-market crops according to order specifications
  
2. Select plants and label orders using recognized handling and protection techniques
  
3. Inspect plant material before shipping to ensure it is free of diseases and insects
  
4. Arrange orders and load on designated transportation as per industry standards
  
5. Advise customers on order status
  
6. Describe cost and efficiency concerns for harvesting nursery, field and container crops

**CONTENT**

- Standards
  - Bare root stock
  - Balled and burlapped stock
  - Containers
  - Liners
- Cold storage of bare root field stock
  - Precautions
  - Procedures
- Verify plants meet order specifications
- Label according to company standards
- Prepare (protect) plants for shipping
- Checklists for diseases and insects
- Procedures for rejected plants
- Protect vulnerable plants
- Secure loads
- Verify documentation is in order
- Estimated delivery date and time
- Back-orders
- Shortages
- Substitutions
- Material and labour costs
- Process and production efficiency requirements



**Line (GAC):**        **F**    **MANAGES NURSERY, FIELD AND CONTAINER CROPS**  
**Competency:**      **F4**   **Process and ship nursery container crops.**

**Objectives**

To be competent in this area, the individual must be able to:

- Package orders for transport.
- Record shipping information.
- Arrange orders and load on designated transportation.

**LEARNING TASKS**

1. Package orders for transport
  
2. Assemble nursery container products in staging or marshalling area
  
3. Inspect containers before shipping to ensure they are free of diseases and insects
  
4. Record shipping information
  
5. Arrange orders and load on designated transportation as per industry standards
  
6. Describe cost and efficiency concerns for the harvesting of nursery, field and container crops

**CONTENT**

- Packaging systems
  - Boxes
  - Trays
  - Pallets
  - Carts/racks
- Add temperature monitoring devices when necessary
- Appropriate area for staging or marshalling
- Organize plants to facilitate loading
- Checklists for diseases and insects
- Procedures for rejected plants
- Inventory adjustments
- Bills of lading
- Phytosanitary certificates
- Invoices
- Packing slips
- Protect vulnerable plants
- Secure loads
- Verify documentation is in order
- Material and labour costs
- Process and production efficiency requirements

**Achievement Criteria**

Performance	The apprentice will prepare nursery container crops for shipping.
Conditions	The apprentice will be given a shipping order and access to nursery container crops.
Criteria	<p>The apprentice will score a passing grade of 70% or better as determined by the Instructor's assessment of their ability to demonstrate the following tasks:</p> <ul style="list-style-type: none"><li>• Prepare orders for transport</li><li>• Assemble nursery container products in staging or marshalling area</li><li>• Inspect containers before shipping to ensure they are free of diseases and insects</li><li>• Record shipping information</li><li>• Arrange orders and load on designated transportation</li></ul>





**Line (GAC): G OVERSEES NURSERY PRODUCTION AND SYSTEM OPERATIONS**

**Competency: G1 Analyze profitability, costs, efficiency, labour, and control of inventory**

**Objectives**

To be competent in this area, the individual must be able to:

- Review records to determine
  - Profitability
  - Production costs
  - Operating costs
- Take inventory of materials and supplies.
- Assess control measures.
- Analyze profitability.

**LEARNING TASKS**

1. Analyze the factors that affect productivity and profitability
  
2. Develop departmental budget

**CONTENT**

- Income statements
- Fixed and variable costs such as
  - Labour costs
  - Plant loss
  - Overhead costs
- Unit cost of production
- Fixed and variable costs such as
  - Labour costs
  - Plant loss
  - Overhead costs
- Unit cost of production
- Departmental profit

**Achievement Criteria**

Performance	The apprentice will develop a departmental budget.
Conditions	The apprentice will be presented with a typical scenario (or case study) with the necessary details to develop a departmental budget.
Criteria	<p>The apprentice will score a passing grade of 70% or better as determined by the Instructor's assessment of their ability to develop a departmental budget base on the following criteria:</p> <ul style="list-style-type: none"> <li>• Fixed and variable costs such as           <ul style="list-style-type: none"> <li>○ Labour costs</li> <li>○ Plant loss</li> <li>○ Overhead costs</li> </ul> </li> <li>• Unit cost of production</li> <li>• Departmental profit</li> </ul>





**LEARNING TASKS**

3. Implement emergency preparedness plan

**CONTENT**

- Electrical breakers
- Shut-off valves
  - Natural gas
  - Water
- Alarm systems
- Standby generators
- Chemical spills
- Petroleum spills
- Communication Plan
  - Emergency phone numbers
- Snow load management



**Line (GAC):**        **G    OVERSEES NURSERY PRODUCTION AND SYSTEM OPERATIONS**

**Competency:**     **G3   Describe industry standards, regulations and programs for managing phytosanitary risk**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe regulations and programs for managing phytosanitary risk.

**LEARNING TASKS**

1. Describe the programs for managing phytosanitary risk

**CONTENT**

- Canadian Nursery Certification Program (CNCP)
- Clean Plant Program
- Canadian Food Inspection Agency (CFIA)
- Phytosanitary Certificates
- Audits
  - Canadian Nursery Certification Program (CNCP)
  - Clean Plant Program



**Line (GAC): G OVERSEES NURSERY PRODUCTION AND SYSTEM OPERATIONS**

**Competency: G4 Manage production employees**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe labour relations requirements.
- Perform supervisory duties and responsibilities.

**LEARNING TASKS**

1. Describe the relationship between employee relations and productivity and profitability
  
2. Perform supervisory duties and responsibilities

**CONTENT**

- Psychological aspects of human motivation
- Relationship between employee relations and productivity
- Employee record keeping
- Employee morale
  
- Matching employees to production tasks
- Supervising foreign workers (culture)
- Writing routine employee performance reports
- Monitoring workers to ensure they meet performance and safety requirements
- Creating ways to make the production process more efficient
- Determining whether new machines are needed, or whether overtime work is necessary
- Fixing any production problems that may arise



# Section 4

## TRAINING PROVIDER STANDARDS



## Facility Requirements

### LEVEL ONE

#### Classroom Area

- Approximately 900 square feet
- Comfortable seating and tables suitable for training, teaching, lecturing and drafting
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen while also allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/Air conditioning for comfort all year round
- In-room temperature regulation to ensure comfortable room temperature
- In-room ventilation sufficient to control training room temperature
- Acoustics in the room must allow audibility of the instructor
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and a multi-media (data) projector

#### Shop Area

- Access to a service bay – approximately 600 square feet
- Access to a site for equipment operation – minimum one acre
- Access to all tools and equipment as listed for Level One

#### Lab Requirements

- Botany or Science teaching lab outfitted with compound and dissecting microscopes – approximately 600 square feet
  - Access to live 'in situ' plant material as well as herbaria, and visual samples (slides, photographic databases, etc.)
  - Microscope slides of showing root, stem and leaf anatomy (monocot and dicot)
  - Microscope slides showing woody stem growth
  - Hand lens (10X)
  - Glassware, lamps, stir plate (with heating capacity)
  - Refrigerator and microwave
  - Collection of arthropods, disease organisms, and examples of plant stress
- Soil Science or Chemistry teaching lab - approximately 600 square feet
  - Glassware, lamps, stir plate (with heating capacity)
  - Refrigerator, drying oven and microwave
  - Nested sieves, shakers, scales
  - Hydrometers and sedimentation cylinders
  - Munsell colour books



**Student Facilities**

- Adequate lunch room as per WorkSafeBC requirements
- Adequate washroom facilities as per WorkSafeBC requirements
- Personal storage lockers

**Instructor's Office Space**

- Suitable space and office furniture necessary for instructor to prepare lessons and secure file records

**Other**

- Access to botanical gardens





## LEVEL TWO

### Classroom Area

- Approximately 900 square feet
- Comfortable seating and tables suitable for training, teaching, lecturing and drafting
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen while also allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/Air conditioning for comfort all year round
- In-room temperature regulation to ensure comfortable room temperature
- In-room ventilation sufficient to control training room temperature
- Acoustics in the room must allow audibility of the instructor
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and a multi-media (data) projector

### Shop Area

- Access to a service bay – approximately 600 square feet
- Access to a site for equipment operation – minimum one acre
- Access to all tools and equipment as listed for Level Two

### Lab Requirements

- Botany or Science teaching lab outfitted with compound and dissecting microscopes - approximately 600 square feet
  - Access to live 'in situ' plant material as well as herbaria, and visual samples (slides, photographic databases, etc.)
  - Microscope slides showing root, stem and leaf anatomy (monocot and dicot)
  - Microscope slides showing woody stem growth
  - Hand lens (10X)
  - Glassware, lamps, stir plate (with heating capacity)
  - Refrigerator and microwave
  - Collection of arthropods, disease organisms, and examples of plant stress
- Soil Science or Chemistry teaching lab - approximately 600 square feet
  - Glassware, lamps, stir plate (with heating capacity)
  - Refrigerator, drying oven and microwave
  - Nested sieves, shakers, scales
  - Hydrometers and sedimentation cylinders
  - Munsell colour books
  - pH meters
  - Soil sampling equipment

**Student Facilities**

- Adequate lunch room as per WorkSafeBC requirements
- Adequate washroom facilities as per WorkSafeBC requirements
- Personal storage lockers

**Instructor's Office Space**

- Suitable space and office furniture necessary for instructor to prepare lessons and secure file records

**Other**

- Access to a botanical garden
- Access to container nursery stock
- Access to field-grown stock/plant material that can be prepared for transplanting
- Trailer and tractor nursery equipment
- Access to large tree transplanting equipment
- Nursery hand carts and tree dollies
- Multiple nursery stock containers



## LEVEL THREE

### Classroom Area

- Approximately 900 square feet
- Comfortable seating and tables suitable for training, teaching, lecturing and drafting
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen while also allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/Air conditioning for comfort all year round
- In-room temperature regulation to ensure comfortable room temperature
- In-room ventilation sufficient to control training room temperature
- Acoustics in the room must allow audibility of the instructor
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and a multi-media (data) projector

### Shop Area

- Access to a service bay – approximately 600 square feet
- Access to a site for equipment operation – minimum one acre
- Access to all tools and equipment as listed for Level Three

### Lab Requirements

- Samples (weeds, pests, diseases and virus infections)
- Diagnostic resources
- Science teaching lab outfitted with compound and dissecting microscopes - approximately 600 square feet
  - Hand lens (10X)
  - Glassware
  - Lamps
  - Refrigerator and microwave
  - Collection of arthropods, disease organisms, and examples of plant stress
- Soil Science or Chemistry teaching lab - approximately 600 square feet
  - Soilless media components
  - Glassware, lamps, stir plate (with heating capacity)
  - Refrigerator, drying oven and microwave
  - Nested sieves, shakers, scales
  - Hydrometers and sedimentation cylinders
  - Munsell colour books
  - pH meters
  - EC meters
  - Moisture meters
  - Soil sampling equipment

**Student Facilities**

- Adequate lunch room as per WorkSafeBC requirements
- Adequate washroom facilities as per WorkSafeBC requirements
- Personal storage lockers

**Instructor's Office Space**

- Suitable space and office furniture necessary for instructor to prepare lessons and secure file records

**Other**

- Access to a container nursery
- Access to nursery complete with a wide range of crops
- Access to fertilizer, pots, and media samples
- Access to greenhouses and nursery areas with a variety of control equipment including computer systems
- Access to greenhouses and nursery areas with a variety of control facilities (lights, thermal screens, blackout screens, carbon dioxide input, heating equipment)
- Access to commercial nurseries using innovative production practices and technology
- Access to nursery and greenhouse with adequate space for performing irrigation audits and level surveying exercises



## Tools and Equipment

### LEVEL ONE

#### SHOP EQUIPMENT

##### *Motorized Equipment*

- Baggers for leafs
- Blowers (backpack, hand held, push, earth auger)
- Dethatcher
- Edgers
- Hedge trimmer (extension, long reach)
- Lawn/weed trimmers (gas & electric)
- Pressure washer
- Soil screener
- String trimmer
- Sterilizers

#### SHOP (FACILITY) TOOLS

##### *Standard Power Tools*

- Chainsaw
- Grinder
- Pole chainsaw
- Pallet Jack
- Power cultivator (rototiller)
- Vacuum (wet/dry, leaf)
- Walk-behind aerator

##### *Standard Hand Tools*

- Brooms
- Cultivator (manual)
- De-thatching rake
- Garden forks
- Grease guns
- Handheld watering equipment
- Landscape rakes
- Loppers
- Mallet
- Microscope
- Pickaxes
- Picks
- Pitch forks
- Pliers (various types)
- Pruning shears
- Rakes (various types)
- Screwdrivers (various types)
- Seed/fertilizer spreader
- Sharpening tools
- Shovels (coal, clam, scoop/barn, spade, garden)
- Spades (various types)
- String line
- Tarps
- Trowels
- Weed digger
- Wheelbarrow
- Wrenches



***Specialty (Facility) Tools***

**Measuring Equipment**

- EC meters Levels
- Hydrometer
- Levels
- pH meter
- Scales
- Sedimentation cylinder
- Tape measure
- Thermometers
- Tire pressure meter

**STUDENT EQUIPMENT (supplied by school)**

***Required - PPE and Safety Equipment***

- Ear protection
- Eye protection (glasses, shields)
- Eye wash kit
- Fall protection (harness)
- Fire extinguisher
- First Aid kits
- Flares
- Hardhat
- Lanyard
- Particle masks
- Reflective shirts, jackets
- Respirators
- Safety vests
- Spill kit
- Traffic cones

**OFFICE EQUIPMENT**

***Recommended***

- Camera
- Communication devices
- Computers

**STUDENT TOOLS (supplied by student)**

***Required***

- CSA-approved steel-toed footwear
- Calculator
- Hand lens (10x)
- Secateurs

***Recommended***

- Work gloves
- Rainwear



## LEVEL TWO

### SHOP EQUIPMENT

#### *Motorized Equipment*

- 3-reel turf mower
- Backhoe
- Baggers for leafs
- Blowers (backpack, hand held, push, earth auger)
- Brush cutter
- Clearing saw
- Edgers
- Electric powered utility vehicle
- Elevated work platforms
- Excavator
- De-thatcher
- Flat filler
- Fork lift
- Front end loader
- Gas powered utility vehicle (Gator)
- Hedge trimmer (extension, long reach)
- Lawn/weed trimmers (gas & electric)
- Pot filler
- Powered rollers
- Pressure washer
- Pumps
- Ram compactor (jumping jack)
- Riding mowers/mulchers
- Skid steer loader
- Soil screener
- Sterilizers
- String trimmer
- Tractors
- Trucks
- Turf and tree sprayer

#### *Required – Attachments*

- Bucket
- Forks
- Trailer
- Spray equipment

#### *Recommended – Attachments*

- Aerator
- Auger/post hole digger
- Blade
- Cultivator
- Discer
- Harrow
- Leaf vacuum
- Overseeder
- Plough
- Power sweeper
- Rototiller
- Snow blower
- Soil profiler
- Top dresser
- Tow behind de-thatcher
- Tow behind thatcher
- Tree spade
- U-blade
- Vacuum



## SHOP (FACILITY) TOOLS

### **Standard Power Tools**

- Chainsaw
- Electric drill
- Fertilizer injector
- Grinder
- Hammer drill
- Mower/mulcher
- Power cultivator (rototiller)
- Power sprayer
- Vacuum (wet/dry, leaf)
- Walk-behind aerator

### **Standard Hand Tools**

- Axes
- Backpack sprayer
- Boxcutters
- Brick carriers
- Brick splitter
- Brooms
- Bulb planters
- Cart
- Chains
- Chisels
- Clearing axes
- Core samplers (probe)
- Crimpers
- Crowbars
- Cultivator (manual)
- De-thatching rake
- Dolly
- Files
- Flags
- Garden forks
- Grease guns
- Hammers (hand, sledge)
- Hand tamper
- Handheld watering equipment
- Landscape rakes
- Loppers
- Mallet
- Microscope
- Pickaxes
- Picks
- Pitch forks
- Pliers (various types)
- Pry bar
- Punch
- Rakes (various types)
- Screwdrivers (various types)
- Seed/fertilizer spreader
- Sharpening tools
- Shovels (coal, clam, scoop/barn, spade, garden)
- Side cutters
- Soil screener
- Spades (various types)
- String line
- Tap and die
- Tape measure
- Tarps
- Tie-downs (straps, chains)
- Tree cart
- Trowels
- Water key
- Weed digger
- Wheelbarrow
- Wheel chocks
- Wrenches





***Specialty (Facility) Tools***

**Measuring Equipment**

- Anemometer
- EC meter
- Hydrometer
- Hygrometer
- Levels (line, hand, zip laser)
- Light meter
- pH meter
- Tape measure
- Thermometer
- Tire pressure meter

**STUDENT EQUIPMENT (supplied by school)**

***Required - PPE and Safety Equipment***

- Cones
- Chemical protection suits
- Ear protection
- Eye protection (glasses, shields)
- Eye wash kit
- Face shields
- Fall protection (harness)
- Fire extinguisher
- First Aid kits
- Flares
- Goggles
- Hard hat
- Lanyard
- Particle masks
- Reflective shirts, jackets
- Respirators
- Rubber gloves
- Safety vests
- Spill kit
- Traffic cones

***Recommended - Office Equipment***

- Camera
- Communication devices
- Computers

**STUDENT TOOLS (supplied by student)**

***Required***

- CSA-approved steel-toed footwear

***Recommended***

- Calculator
- Hand lens (10x)
- Work gloves
- Rainwear



## LEVEL THREE

### SHOP EQUIPMENT

#### *Motorized Equipment*

- Blowers (backpack, hand held, push, earthauger)
- Conveyors
- Excavator
- Flat filler
- Fork lift
- Front end loader
- Gas powered utility vehicle (Gator)
- Hedge trimmer (extension, long reach)
- Lawn/weed trimmers (gas & electric)
- Potting machine
- Pressure washer
- Pumps
- Skid steer loader
- Soil screener
- Sterilizers
- String trimmer
- Tractors
- Trucks
- Turf and tree sprayer

#### *Required – Attachments*

- Bucket
- Forks
- Trailer
- Spray equipment

#### *Recommended – Attachments*

- Cultivator
- Discer
- Harrow
- Leaf vacuum
- Plough
- Rototiller
- Tree spade

### SHOP (FACILITY) TOOLS

#### *Standard Power Tools*

- Air compressor
- Chainsaw
- Electric drill
- Grinder
- Vacuum (wet/dry, leaf)

#### *Standard Hand Tools*

- Backpack sprayer
- Brooms
- Cart
- Chains
- Core samplers (probe)
- Crimpers
- Crowbars
- Dutch hoe
- Hoe
- Grease guns
- Hammers (hand, sledge)
- Handheld watering equipment
- Landscape rakes
- Loppers
- Pickaxes
- Picks
- Pitch forks
- Pliers (various types)
- Pry bar
- Rakes (various types)
- Screwdrivers (various types)
- Seed/fertilizer spreader
- Sharpening tools



- Shovels (coal, clam, scoop/barn, spade, garden)
- Side cutters
- Spades (various types)
- Tape measure
- Tapener
- Tie-downs (straps, chains)
- Tree cart
- Water key
- Wheelbarrow
- Wheel chocks
- Wire tensioners
- Wrenches

***Specialty (Facility) Tools***

**Measuring Equipment**

- Anemometer (wind gauges)
- Barometer
- Builder's level
- EC meter
- Flow meter
- GPS
- Hydrometer
- Hygrometer
- Laser distance measure
- Levels (line, hand, zip laser)
- Light meter
- Measuring wheel
- pH meter
- Planimeter
- Pressure gauge
- Scale ruler
- Scales
- Sling psychrometer
- Soil tester
- Surveying equipment
- Tape measure
- Thermometer
- Water meter

**STUDENT EQUIPMENT (supplied by school)**

***Required - PPE and Safety Equipment***

- Chemical protection suits
- Ear protection
- Eye protection (glasses, shields)
- Eye wash kit
- Face shields
- Fall protection (harness)
- Fire extinguisher
- Goggles
- Hard hat
- Particle masks
- Reflective shirts, jackets
- Respirators
- Rubber gloves
- Safety vests
- Spill kit
- Traffic cones

***Recommended - Office Equipment***

- Camera
- Communication devices
- Computers



**STUDENT TOOLS (supplied by student)**

***Required***

- CSA-approved steel-toed footwear

***Recommended***

- Calculator
- Hand lens (10x)
- Work gloves
- Rainwear
- Pocket knife
- Felco pruners with scabbard
- Notebook
- Valid tetanus immunization



## Reference Materials

### LEVEL ONE

#### Required Reference Materials

- Kwantlen University College School of Horticulture Plant identification Database  
[www.kwantlen.ca/horticulture/](http://www.kwantlen.ca/horticulture/)  
<https://plantdatabase.kwantlen.ca/>
- Botany for Gardeners - Latest edition. Capon, Brian. Timber Press, Portland, OR.
- Soil Science and Management - Latest edition. Plaster J. Edward. Thomson/Delmar Learning, Clifton Park, NY
- British Columbia Landscape Standard - Latest edition. BC Landscape and Nursery Association and the British Columbia Association of Landscape Architects, Surrey, BC

#### Recommended Resources

- Integrated Pest Management Manual for Landscape Pests in British Columbia. Gilkeson, Linda A. 2000. Pollution and Remediation Branch, Victoria, BC.
- WorkSafeBC Website  
<http://www.worksafebc.com/>
- Equipment Manufacturers Websites (Internet)

#### Suggested Texts

- Abiotic Disorders of Landscape Plants : A Diagnostic Guide - Costello, Laurence Raleigh. 2003. University of California, Agriculture and Natural Resources, Oakland, CA
- Home and Garden Pest Management Guide for British Columbia - B.C. Ministry of Agriculture Fisheries and Food Latest edition. Crown Publications, Victoria, BC
- B.C. Nursery and Landscape Pest Management and Production Guide - Latest edition. B.C. Ministry of Environment, Lands, and Parks. Latest Edition, Crown Publications, Victoria BC
- Ball Identification Guide to Greenhouse Pests and Beneficials - Gill, Stanton. 1998. Ball Publishing, Batavia, Ill.
- Field Guide to Noxious and Other Selected Weeds of British Columbia - Cranston, Roy. 2002. Ministry of Agriculture, Food and Fisheries; Ministry of Forests, Victoria, BC  
<http://www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm>
- Pacific Northwest; Plant Disease Management Handbook - 2000. Extension Services of Oregon State University, Washington State University, and the University of Idaho
- Soil Management Handbook for the Lower Fraser Valley - Bertrand, R.A., G.A. Hughes-Games, and D.C. Nikkel. 1991. Ministry of Agriculture, Fisheries & Food, Abbotsford, B.C.
- Western Fertilizer Handbook - Soil Improvement Committee, California Fertilizer Association. Latest edition (Horticulture ed.) Interstate Publishing Inc., Danville, Illinois
- Groundskeepers Safety Guide - Latest edition. Canadian Centre for Occupational Health and Safety, Hamilton, ON.
- Outdoor Power Equipment, Latest Edition, Webster, Jay, Nelson. Canada, Scarborough ON



## LEVEL TWO

### Required Reference Materials

- Landscape Horticulture Apprenticeship Program Learning Resources – Level Two, HEBC 2012
- Kwantlen University College School of Horticulture Plant identification Database, [www.kwantlen.ca/horticulture/](http://www.kwantlen.ca/horticulture/)  
<https://plantdatabase.kwantlen.ca/>
- Botany for Gardeners - Capon, Brian. Latest edition. Timber Press, Portland, OR.
- Integrated pest management manual for landscape pests in British Columbia - Gilkeson, Linda A. 2000. Pollution and Remediation Branch, Victoria, BC.
- Soil Science and Management - Latest edition. Plaster J. Edward. Thomson/Delmar Learning, Clifton Park, NY
- British Columbia Landscape Standard - Latest edition. BC Landscape and Nursery Association, BC Society of Landscape Architects, BC
- Canadian Standards for Nursery Stock - Latest edition. Canadian Nursery and Landscape Association

### Recommended Resources

- Field Guide to Noxious and Other Selected Weeds of British Columbia - Cranston, Roy. 2002. Ministry of Agriculture, Food and Fisheries; Ministry of Forests, Victoria, BC  
<http://www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm>
- WorkSafeBC Website  
<http://www.worksafebc.com/>
- Equipment Manufacturers Websites (Internet)

### Suggested Texts

- B.C. Nursery and Landscape Pest Management and Production Guide - Latest edition. B.C. Ministry of Environment, Lands, and Parks. Latest Edition, Crown Publications, Victoria BC
- Home and Garden Pest Management Guide for British Columbia - B.C. Ministry of Agriculture Fisheries and Food Latest edition. Crown Publications, Victoria, BC
- Abiotic disorders of landscape plants: a diagnostic guide - Costello, Laurence Raleigh. 2003. University of California, Agriculture and Natural Resources, Oakland, CA
- Ball Identification Guide to Greenhouse Pests and Beneficials - Gill, Stanton. 1998. Ball Publishing, Batavia, Ill.
- Pacific Northwest; Plant Disease Management Handbook - 2008. Extension Services of Oregon State University, Washington State University, and the University of Idaho
- Handbook for Pesticide Applicators and Pesticide Dispensers - Latest edition. Provincial Ministry of Environment, BC
- Western Fertilizer Handbook - Soil Improvement Committee, California Fertilizer Association. Latest edition. (Horticulture Ed.) Interstate Publishing Inc., Danville, Illinois
- Soil Fertility Manual - Latest edition. Potash & Phosphate Institute and the Foundation for Agronomic Research. Province of British Columbia Ministry of Skills, Training and Labour and the Centre for Curriculum and Professional Development, Norcross, GA
- Considerations for their use - Ministry of Education, Skills and Training and the Ministry of Labour and the Centre for Curriculum and Professional Development. 1995. BC.
- Outdoor Power Equipment, Latest Edition, Webster, Jay, Nelson. Canada, Scarborough ON



## LEVEL THREE

### Required Reference Materials

- Kwantlen University College School of Horticulture Plant identification Database, [www.kwantlen.ca/horticulture/](http://www.kwantlen.ca/horticulture/)  
<https://plantdatabase.kwantlen.ca/>
- British Columbia Landscape Standard - Latest edition. BC Landscape and Nursery Association, BC Society of Landscape Architects, BC.
- Concepts in Integrated Pest Management - Latest edition. Norris, R.F., et al. Prentice Hall, Upper Saddle River, NJ.
- Clean Plant Program Standards and other Training Materials, <http://www.cleanplants.ca/Page.asp?PageID=924&ContentID=854>

### Recommended Resources

- BCLNA Occupational Analysis for Nursery Production Workers Manuals - Nursery and Greenhouse Skills Training, B.C. Landscape Nursery Association, March 1, 2008. Prepared by McTavish Resource & Management Consultants.
  - Integrated Pest Management
  - Grading, Shipping & Receiving
  - Field Harvesting Techniques
  - Soil, Fertility & Cultural Management
  - Plant Propagation
  - Irrigation Equipment Repair & Maintenance
  - Staff Management
  - Systems Approaches to Phytosanitary Issues
- Horticulture Apprenticeship Competency Guide Modules - Ministry of Education, Skills and Training and the Ministry of Labour and the Centre for Curriculum and Professional Development. 1998. Province of British Columbia.
  - Describe Production, Handling and Shipping of Nursery Container Crops Horticulture
  - Identify and Explain Control Measures used for Various Pests in Area of Specialty
  - Describe Media, Containers and Transport Methods Used in Nursery and Greenhouse
  - Describe the Maintenance of Container Growing Media During the Growing On Period
  - Describe the Production
  - Plan, Implement, Monitor and Evaluate an IPM Program for the Worksite
  - Explain the Fundamentals of an Integrated Pest Management Program
  - Describe Water Management Systems Used in Greenhouses
  - Describe the Design and Installation of Sub-surface Drainage Systems
  - Describe the Design and Installation of Surface Drainage Systems
  - Explain Factors Affecting Irrigation Design - Ministry of Education
  - Describe Irrigation Equipment, Installation and Maintenance
  - Compare Environmental Control Systems
  - Describe Greenhouse and Nursery Protective Structures
- Entomology and Pest Management - Latest edition. Pedigo, L. P. Prentice Hall, Upper Saddle River, NJ.



- Concepts in Integrated Pest Management - Latest edition. Norris, R.F., et al. Prentice Hall, Upper Saddle River, NJ.
- IPM for Floriculture and Nurseries - Latest edition. Dreistadt, Steve (editor) University of California, Oakland CA Publication 3402.
- Pests of Landscape Trees and Shrubs - Latest edition. Dreistadt, Steve (editor) University of California Oakland CA. Publication 3359.
- Knowing and Recognising - Latest edition. Malais, M.H. and W.J. Ravensberg. Koppert Biological Systems, Reed Business Information, Doetinchem, Netherlands.
- A Colour Handbook of Biological Control in Plant Protection - Latest edition. Helyer, N. et al. Timber Press, Portland, OR.
- Pest Management Recommendations for Greenhouse Crops - Latest edition. Ontario Ministry of Agriculture. Publication 365, Ontario MAF.
- Nursery and Landscape Plant Production and IPM - Ontario Ministry of Agriculture. Latest edition. Publication 383, Ontario MAF.
- Nursery Crop Production Guide for Commercial Growers - Latest edition. Mathers, H. and Leidenfrost, P. B.C. Crown Publications, Victoria, BC.
- Applied Bionomics Biological Technical Manual - Latest edition. Matteoni, J.A. and D. Elliot. Applied Bionomics, Sydney, BC.
- Describe Biological and Environmental Methods of Pest Control and Their Limitations - Ministry of Education, Skills and Training and the Ministry of Labour and the Centre for Curriculum and Professional Development.. 1998. Apprenticeship Competency Guide D3. Centre for Curriculum, Transfer and Technology, Publication MN 1452.
- IPM in Greenhouses - Vocational Educational Productions, California State Polytechnic. (video)
- Ball, V. Ball Red Book, Volume 1 Structures. Latest edition. Ball Publishing, West Chicago, Ill.
- Greenhouse Construction - Jones, G. and Peter Nemeth. Kwantlen University College, Langley, B.C.. In Kwantlen Langley Library. (video)
- Introduction to Greenhouse Design and Construction - Vocational Educational Productions. 1991. California Polytechnic State University, San Luis Obispo, CA. (video)
- Introduction to Greenhouse Management - Vocational Educational Productions. 1991. California Polytechnic State University, San Luis Obispo, CA. (video)
- Knowing and Recognising - Latest edition. Malais, M.H. and Ravensberg, W.J. Koppert
- B.C. Nursery Crop Production Guide for Commercial Growers - Latest edition. Mathers, H. and Leidenfrost, P. Crown Publications, Victoria, BC.
- Limitations - Ministry of Education, Skills and Training and the Ministry of Labour and the Centre for Curriculum and Professional Development. 1998. Publication MN 1452, Province of British Columbia.
- Greenhouse Engineering NRAES - Latest edition. Aldrich and Bartok. Ithaca, New York.
- BC. Sprinkler Irrigation Manual - Latest edition. BC Ministry of Agriculture. Crown Publishers, Victoria, BC.
- Current product catalogues (hard copy or CD) from Rainbird, Toro.

**NOTE:**

This list of Reference Materials is for training providers. Apprentices should contact their preferred training provider for a list of recommended or required texts for this program.





## Instructor Requirements

### Occupation Qualification

The instructor must possess:

- Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma
- Teaching competence as demonstrated by successful completion of Provincial Instructor Diploma (PIDP) or equivalent or regular faculty status at an institution which has a defined faculty review process (as specified by institutional policy) or contract faculty who have at least completed the Instructional Skills Workshop (PIDP 3102) or equivalent

### Work Experience

- Instructors with the Landscape Horticulture Certificate of Qualification must have a minimum 2 years experience working in the industry as a journeyman, or;
- Credentials for related subject matter competence

### *Additional Credentials and Experience Recommended for Specific Subject Matter*

## LEVEL ONE

### **Subject Matter: Plant Identification and Use**

Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture and 2 years of plant identification experience.

### **Subject Matter: Communication and Supervision**

Subject matter competence as demonstrated by a Business Diploma with Human Resource or Organizational Behaviour specialty or Baccalaureate Degree in with a minor in Business or Certified Landscape Professional. Two years supervisory or management experience in a private or public organization.

### **Subject Matter: Equipment Operation and Maintenance**

Subject matter competence as demonstrated by an Outdoor Power Equipment Trades Qualification/Apprentice Certificate. 5 years of relevant industry experience.

### **Subject Matter: Plant Science**

Subject matter competence as demonstrated by a Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science and/or a Diploma in Horticulture, Agriculture or Forestry with a minimum of 5 years of experience in plant science.

### **Subject Matter: Analyze and Maintain Plant Health**

Subject matter competence as demonstrated by a Horticulture Diploma or Baccalaureate Degree in Horticulture, Agronomy, Forestry, Crop Science, or Pest Management and/or a Diploma in Agriculture or Forestry with a minimum of 5 years of experience in analyzing and maintaining plant health.

**Subject Matter: Physical and Biological Characteristics of Soil and Soilless Media**

Subject matter competence as demonstrated by a Baccalaureate Degree in Soil Science Horticulture, Agronomy, Forestry, or Crop Science and/or a Diploma in Horticulture, Agriculture or Pest Management with a minimum of 5 years of experience in analyzing physical and biological characteristics of soil and soilless media.

**Subject Matter: Practical Horticultural Skills**

Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture and 2 years of practical landscape or nursery experience

**LEVEL TWO****Subject Matter: Plant Identification and Use**

Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture and 2 years of plant identification experience.

**Subject Matter: Communication and Supervision**

Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in with a minor in Business or Certified Landscape Professional. Two years of relevant industry experience.

**Subject Matter: Equipment Operation and Maintenance**

Subject matter competence as demonstrated by an Outdoor Power Equipment Trades Qualification/Apprentice Certificate or equivalent within Horticulture training or education, with a minimum of 2 years of relevant industry experience.

**Subject Matter: Plant Science**

Subject matter competence as demonstrated by a Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science and/or a Diploma in Horticulture, Agriculture or Forestry with a minimum 5 years of experience in plant science.

**Subject Matter: Analyze and Maintain Plant Health**

Subject matter competence as demonstrated by a Horticulture Diploma or Baccalaureate Degree in Horticulture, Agronomy, Forestry, Crop Science, or Pest Management and/or a Diploma in Agriculture or Forestry with a minimum of 5 years of experience in analyzing and maintaining plant health.

**Subject Matter: Chemical Characteristics of Soil and Soilless Media**

Subject matter competence as demonstrated by a Baccalaureate Degree in Soil Science Horticulture, Agronomy, Forestry, or Crop Science and/or a Diploma in Horticulture, Agriculture or Pest Management with a minimum of 5 years of experience in analyzing physical and biological characteristics of soil and soilless media.

**Subject Matter: Practical Horticultural Skills**

Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture and 2 years of practical landscape or nursery experience.



## LEVEL THREE

### **Subject Matter: Manages Growing Facilities**

Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science. Five years relevant industry experience.

### **Subject Matter: Analyzes and Maintains Plant Health**

Subject matter competence as demonstrated by a Horticulture Diploma or Baccalaureate Degree in Horticulture, Agronomy, Forestry, Crop Science, or Pest Management and/or a Diploma in Agriculture or Forestry with a minimum of 5 years of experience in analyzing and maintaining plant health.

### **Subject Matter: Manages Nursery, Field and Container Crops**

Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science. Canadian Nursery Certification Institute (CNCI) P. ramorum accredited instructor. Five years relevant industry experience.

### **Subject Matter: Oversees Nursery Production and Systems Operations**

Subject matter competence as demonstrated by a Horticulture Trades Qualification/Apprentice Certificate or Horticulture Diploma or Baccalaureate Degree in Horticulture, Botany, Agronomy, Plant Biology, Forestry, or Crop Science. Canadian Nursery Certification Institute (CNCI) P. ramorum accredited instructor. Five years relevant industry experience.