Skilled Trades Ontario | Métiers spécialisés Ontario

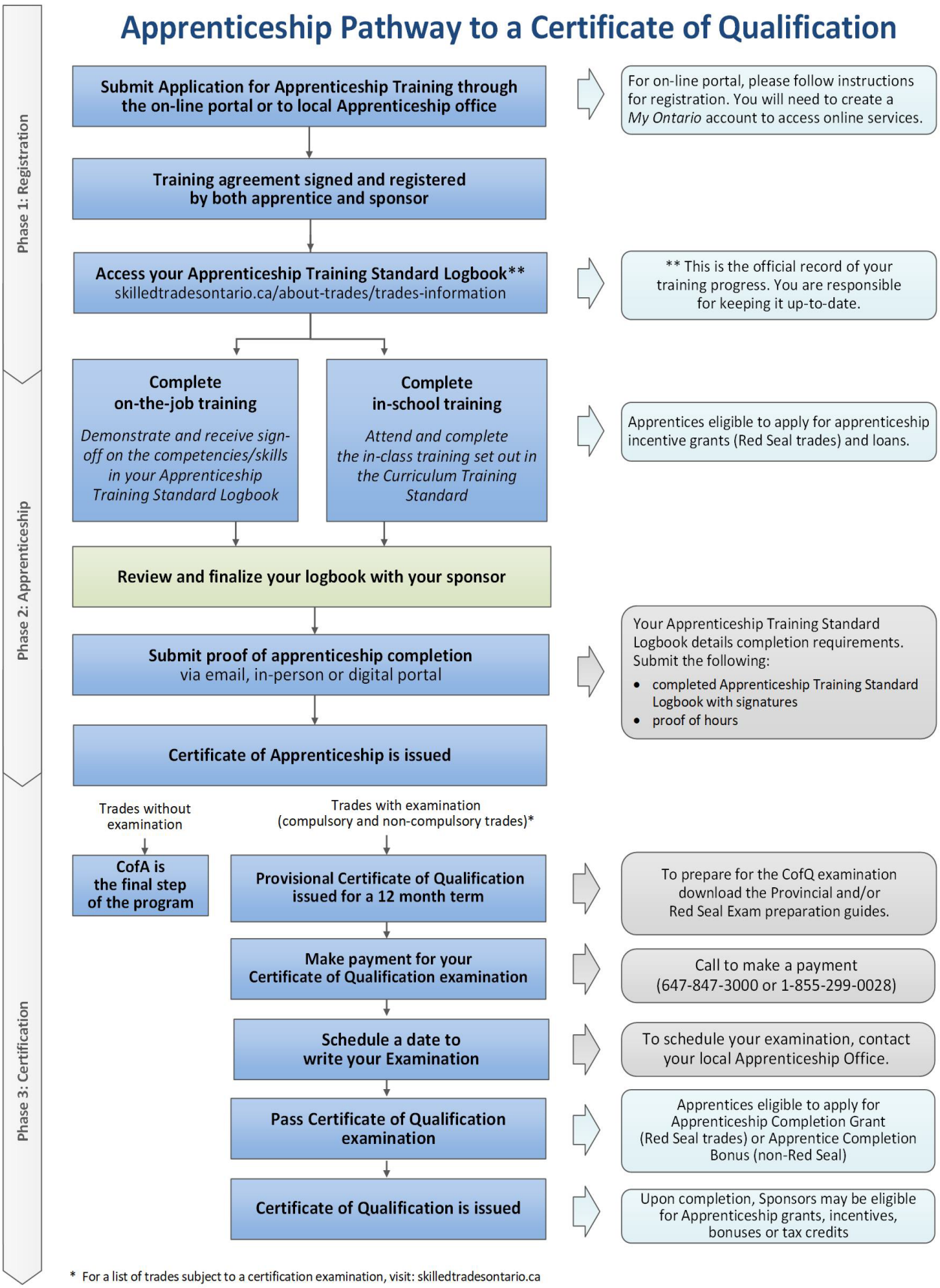
Apprenticeship Curriculum Standard

Arborist/Utility Arborist
Common Core Level 1
444A/444B

Arborist Level 2
444A

Utility Arborist Level 2
444B

Apprenticeship Pathway to a Certificate of Qualification



* For a list of trades subject to a certification examination, visit: skilledtradesontario.ca

Draft version: 2022-02-07

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Revised 2022 (V300)

Introduction

This standard is comprised of two levels of in-school training for Arborist (444A) and Utility Arborist (444B). Level one is a shared common core for both trades and there is a separate level two for Arborist and for Utility Arborist. In addition, in level two, both programs share 2 common reportable subjects, (3451) Tree Identification II and (3453) Aerial Devices and Other Equipment.

The curriculum standard identifies the learning outcomes that apprentices must achieve while "in-school". It focuses primarily on the theoretical knowledge and the essential skills required to support the performance objectives identified in the "on-the-job" industry-approved Training Standards. Objectives of the curriculum standard provide a basis for:

a. Sound theoretical training to meet challenges presented by innovation and increasingly complex tools and equipment within the workplace.
b. Reinforcement of fundamental trade proficiency through practice of work skills as identified in specific Learning Outcomes.
c. Development of a high standard of craftsmanship and problem-solving skills.
d. Formation of a desirable work attitude and a keen sense of responsibility, particularly concerning public and personal safety.

The design of the curriculum standard facilitates cross-referencing between in-school learning outcomes and related workplace performance objectives, as defined in the Training Standard. It is organized into 2 levels of training, each including reportable subjects and similar learning outcomes to reflect the skill sets of the training standard. Apprentices, therefore, are expected to complete learning associated with these objectives by applying in-school knowledge to workplace practice.

The detailed content listed under the learning objectives are not intended to represent an inclusive list; rather, it is included to illustrate the intended direction for the skill acquisition. Theoretical knowledge and skills are to be reinforced in the practical aspects of the in-school program. Regular evaluations of the apprentice's knowledge and skills are conducted throughout the in-school training to ensure that all apprentices have achieved the learning outcomes identified in the curriculum standard. It is not the intent of the in-school curriculum to perfect on-the-job skills.

To assure consistency in delivery, a time allocation has been included for each reportable subject, along with theoretical and practical breakdown of the Learning Content. Specific times have been allocated for practical skills development to ensure that apprentices have an opportunity to demonstrate achievement of learning outcomes according to performance criteria.

In all practical learning activities, the apprentices will abide by the Occupational Health and Safety Act (OHSA) and all other regulations and policies relating to safety for personal and public safety with a particular focus on personal protective equipment.

As the Curriculum Standard provides a minimum standard of theoretical knowledge and practical application to complement on-the-job experience, Employers/Sponsors are expected to extend the apprentice's knowledge and skills through practical training on a work site.

Please refer to Skilled Trades Ontario website (www.skilledtradesontario.ca) for the most accurate and up-to-date information about Skilled Trades Ontario. For information on *Building Opportunities in the Skilled Trades Act, 2021 (BOSTA)*) and its regulations, please visit Building Opportunities in the Skilled Trades Act, 2021, S.O. 2021, c. 28 - Bill 288 (ontario.ca)

***Please note that all practices described in this standard must be performed according to manufacturer's recommendations, company policies, industry best practices and Occupational Health and Safety Act (OHSA) and all other relevant jurisdictional legislation and regulations** as noted in 3440 Workplace Health and Safety.

Prerequisites

In order to advance to Level 2 of the apprenticeship program, an individual must have completed all of the units outlined in Level 1.

Disclaimer regarding Hours (if applicable)

Hours are provided for each reportable by level. While traditionally the curriculum has been delivered in a block release, as the reportable subjects are divisible by three, they can be adapted to accommodate various methods of training delivery. It is agreed that Training Delivery Agents (TDAs) may need to make slight adjustments (with cause) according to apprentice needs and may deviate from the unit sequencing and the prescribed practical and theoretical hours shown within the standard. However, all TDAs will comply with the hours at the reportable subject level.

Suggested Equipment for Training Delivery Agencies

The listing of tools on page 91 provides a basic list of the requirements. The delivering TDA is in the best position to determine the amount required based on its delivery methodology.

Level 1
Arborist/Utility Arborist Common Core

Reportable Subjects Summary

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
Level 1 Arborist/Utility Arborist				
3440	Workplace Health and Safety	36	36	0
3441	Arborist Safe Work Practices	48	48	0
3442	Arborist Safe Work Practices -Climbing	144	0	144
3443	Arborist Tools and Felling Techniques	36	0	36
3444	Arborist Equipment	24	12	12
3445	Arboricultural Sciences I	36	36	0
3446	Arborist Tree Identification I	36	36	0
	Total	**360**	**168**	**192**
Level 2 Arborist				
3447	Arborist Theory	36	36	0
3448	Arborist Practices-Pruning & Removal Techniques	144	0	144
3449	Plant Health Care - Pest Management	48	48	0
3450	Arboricultural Science II	36	36	0
3451	Tree Identification II	33	33	0
3452	Crane Assisted Rigging	24	18	6
3453	Aerial Devices	27	8	19
3454	Tree Planting Practices	12	12	0
	Total	**360**	**191**	**169**
Level 2 Utility Arborist				
3455	Utility Arborist Safe Work Practices	18	18	0
3456	Vegetation Management	30	18	12
3457	Utility Arborist Practices-Tree Climbing	144	0	144
3453	Aerial Devices	27	8	19
3458	Utility Arborist Tools and Equipment Practical	18	6	12
3459	Utility Arboricultural Sciences	15	15	0
3451	Tree Identification II	33	33	0
3460	Utility Transmission Line Clearing	15	9	6
	Total	**300**	**107**	**193**

Number:	3440		
Title:	**Workplace Health and Safety**		
Duration:	Total Hours: 36	Theory: 36 Hours	Practical: 0 hours
Prerequisites:	N A		

General Learning Outcomes

Upon successful completion of this reportable subject, the apprentice is able to explain legislation related to safe workplace practices for the trades of arboriculture and utility arboriculture such as the managing of dangerous on-site conditions, emergency protocols and the handling, storage and disposal of hazardous material explain risks associated with working in an energized environment.

In all aspects of the program, the principles covered in this learning outcome are reinforced and evaluated to ensure apprentices are continually adhering to industry regulations.

Learning Outcomes and Content

On completion of the learning content the apprentice is able to:

3440.01 Interpret industry legislation.

- Identify the legislative requirements (federal, provincial and municipal) governing all aspects of the Arboricultural industry such as: The Occupational Health and Safety Act (OHSA) for Construction and Industrial legislation, WHMIS, First Aid Requirements, Dangerous Goods Transportation Act, Criminal Liability of Organizations and Forest Fire Prevention Act
- Describe sections of Ontario Traffic Manual (OTM) Book 7 Traffic Control related to controlling various work zones
- Describe sections of the Electrical Utility Safety Rules related to authorization of work, authorized worker, competent worker, controlling authority and proximity to energized apparatus/lines
- Describe sections of the Highway Traffic Act, relating to circle checks maintenance and trip logs, dimension and weight limits
- Describe sections of the Ontario Regional Common Ground Alliance best practices relevant to location, marking, excavation and compliance
- Describe the prohibition to exterminations in the Pesticides Act-Ontario
- Identify the regulatory requirements for mandatory working at heights training as noted in the Occupational Health and Safety Awareness and Training Regulation (Ontario Regulation 297/13) under the Occupational Health and Safety Act (OHSA)
- Identify Migratory Birds Convention Act, 1994
- Identify Endangered Species Act, 2007
- Identify Fish and Wildlife Conservation Act, 1997
- Identify the legal requirements for working with drones -Canadian Aviation

Regulations (CARs) and Standards 900.01 - Part IX- Remotely Piloted Aircraft Systems

3440.02 Interpret bylaws from municipalities related to tree preservation, tree removal, wood lots/ forestry tracts, Municipal property standards, hazards/nuisance trees and the Right-of-Way(s) on public/private lands.

- Identify municipal by-laws related to Off Road Vehicle Act

3440.03 Explain the electrical theory, electrical generation and the transmission process.

- Describe electrical theory
  - Ohm's Law
- State the relationships between, resistance, voltage and current
- Describe parallel and series circuits
- Describe the following processes:
  - generation of electricity
  - generation voltage to transmission voltage
  - transmission voltage to distribution voltage
- Define:
  - Second point of contact
  - Backfeed
  - Touch potential – ground gradients
  - Step potential – ground gradients

3440.04 Describe the electrical system from generation to distribution through the transformation of voltage.

- Identify transmission voltage and distribution voltage systems
- Identify protective devices within the electrical system
- Identify electrical System Configuration, Loop feeds, Radial feeds

3440.05 Describe the rules and procedures for identifying, eliminating and controlling electrical hazards based on the following:

- the Electrical Utility Safety Rule Book
- Utility Work Protection Code
- application of appropriate safe limits of approach
- application of appropriate job planning
- proximity to other workers/equipment
- application of protocol for establishing clear communication between work groups and the controlling authority.

3440.06 Differentiate overhead and underground utilities such as hydro, cable, television, natural gas and water lines and the need to request locates from One Call/local utilities.

- Identify electrical equipment such as:
  - switches
  - transformers
  - service wire identification - triplex, open bus
  - underground hardware identification – pad mounted transformers, pole markers, guy wires, buried gas or cable conductors
  - pole anchors

- Identify the need to apply protective barriers to adhere to limits of approach

3440.07 Identify the hazards of working in an energized environment including:

- Second point of contact
- Backfeed
- Touch potential – ground gradients
- Step potential – ground gradients
- Flashover
- Induction (electrostatic and electromagnetic)

3440.08 Describe the effect of electricity on the body.

- Identify minimum current for injury to the body
- Identify effects (physiological and psychological problems) and severity to the human body from electrical contact

3440.09 Describe the types and applications of utility protective barriers (nonphysical and physical) such as:

Non-Physical	Physical
Electrical Safety Rule Book	Electrically tested insulated Tools
Limits of Approach	Fences
Application of proximity to electrical conductors for unauthorized workers and equipment	PPE/ Rubber Gloves
Application of limits of approach to energized electrical apparatus	
Utility Work Protection Code	Flame retardant clothing
Job Planning Documentation	Electrically tested rubber cover-up

3440.10 Identify environmental, tree, ground and poisonous plant hazards.

3440.11 Describe potential sources, types and characteristics of fires.

Sources of ignition such as:	Types/characteristics of fire hazards
▪ Open flame ▪ Spontaneous combustion ▪ Electricity ▪ Sources of high temperature, e.g.: hot muffler ▪ Combustible materials ▪ Static electricity ▪ Flashover	▪ Explosion ▪ Ignition of combustibles and flammables ▪ Dust ▪ Vapour ▪ Static electricity ▪ Gaseous ▪ Liquid ▪ Solid ▪ Size of fire

3440.12 Describe methods for prevention and suppression of fires based on type and characteristics.

- Identify prevention methods such as:
  - clean/organized work area
  - approved containers
  - grounding of equipment
  - ventilation to outside environment
  - fire hazard policies and procedures
  - Forest Fire Prevention Act and work practices

- Identify suppression methods based on type and characteristics of the fire and availability of equipment

- Identify the types of fire suppression equipment used based on type and characteristics of fire, such as backpack pumps, dry, chemical-based extinguishers and water pumps

3440.13 Explain the methods for safe handling, storage and disposal of hazardous materials in the workplace.

- Identify hazardous materials such as:
  - lubricants
  - solvents
  - liquid and pressurized fuels
  - pressurized materials
  - wood debris
  - corrosives
  - pesticides
  - de-hydrants (isopropanol, isopropyl-alcohol)

- Describe the considerations for handling and storing hazardous materials according to manufacturers' recommendations and legislative requirements

  Considerations to include:
  - WHMIS
  - personal/worker safety
  - personal protective equipment (PPE)
  - securing for transport/site clean up
  - loading and unloading of materials
  - storage procedures
  - emergency reporting

- Describe the procedures for handling, labelling, dispensing and transporting of and disposal of hazards materials according to jurisdictional requirements

- Describe spill preparedness and response

3440.14 Describe the requirements for the use of pedestrian and vehicular traffic control devices.

- Identify hazards to control such as:
  - collision hazards
  - operating machinery
  - obstacles to pedestrian and vehicular traffic
  - struck by from falling material

- Identify site securing methods such as the use:
  - traffic cones
  - hazard tape
  - Traffic Control Person
  - signage
  - temporary barricades
  - temporary traffic signals
  - safe distances to maintain
  - deployment methodology
  - crash truck
  - dedicated spotter

Instructional & Delivery Strategies Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3441		
Title:	**Arborist Safe Work Practices**		
Duration:	Total Hours: 48	Theory: 48 Hours	Practical: 0 hours
Prerequisites:	N A		

General Learning Outcomes

Upon successful completion of this reportable subject the apprentice is able to describe safe work practices and requirements for operational planning, ascending, descending trees, pruning and removing limbs and trees, identifying electrical hazards, other hazards, handling and disposal of debris generated on the job site.

Learning Outcomes and Content

On completion of the learning content the apprentice is able to:

3441.01 Describe verbal and written skills required to effectively communicate with colleagues, customers and the general public.

- Identify the requirements for locating, accessing and completing documentation and forms (written and electronic) including:
  - Locate the forms and documents commonly used in the sector
  - Identify the process for completing forms such as:
    - job specifications
    - work orders
    - time sheets
    - material list
    - company emails, memos and manuals

3441.02 Describe the procedures for inspecting, adjusting, maintaining and wearing personal protective equipment (PPE).

Eye protection	Head protection	Hearing protection
▪ Goggles appropriate to task ▪ Prescription safety glasses ▪ Non-prescription safety glasses	CSA and/or ANSI approved: ▪ Hard hats Class E type ▪ Face protection	CSA and/or ANSI approved: ▪ Ear muffs ▪ Ear plugs ▪ Disposable foam plugs

Hand protection CSA and/or ANSI approved: ▪ Work gloves ▪ Chainsaw gloves	Foot protection CSA and/or ANSI approved: ▪ Electrical resistive	Leg protection CSA and/or ANSI approved: ▪ Chainsaw pants ▪ Chaps
Fall Arrest ▪ Carabiner ▪ Safety snap, ▪ Shock absorbing lanyard ▪ Full Body Harness	Fall Restriction ▪ Harness or saddle, rope ▪ Lanyard ▪ Spurs, ▪ Fall restrict devices: - Pole choker - Bucksqueeze	

3441.03 Describe how to plan work operations in compliance with provincial and municipal legislation.

- Identify job requirements such as:
  - plans and specifications i.e. cycle clearance
  - work orders
  - scope of work
  - equipment, material and personnel required
  - determine job site limits
  - property lines
  - identify hazards and barriers
  - Drop zone
  - worksite and traffic hazards/barriers required
  - personal protective equipment
  - safe limits of approach
  - overhead utilities
  - buried utilities
  - tailboard discussion documentation

- Identify job sequences, hazards and required barriers to hazards.
  - Determine job communication requirements
  - Identify when to revaluate hazards and barriers
    - Define the concept of hierarchy of hazard controls

3441.04 Describe how to manage hazards, environmental, tree, ground, underground, overhead and poisonous plants.

Environmental Hazards ▪ Restricted visibility, i.e., glare, fog, darkness ▪ Wet/ice/snow conditions ▪ Wind ▪ Thunder & lightning ▪ Temperature extremes/seasonal fluctuations ▪ Storm damage Poisonous plants ▪ Poison Ivy ▪ Poison Sumac ▪ Poison Wild Parsnip ▪ Giant Hogweed ▪ Monkshood	Tree Hazards ▪ Hangers and split branches ▪ Deadwood/severed limbs ▪ Excessive fill over root zone ▪ Root, stem/trunk and branch rot and cavities ▪ Compression and tension wood ▪ Spring poles ▪ Barber chair ▪ Cracks, seams and ribs ▪ Chicot ▪ Wind-thrown / Free-standing trees and adjacent trees ▪ Wildlife, i.e., stinging insects, raccoons ▪ Falling debris
Ground hazards ▪ Debris ▪ Unstable / slippery ground ▪ Slopes/uneven ground/embankments ▪ Structures, i.e. Bridges, culverts, foundations, retaining walls ▪ Wildlife, holes and dens ▪ Trip hazards ▪ Deep snow	Underground hardware ▪ Natural gas markers ▪ Water line markers ▪ Electrical transformers ▪ Septic systems, wells ▪ Communication lines Overhead hazards ▪ Live conductor ▪ Danger trees ▪ Drop Zone Hazards

- Identify other preventable hazards
  - State the effect of worker competency and/or mental state (due to production pressures, etc.) as a risk factor
  - Describe methods to prevent Musculoskeletal and strain injuries

3441.05 Describe the reasons, considerations and risk factors for pruning and removing trees and woody plants.

- Identify the considerations/reasons for pruning such as:
  - customer consideration
  - species characteristics
  - utility clearance requirements

- Identify risk factors and tree conditions prior to pruning and removing trees such as:
  - crown condition
  - stem condition
  - root condition
  - lean
  - living/dead
  - central leader/multi-stemmed
  - structural defects
  - conductor location

- Identify subject woody plants on site
  - written description
  - flagging/marking subject trees
  - plant names

3441.06 Describe how to determine type of pruning cut, method and equipment.

- Identify pruning cut location on a tree
  - collar
  - branch bark ridge

- Identify types of pruning cuts such as:
  - Drop cut
  - Hinge cut
  - Snap/bypass cut

- Identify various pruning methods
  - General pruning practices such as:
    - structural thinning
    - side pruning
    - utility pruning
    - dead wooding
    - crown elevating
    - crown reduction
    - crown restoration

  - Specialized Pruning Practices such as, pollarding, espalier, pleaching, coppicing, topiary and laying

3441.07 Explain the application and maintenance of basic tools and equipment used in pruning and removal operations.

- Identify basic tools and equipment required for pruning operations such as:

Handsaw	Rigging ropes	Slings	Chipper	Friction Devices:
Rope	Loppers	Secateurs	Blower	Port a Wrap
Wedges	Rigging blocks	Chainsaw	Rigging rings	GRCS

- Describe the types and uses of ladders for working at heights
  - Identify the advantages and disadvantages of ladders
  - Describe how to inspect and care for ladders;
  - Describe how to safely position and use ladders

- Identify the inspection requirements for hand tools and equipment prior to use in pruning operations according to manufacturer's recommendations

- Describe the operation of various basic tools and equipment used for tree pruning

3441.08 Describe knots, hitches and splices used for pruning and removal operations.

- Define rope terminology such as:

Bight	Loop	Turn	Round Turn
Working end, lead and fall	Running end, lead and fall	Standing part, lead and fall	Lead
Fall	Splice	Bridge	Bar
Tail			

- Identify rigging knots including:

Square or Reef	Running bowline	Double sheet bend
Single bowline	Valdotain tresse	Half hitch
Double bowline	Figure 8 stopper knot	Clove hitch (end)
Figure 8 on a bight	Single sheet bend	Clove hitch (middle)
	Clove hitch and two half hitches	Snubbing hitch
Stirrup hitch	Cow hitch	Double Fisherman
Triple Fisherman	Running Bowline with a Yosemite Tie off	Timber hitch
Klemheist	Alpine butterfly	Zeppelin bend

- Identify fall climbing knots including:

Tautline hitch – Figure 8 Stopper Knot	Cow hitch (Girth Hitch)
Blake's hitch	Beckett bend - Figure 8 Stopper Knot
Klemheist	Triple fisherman
Schwabisch	Anchor hitch
Prusik 6 coil	Bowline- Figure 8 Stopper Knot
Figure 8 on a bight	Bowline on a bight

- Identify eye splice and crown splice on a three-strand rope.

3441.09 Describe methods for ascending and descending trees.

- Define fall protection systems and components
  - climbing harness and rope
  - work positioning lanyard
  - connecting links
  - pulleys for redirect
  - Friction saver
  - Eye to eye Prusik
  - Split tail
  - other mechanical components

- Identify the process for inspecting and maintaining fall protection systems and components

- Define the differences between stationary rope systems (formerly SRT) and moving rope systems (formerly DDRT)

- Identify factors to consider as part of a pre-climb tree inspection including:
  - Outer perimeter, inner perimeter and aerial inspection
  - Root zone hazards
  - Fruiting bodies
  - Root crown excavation to determine root structure condition
  - Limbs in proximity

- Define crown and stem zone hazards and structural defects including:

Deadwood/Hangers	Fruiting bodies	Splits, cracks
Animals	Rots	Decay
Conks	Included bark	Grade changes

- Describe techniques used to ascend and descend trees
    - use of ladder
    - use of spurs
    - belay technique
    - ascenders (hand, foot, knee and chest), split tail, hitch cord
    - secured body thrust with climbing hitch
    - secured footlock
    - split tail

- Identify factors to consider for determining an interim (ascending) and final (working) anchor point.

    - size of branch/limb
    - type of load applied
    - direction of loading from stem of tree
    - other loads on the limb (foliage, snow, torque, etc.)
    - tree species and characteristics
    - cross sectional area of limb
    - condition of wood
    - angle of branch attachment
    - size of branch relative to stem
    - characteristics of branch union
    - season and temperature
    - location of limb to electrical conductor, worker cannot swing into electrical conductors

- Identify equipment used to assist in the accessing of a tree
    - throw line
    - rope poking tool
    - pole pruner
    - ladder

- Identify steps used to ascend and work the tree such as:
    - installing the climbing line
    - determining open or closed climbing systems
    - load test anchor points
    - tie, dress, set knots for fall protection
    - reposition climbing line
    - employ double tie ins/work positioning lanyard
    - limb walking- secure self at work location

3441.10 Calculate quantities of materials required based on linear, area and volume, in Metric and Imperial measurement.

- Calculate systems of measurement
  - Compare systems of measurement- Metric and Imperial measures
  - Calculate conversions from Imperial to Metric and vice versa
- Calculate dimensions of measurement
  - linear /area measures
  - volume /mass measures
- Calculate quantities of materials using both systems of measurement
  - Determine units of measure based on material requirements
  - Identify shrinkage and expansion factor
  - Calculate quantities

3441.11 Explain processes for limb and tree removal using rigging equipment.

- Describe various methods for limb and tree removal and the required tools/equipment
- Describe the principles, concepts and associated calculations required when working with rigging equipment including:
  - Newton's laws
  - calculating force
  - safety margin
  - heat/ friction
  - elasticity
  - wood weight
  - loading on ropes and equipment
  - cycles to failure
- Determine mechanical advantage when using various types of rigging equipment such as block and tackle equipment, fiddle blocks, hand winches
  - Identify methodology/principles
  - calculate forces on Anchor points, pulleys and ropes
  - Identify rigging equipment materials, safe working load limits, tensile strength
- Identify the requirements for routinely inspecting equipment for defects (ropes, carabiners, slings, pulley, blocks, friction devices, quick links and shackles)
- Define various felling cuts and notches such as:
  - conventional notch and back cut
  - open face notch

- "v" notch ("birds' mouth") and back cut
- "Humboldt" notch and back cut

- Identify various felling assist devices such as:
  - wedges
  - levers
  - pull ropes
  - tackle blocks

3441.12 Calculate load requirements for determining rigging equipment by considering factors such as materials construction, materials, safe working load limits and Tensile strength.

- Describe the use of the Green Log Weight Chart for calculating loads
- Use formulas to calculate load requirements
- Calculate load weight to determine what pieces of equipment to use for the rigging system
  - Explain the components of a rigging equipment system
    - ropes
    - slings
    - carabiners
    - pulleys
    - arborist Blocks
    - figure 8
    - friction device (i.e., Port-a Wrap)
    - mechanical lowering devices (i.e., GRCS)
    - quick links and shackles
    - block and tackle
  - Explain the use and limitations of the various rigging equipment and hardware

3441.13 Describe techniques for handling and disposing of debris generated on the job site.

- Identify technique required based on size and location such as:
  - piling brush
  - piling brush for chipping
  - bucking and limbing
  - lifting/carrying brush and large wood
  - loading brush and large wood on vehicles
  - site clean-up, lower stumps
  - clean-up site of small debris

3441.14 Describe protocols for handling various emergency situations.

- Identify protocols for handling emergency situations such as:
  - assessing the situation
  - calling 911 as per job plan
  - determining if rescue is necessary and can be accomplished safely
  - applying first aid (a-airway-breathing control, c- circulation)
  - ensuring workers involved in electrical contact accidents are sent to hospital for treatment

- Describe the steps to assess the need to perform a rescue from a tree.
  - assessing the emergency/performing scene survey/determining if rescue is necessary
  - identifying proximity to other workers/equipment or electrical apparatus
  - assessing contributing factors
    - electrical conductors/contact
    - struck by limbs, tree sections, lightning
    - is victim pinned
    - medical conditions (bug/animal bites, heat exhaustion, etc.)
  - Assessing the victim's condition
  - Determining feasibility/appropriateness of aerial rescue with consideration of:
    - electrical conductors/contact
    - rescuers competency in performing tree rescue
  - Determining need for EMS to perform rescue, contacting EMS

Instructional & Delivery Strategies
Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency. In all practical assignments, the unit is to evaluate the "Method of work" which includes application of theory.

Number:	3442		
Title:	**Arborist Safe Work Practices — Climbing**		
Duration:	Total Hours: 144	Theory: 0 hours	Practical: 144 hours
Prerequisite:	N A		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to demonstrate how to plan work operations, ascend, descend trees while pruning and removing limbs and trees with consideration of associated hazards; perform an aerial rescue and handle and disposal of debris generated on the job site.

Learning Outcomes and Content

On completion of the learning content the apprentice is able to:

3442.01 Demonstrate the procedures for inspecting, adjusting, maintaining and wearing personal protective equipment (PPE).

- eye protection
- head protection
- face protection
- hearing protection
- hand protection
- foot protection
- leg protection

3442.02 Demonstrate how to plan work operations by interpreting work orders, job planning documents in compliance with legislative requirements by considering:

- required equipment and materials
- identification of worksite hazards/ traffic hazards
- implementation of barriers to hazards
- personal protective equipment
- tailboard discussion documentation
- safe limits of approach

3442.03 Demonstrate preventative steps for identifying, eliminating and controlling electrical hazards by considering:

- application of the Electrical Utility Safety Rule Book
- application of the Utility Work Protection Code
- application of the safe limits of approach
- application of job planning
- maintaining appropriate limits to other workers/equipment
- establishing clear communication between workers (Command and respond).

3442.04 Demonstrate the management of hazards related to environmental, tree, ground, underground and poisonous plants.

3442.05 Demonstrate the performance of basic concepts for pruning trees/woody plants.

- Identify risk factors such as:
  - species characteristics
  - crown condition
  - stem condition
  - root condition
  - electrical apparatus location
  - worker competency and mental state
- Demonstrate the operation and inspection of basic tools and equipment used in pruning operations
- Demonstrate location for pruning cuts using the branch collar and branch bark ridge identifiers
- Demonstrate types of pruning cuts such as:
  - Drop cut
  - Hinge cut
  - Snap/bypass cut

3442.06 Demonstrate various knots, hitches and splices according to arborist safe work practices.

3442.07 Demonstrate techniques for handling and disposal of debris generated on the job site based on size and location of materials. Techniques to include:

- lifting/carrying/ piling brush and large wood
- loading brush and large wood on vehicles
- site clean-up, lower stumps
- clean-up site of small debris

3442.08 Demonstrate methods for ascending and descending trees.

- Demonstrate process for inspecting and maintaining fall protection systems and components according manufacturers' specifications.
- Demonstrate the use of fall protection systems and components
  - climbing harness and rope
  - work positioning lanyard
  - connecting links
  - pulleys for redirect
  - Friction saver
  - Eye to eye prusik cord
  - Split tail
  - other mechanical components

- Demonstrate the differences between stationary rope systems (SRS)and moving rope systems (MRS).

- Demonstrate a pre-climb tree inspection including checking for:
  - root zone hazards
  - fruiting bodies
  - limbs or tree stems in proximity to energized equipment

- Demonstrate techniques used to ascend and descend trees such as:
  - use of ladder
  - use of spurs
  - belay technique
  - eye to eye prusik cord, split tail
  - secured body thrust with climbing hitch
  - secured footlock
  - foot, chest, knee and hand ascender

- Describe Crown and Stem zone hazards and structural defects.
  - deadwood/hangers
  - animals
  - structural weaknesses (rot, decay, fruiting bodies, conks
  - trunk and branch attachments
  - splits, cracks
  - grade changes

- Describe how an interim (ascending) and final (working) anchor point is determined.

  Considerations to include:
  - Branch/limb size
  - type of load applied
  - direction of loading from stem of tree
  - other loads on the limb (foliage, snow, torque, etc.)
  - tree species and characteristics
  - cross sectional area of limb
  - condition of wood
  - angle of branch attachment
  - size of branch relative to stem
  - characteristics of branch union
  - season and temperature
  - location of limb to electrical conductor, worker cannot swing into electrical conductors

- Demonstrate methods to maintain tie-off at all times to an anchor point when changing anchor points

3442.09 Demonstrate an aerial tree rescue.

- Assess the Emergency/ scene survey
- Assess contributing factors
- Assess the victim's condition
- Determine feasibility/appropriateness of aerial rescue
- Determine the need for EMS
- Describe the use of a rescue rope when performing an emergency rescue
- Perform a rescue

Instructional & Delivery Strategies
Instruction is presented using a variety of teaching methodologies, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, demonstration of proficiency. In all practical assignments, the unit is to evaluate the "Method of work" which includes application of theory.

Number:	3443		
Title:	**Arborist Tools and Felling Techniques**		
Duration:	Total Hours: 36	Theory: 0 hours	Practical: 36 hours
Prerequisite:	N A		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to perform directional felling techniques including selecting, using, maintaining and storing tools and equipment.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3443.01 Demonstrate use of hand tools, power tools and equipment as required for various applications.

- Select tool for specific application
- Locate and read manufacturer's recommendations
- Inspect and adjust tool as required

3443.02 Perform maintenance and storage of hand tools, power tools and equipment according to manufacturers' instructions.

3443.03 Perform steps to inspect and maintain chainsaws

- Identify manufactures' instructions/operators' manual
- Inspect components including:
  - air filter, fuel filter
  - spark arrestor
  - lubrication
  - fueling/mixing ratios/battery charge level/spare battery
  - bar/ gullet and de-burr
  - sprockets
  - chassis
  - chain and inertia brakes
  - anti-vibration system

Chains:

▪ Identification ▪ Removal from bar ▪ De-burr drive links ▪ Break/remove/add/re-rivet links ▪ Sharpening	▪ Depth gauge adjustment ▪ Chain installation on bar ▪ Chain tension adjustment ▪ Clean and lubricate bearing ▪ Adjust/repair recoil

- Describe the requirements for seasonal adjustment including use of bar oil and winter maintenance kits

3443.04 Demonstrate the operation and testing of power saws such as chainsaws, brush/clearing and power pole saws according to manufacturers' recommendations/instructions.

3443.05 Describe how to perform routine repairs and adjustments, to powers saws and components according to manufacturers' recommendations/ instructions.

3443.06 Demonstrate directional felling techniques for removing woody plants using a felling plan that considers hazards, obstacles, height/lean and escape route, equipment to be used, notch selection, back cut plan and wood diameter to perform cuts/notches.

- Identify tree to be removed
- Prepare a felling plan
- Determine removal method based on tree condition and site condition
- Establish communications techniques with fellow workers

- Identify Felling and Danger Zones considering:
  - tree condition - dead, living, diseased
  - site condition - proximity to energized conductors
  - personnel location
  - traffic control
  - potential targets and hazards removed/controlled
  - escape route developed
  - approximate height of tree

- Describe various felling notches, cuts and felling assist devices such as:
  - open face notch and back cut
  - conventional notch and back cut
  - Humboldt notch and back cut
  - Boring and back cut
  - cornering cuts
  - bucking and limbing
  - wedges
  - levers
  - pull ropes
  - tackle blocks

- Perform felling techniques using notches and cuts as required

- Perform post felling inspection of worksite

    - hangers removed
    - spring poles
    - rigging equipment removed
    - debris/wood safely processed
    - stump lowered

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency. In all practical assignments, the unit is to evaluate the “Method of work” which includes application of theory.

Number:	3444		
Title:	**Arborist Equipment**		
Duration:	Total Hours: 24	Theory: 12 hours	Practical: 12 hours
Prerequisite:	N A		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to demonstrate the set up and operation of brush chippers and describe the set up and operation of stump grinding units and mini log grapples.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3444.01 Demonstrate how to set up, inspect, operate a chipper

- Identify types of brush chippers (drum and disc) and mounting configurations such as trailer-mounted, vehicle-mounted and track mounted
- Locate and read manufacturer's operating manual
  - Identify the safety features
    - emergency stop bars
- Describe the chipper pre-operation inspection process

  - Identify the deficiencies to be checked as part of the chipper circle check such as:
    - visual defects
    - Loose, worn, cracked, broken nuts/bolts/pins
    - fluid types/levels and leaks
    - tension of belts
    - condition of guards and shields
    - in-feed chute condition
    - cutter knife sharpness
    - anvil condition and setting
    - directional control feed operational
    - winch rope and connector condition
    - wood grapple head and arm condition

  - Describe the process for setting up a brush chipper for use on site
  - Identify required PPE, pedestrian and vehicular control devices
  - State the considerations for site selection for efficiency and safety of the worker including:
    - level, stable ground
    - work site limits and security

- secure chipper
- discharge chute orientation and control

- Describe the procedure for feeding materials into the brush chipper, procedure to include steps such as:

  - purging of dangerous materials: metal, stones, nails, contaminated brush
  - brush pile proximity and organization
  - consider the item size
  - branch butt ends first
  - operator positioning
  - controlling chipper feed
  - proximity to feed rollers
  - monitoring discharge
  - use of pusher tool for smaller pieces of wood

- Describe chipper emergency shut down procedures
  - movement of central arm to neutral
  - disengagement of clutch
  - shutting down of engine
- Explain what functions are monitored on a chipper after work site location changes. Monitoring to include:

  - normal and emergency shutdown
  - gauges and warning lights functioning
  - safety bar
  - roller movement
  - chipper stability
  - discharge deflection
  - clutch engagement and functioning
  - engine speed (RPM)

3444.02 Describe the inspection process required on a chipper prior to transportation.

- Identify what is to be inspected according to manufacturer's recommendations and legislative requirements such as:
  - hitching chipper to tow vehicle
  - pintle or ball hitch
  - pin hitch
  - inspection of hitching mechanism including tongue
  - safety chains attached in crossed (cradled) arrangement and safety hooks facing upward
  - brake inspection and hook-up
  - signal/taillight connection and test

- chipper jack positioning for travel
- extendable tongue positioning and securing
- tire/rim condition
- discharge chute positioning for travel
- removal and stowing of wheel chocks

3444.03 Describe the requirements for basic chipper maintenance according to manufacturers' recommendations.

- greasing, cleaning,
- checking, fluids, air filter
- how to change cutter knives
- how to cycle blade bolts
- how to rotate anvil

3444.04 Explain the set-up and operation of a stump grinding unit according to manufacturers' procedures and legislative requirements.

- Define types of stump grinding units and mounting configurations including, trailer-mounted, vehicle-mounted and track-mounted
- Describe the pre-operation inspection process of a stump grinding unit

- Identify the deficiencies to be inspected as part of the stump grinding unit circle check such as:
  - visual defects
  - loose, worn, cracked, broken nuts/bolts/pins
  - fluid types/levels and leaks
  - tension of belts
  - condition of guards, shields and safety curtains
  - movable control panel setup/remote control operational
  - teeth sharpness, angle and condition
  - grinder wheel condition

- Identify required PPE, pedestrian, vehicular and debris control devices and underground utility locates
- Describe the process for setting up a stump grinding unit for use and maneuvering on site according to manufacturer's recommendations and legislative requirements
- Identify the considerations for site selection for efficiency and safety of the worker including:
  - level, stable ground
  - work site limits and security
  - positioning of stump grinding unit
  - orientation and control of discharged stump grindings

- Define the procedure to prepare a stump grinding unit for operation according to manufacturer's recommendations

  - Procedures to include steps such as:
    - purging of dangerous extraneous materials: metal, stones, nails
    - removal of excess trunk material
    - operator positioning
    - locking pin removal
    - grinding wheel orientation and control
    - position of cutter wheel to stump
    - clutch engagement and functioning
    - range of movement for cutter arm/wheel
    - monitoring discharge
    - first cut - light
    - progressive wheel lowering
    - desired depth of root removal
    - significance of wood type
    - re-positioning for second cut, if necessary

- Explain the functions that are monitored on a stump grinding unit after work site location changes.

  - Monitoring to include:
    - normal and emergency shutdown
    - gauges and warning lights functioning
    - stability of unit
    - discharge deflection of grindings
    - clutch/belt engagement and functioning
    - engine speed (RPM)

3444.05 Describe the requirements for inspecting a stump grinding unit prior to transportation according to manufacturer's recommendations and legislative requirements.

- Identify what is inspected prior to transporting a stump grinding unit
  - hitching mechanism and lights
  - trailer used for transporting stump grinding unit
  - load secured

- State the process for inspecting and preparing the stump grinding unit for travel
  - secure stump grinding unit to trailer for travel
  - ensure safety chains are attached in crossed (cradled) arrangement and safety hooks facing upward
  - check stumper/trailer jack is positioned for travel
  - check extendable tongue is positioned and secured
  - check stumper/trailer jack is positioned for travel
  - remove and stow wheel chocks
  - inspect trailer connection
  - conduct brake inspection
  - check signal/taillight connection
  - check tire/rim condition

3444.06 Describe the requirements for basic maintenance for stump grinding units according to manufacturer's recommendations such as:

- greasing, cleaning,
- checking, fluids, air filter, belts
- how to change stump grinding unit teeth
- how to cycle stump grinding unit teeth bolts

3444.07 Explain the set-up procedure and operation of a mini log grapple according to manufacturers' procedures and legislative requirements.

- Identify the types of mini log grapples and mounting configurations

- Describe the pre-operation inspection process for a mini log grapple
  - Identify requirements for conducting a circle check to inspect for deficiencies on a mini log grapple such as:
    - visual defects
    - loose, worn, cracked, broken nuts/bolts/pins
    - fluid types/levels and leaks
    - tension of belts
    - condition of guards, shields and valves
- Identify required PPE, pedestrian and vehicular control devices
- Describe the process for setting up and maneuvering a mini log grapple for use on site according to manufacturers' recommendations and legislative requirements

- Identify the considerations for site selection for efficiency and safety of the worker including:
  - level, stable ground
  - work site limits and security
  - positioning of mini log grapple

- Explain the operations that are monitored on mini-log grapples after work site location changes.
  Monitoring to include:
  - start-up and normal and emergency shutdown.
  - gauges and warning lights functioning
  - mini log grapple stability

3444.08 Describe the inspection process required before transporting a mini log grapple.

- Identify requirements for conducting a circle check according to manufacturer's specifications and legislative requirements.
  Items to be checked include:
  - security of mini log grapple to trailer for travel
  - pintle hitch and pins
  - hitching mechanism including tongue
  - that the safety chains attached in crossed (cradled) arrangement and safety hooks facing upward
  - brakes and hook-up
  - signal/tail light connection
  - trailer jack is in position for travel
  - tire/rim condition
  - the placement, removal and stowing of wheel chocks

3444.09 Describe basic maintenance requirements for mini log grapples according to manufacturer's instructions.
- greasing, cleaning,
- checking, fluids, air filter, belts
- engine speed (RPM)

Instructional & Delivery Strategies
Theory Classes using a variety of teaching methodologies, lectures, presentations, demonstration and assignments

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency. In all practical assignments, the unit is to evaluate the "Method of work" which includes application of theory.

Number:	3445		
Title:	**Arboricultural Sciences I**		
Duration:	Total Hours: 36	Theory: 36 hours	Practical: 0 hours
Prerequisite:	N A		

General Learning Outcomes

On the completion of this reportable subject, the apprentice is able to describe the characteristics, types and stages of a forest, plant structure and physiology, growth factors and compartmentalization.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3445.01 Describe the characteristics, types and stages of a forest.

- Identify various forest stages (pioneer species, mixed forest (young/mature), steady state, climax stage and old growth

3445.02 Describe the structure, functions and interrelationship of the main organs of plants.

- Identify the plant structure:
  - cell
  - roots
  - branch structure
  - vascular system
  - leaves
  - flowers
  - fruits
  - seeds
- Explain the interrelationship of plant parts

3445.03 Explain plant systems and plant processes.

- Identify xylem/phloem/cambiums
- Describe photosynthesis/respiration
- Describe transpiration/translocation
- Describe osmosis/diffusion
- Describe the law of limiting factors
- Describe the Decline Disease Spiral

3445.04 Describe factors affecting plant growth including environmental conditions and plant competition.

- State plant growth hormones and tropisms
  - allelopathy
  - phototropism/geotropism
  - excurrent/decurrent growth

- Identify environmental conditions
  - water/light availability
  - pollution-soil/airborne
  - temperature-air/soil

3445.05 Describe how soil characteristics and nutrients affect plant growth.

- Identify site conditions
  - topography
  - slope/aspect
  - soil types and textures/ structure
  - drainage
  - aeration/porosity

- Identify soil nutrients
  - micro
  - macro
  - soil pH

3445.06 Explain the process of compartmentalization of decay in trees (CODIT).

- Describe the formation of walls 1-4
- Describe the need to protect the branch collar.

Instructional & Delivery Strategies
Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3446		
Title:	**Arborist Tree Identification I**		
Duration:	Total Hours: 36	Theory: 36 hours	Practical: 0 hours
Prerequisite:	N A		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to describe the tree genera, species, cultivars and characteristics of 57 woody plants and 5 poisonous plants commonly found in Ontario.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3446.01 Describe 57 common woody plants in all seasons according to species and morphological characteristics using the International System of Plant Nomenclature.

- Identify various plant groups
  - herbaceous/woody
  - deciduous/evergreen
  - conifers/broadleaf
  - native/exotic
  - invasive
- Define plant nomenclature
  - family
  - genus
  - species/hybrid
  - variety/cultivar
  - common name
- Describe characteristics for each plant
  - leaves
  - flowers/fruit
  - buds
  - bark
  - growth habit and form

3446.02 Describe types of tree species using various characteristics.
Reference appendix iii.

- Define characteristics of evergreen and deciduous trees
- Define bud/leaf arrangements on evergreen and deciduous trees

3446.03 Describe types and characteristics of trees and shrubs that are compatible and those that are not compatible in the electrical environment.

- Define characteristics of trees that are compatible with the electrical environment
- Define characteristics of trees that are non-compatible with the electrical environment
- Define environmental or other factors that may determine if trees or shrubs remain compatible with the electrical environment.

3446.04 Identify 5 poisonous plants found in Ontario.

Instructional & Delivery Strategies
Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency.

Level 2
Arborist

Reportable Subjects Summary Arborist Level 2

Summary of Level 2 In-School Training Hours

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
3447	Arborist Theory	36	36	0
3448	Arborist Practices - Pruning and Removal Techniques	144	0	144
3449	Arborist Plant Health Care - Pest Management	48	48	0
3450	Arboricultural Sciences II	36	36	0
3451	Tree Identification II	33	33	0
3452	Arborist Crane Assisted Rigging	24	18	6
3453	Aerial Devices	27	8	19
3454	Tree Planting Practices	12	12	0
	Total	**360**	**191**	**169**

Number:	3447		
Title:	**Arborist Theory**		
Duration:	Total Hours: 36	Theory: 36 hours	Practical: 0 hours
Prerequisite:	Level 1		

General Learning Outcomes

On the completion of this reportable subject, the apprentice is able to describe the procedures for installing tree cabling systems, assessing tree wounds and defects and determining corrective measures; explain the application of various arborist reports, business reports and the principles and goals of urban forestry.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3447.01 Describe wounds and defects in woody plants and possible causes.

- Differentiate between a wound and a defect in a woody plant
- Define causes and symptoms
  - Identify wounds:
    - mechanical wounds to root, trunk and branches
    - intentional/unintentional wounding
    - biotic wounding agents (ex. insects, birds, animals)
    - abiotic wounding agents (ex. wind, ice, snow)
  - Identify defects:
    - girdling root
    - co-dominant stems
    - included bark unions/branch attachments/scaffold limbs
    - crossing and rubbing branches
    - over-reaching branches
    - cavities to the basal area, trunk and scaffolds
    - root defects
    - various trunk defects
    - rot (brown, white, soft)
    - cracks – horizontal, rotational and vertical

3447.02 Explain the process for assessing, treating and monitoring results of treatment to wounds and defects on woody plants.

- Describe how to assess the severity of wounds and defects
- Describe treatment methods based on type of wound/defect
  - Define:
    - stem subordination/stem reduction
    - limb removal/corrective pruning
    - bark tracing
    - girdling root removal
    - sunscald treatment
    - cavity treatment
    - root pruning
- Identify treatment method based on wound requirement
  - Root pruning on construction site
- State the process for monitoring treatment of wounds and defects
- Define how the effectiveness of treatment is established

3447.03 Explain the procedure for installing various types of tree cabling systems.

- Identify the types and functions of tree cabling systems
  - Dynamic versus static
  - Steel versus dynamic
- Identify components of tree cabling systems
  - Lags, threaded rod, synthetic cable (e.g. Cobra system)
  - Thimbles, Amon Eye Nuts, Lock Washers/threaded nuts
  - 7 strand common grade cable, 7 strand EHS extra high strength cable and Aircraft cable
- Describe the steps for installing steel with lag, steel with threaded rod and dynamic/synthetic cabling systems

3447.04 Explain the types and applications of arborist reports, forms and business reports.

- Describe types of forms and reports such as hazard tree risk assessment, arborist and tree preservation reports
- Describe the requirements for developing an arborist report, a tree preservation report and hazard tree-risk assessment report
- Describe the use of work orders and sale report for customer service
- Describe the relationship between work orders, sales and expense reports and customer service goals.

3447.05 Describe the principles and goals of urban forestry.

- Define the differences between urban forestry and forestry to understand the limits of scope
- Describe the role and responsibilities of Municipalities in managing the urban forest
- Describe the use of GIS mapping systems for inventory assessment
- Identify types of Urban Forestry Reports

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3448		
Title:	**Arborist Practices- Pruning and Removal Techniques**		
Duration:	Total Hours: 144	Theory: 0 hours	Practical: 144 hours
Prerequisite:	Level 1		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to perform standard and specialty tree pruning and removal techniques, while ascending and descending from various work positions in trees.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3448.01 Demonstrate climbing and rigging techniques used when removing or pruning trees

- Demonstrate various hitches, knots and knot configurations used when rigging such as:

Clove hitch	Running bowline	Timber Hitch	Klemheist
Cow hitch	Alpine butterfly	Zeppelin bend	Valdotain tresse
Half hitch configuration	Marline hitch configuration		

- Perform rigging calculations
- Demonstrate climbing techniques performed with and without spurs

3448.02 Demonstrate how to use and build a mechanical advantage system.

- Describe the function of a 2:1, 3:1 and 5:1 mechanical advantage system
- Describe the function of compounding mechanical advantage systems
- Describe the applications of various mechanical advantage systems
- Determine type of system to build based on application required
- Construct a mechanical advantage system based on tree requirements

3448.03 Demonstrate tree pruning techniques.

- Identify the link/connection between the pruning technique and the pruning objective
- Identify the pruning cuts applicable
- Identify the tools, methods and equipment required
- Identify worksite hazards
- Perform various pruning cuts

3448.04 Demonstrate sectional removals of a tree while using a chainsaw aloft

- Describe the considerations for selecting method of removal
  - tree health
  - tree characteristics and structural defects
  - potential site, obstacles and tree hazards
- Describe the considerations for equipment selection
  - wood diameter
  - chainsaw and other tool requirements
  - cuts and notches
- Describe the methods for sectional removal
  - Define Kerf cuts and why they might be required before sectional removal
  - Describe Free fall sectional removal
  - Describe conventional rigging sectional removal
    - rigging using lowering devices
    - rigging using lifting devices
- Perform sectional removal
  - Identify the removal method based on considerations
  - Identify and select the equipment applicable (manual, power and rigging)
  - Perform cuts/notches as required

3448.05 Demonstrate various felling techniques for tree removal by establishing a felling plan and performing the cuts/notches.

- Prepare felling plan that considers hazards, obstacles, height/lean and escape route equipment to be used, notch selection, back cut plan
- Determine tree felling technique based on various considerations
  - Tree health
  - Tree characteristics and structural defects
    - balanced/unbalanced/leaning tree
    - tree with splits or cavities
  - “Hung up” trees
- Perform felling techniques using notches and cuts as required
  - Open face notch
  - Conventional notch
  - “V” notch and back cut
  - “Humboldt” notch and back cut
  - Boring and back cut
- Perform post felling inspection of worksite

Instructional & Delivery Strategies
Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency. In all practical assignments, the unit is to evaluate the “Method of work” which includes application of theory.

Number:	3449
Title:	**Arborist Plant Health Care - Pest Management**
Duration:	Total Hours: 48 Theory: 48 hours Practical: 0 hours
Prerequisite:	Level 1

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to explain the care and treatment of woody plants by identifying pests, insects, mites, diseases and disorders and managing according to Integrated Pest Management (IPM) protocols and jurisdictional requirements.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3449.01 Interpret relevant legislation and jurisdictional requirements pertaining to pest and disease management.

- Describe the history of pest control in arboriculture
- Describe the requirements for documentation and associated procedures pertaining to IPM and plant care health programs according to jurisdictional regulations
  - Explain the importance of maintaining records related to integrated pest management (IPM) and plant health programs

3449.02 Describe Integrated Pest Management (IPM) Principles.

- Describe the key components of an IPM strategy (Prevent, Monitor, Intervene) as it relates to plant health care programs
  - Define terminology associated with pest and disease management
  - Define the protocols of an integrated pest management (IPM) program
- Identify strategies used for pest and disease management and treatment
  - Define preventative/ reactive control practices – mechanical, biological, chemical and cultural
  - Define “responsible use” acceptable/non-acceptable pest threshold levels
  - Identify the factors to consider for selecting and applying pest and disease management measures for maximum effectiveness
  - Describe methods for assessing and monitoring the effectiveness of treatments

3449.03 Explain cultural, mechanical, biological, behavioural, chemical pest management control methods.

- Describe various cultural control methods
    - fertilization/mulching/sanitation
    - watering/aeration
- Describe various mechanical/physical control methods
- Describe various biological control methods such as use of insects/pathogens e.g. Bacillus thuringiensis botanical/pheromones
- Describe various chemical control methods - horticultural oil/insecticidal soap, herbicides, Sulphur
- Describe the benefits and effects of cultural, mechanical, biological and chemical pest management control methods
- Identify considerations for the selection of control method
    - identifying action threshold information
    - identification of weak link (best time to treat)
    - type of woody plant
    - life cycles
    - least toxic first
    - client preference
    - safety of non-target organisms
    - possibility of environmental contamination
    - identification of range of control strategies available
    - use of phenology to time control methods (plant phenology and insect development)

3449.04 Describe the methods for assessing and diagnosing trees and woody plants for plant health.

- Define characteristics of normal plant growth vs abnormal plant growth
- Identify primary and secondary signs and symptoms of plant stress
- Describe the processes for assessing plant health such as conducting woody plant tissue sampling, assessing soil, moisture and space and light availability

3449.05 Describe cultural/abiotic disorders.

- Identify site and environmental factors that contribute to plant stress such as weather, soils, chemicals, mechanical injuries, cultural practices/ human activities - past and present.
    - poor planting practices - planting too low/high
    - girdling ropes and ties, girdling roots
    - Insufficient/excessive moisture/ desiccation
    - human activities- construction damage
    - environmental causes
        - pollution
        - temperature extremes
        - soil
        - salt
        - air
    - improper pruning
    - animal damage
    - pesticide damage

3449.06 Describe the signs, symptoms and causes of diseases and disorders on woody plants.

- Identify characteristics and life cycles of common types of diseases and disorders
- Identify causes of diseases and environmental conditions that support the pathogen
    - Identify pathogens that cause disease - fungus, bacteria, virus
    - Define the disease cycle
    - Describe pathogen requirements
    - Define host environments and environmental condition requirements
- Identify signs, symptoms and causes of leaf diseases for deciduous and coniferous tress such as:
    - Deciduous -e.g., Apple scab
    - Coniferous -e.g., Needle cast
- Identify signs, symptoms and potential damage of branch and stem diseases such as Cytospora canker
- Identify signs, symptoms and potential damage of root diseases such as Armilleria root rot
- Identify signs, symptoms and potential damage of vascular diseases such as Dutch Elm Disease

3449.07 Describe the signs and symptoms of insects, pests, and invasive species and beneficial insects on woody plants.

- Describe characteristics and life cycles of common types of pests
  - identify pests, invasive species and beneficial insects
- Identify causes of diseases, pathogens, biotic factors and abiotic factors
- Identify signs and symptoms of each main group including:
  - Defoliators
  - Whole leaf and Skeletonizers
    - Sawflies
    - Eastern tent caterpillar
    - Elm leaf beetle
    - Fall webworm
    - Forest tent caterpillar
  - Leaf miners
    - Birch leaf miner
    - Cedar leaf miner
    - Elm leaf miner
  - Sap suckers, Aphids, Scales, Spider mites
  - Wood borers
    - Stem borer -Asian long horned beetle
    - Shoot borer- Bronze birch borer
    - Emerald ash borer
    - Heartwood borer
    - Locust borer
  - Gall makers such as Cooley spruce gall adelgid, Eastern spruce gall, rust galls
  - Identify beneficial Insects
    - Lady Beetles
    - Parasitic Wasps
    - Bees

3449.08 Explain the procedures for safe handling, applying, transporting and storing of pesticides according to jurisdictional regulations.

- Identify hazards associated with pesticides use
  - Describe the effects of pesticides on the body
  - Symptoms/Antidotes
- Describe the procedures for applying pesticides
  - Identify differing conditions/ considerations for selecting application method such as species, brush densities, environmental conditions, terrain and soil type

- Identify specific tools, application equipment and products relating to pest and disease management
    - application equipment and such as low volume back-packs and high-volume equipment
    - identify methods of herbicide application such as, broadcast, stump treatment, basal treatment, soil sterilant and stem foliar
- Describe the use of pesticide concentrate and solutions
- Define the LD 50 Rating of active ingredients in products
- Describe the procedure for safe handling, transporting and storing of pesticides according to manufacturers' specifications and jurisdictional requirements
- Describe how the effectiveness of treatments is monitored and determined.

3449.09 Describe how to develop and implement a Plant/Tree Health Care Program.

- Define the objective of Plant Health Care (PHC) programs
- Describe what is required in providing routine monitoring and preventive treatment

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3450		
Title:	**Arboricultural Sciences II**		
Duration:	Total Hours: 36	Theory: 36 hours	Practical: 0 hours
Prerequisite:	Level 1		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to describe soil types, conditions and environmental factors that impact plant growth and explain procedures for amending soil conditions.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3450.01 Describe soil characteristics- physical, chemical and biological that impact plant growth.

- Define soil characteristics (physical, chemical and biological)
  - Describe the soil volume diagram and variations in bulk density
  - Define pH levels and types of soil nutrients- nitrogen (N), phosphorus (P) and potassium
  - Describe the significance of rhizosphere to soil health

3450.02 Describe methods to determine the composition and quality of soil for plant growing purposes.

- Identify soil types and textures (variations of sand, silt and clay)
- Describe the purpose of various types of soil testing e.g. Electrical Conductivity (E.C.)
- Describe the procedures used for soil testing, such as taking soil samples from various locations and using soil gathering tools and probes
- Describe the purpose and procedure for plant tissue sampling
- State how to interpret test results and make recommendations based on the results

3450.03 Explain methods for modifying the physical qualities of soil to improve plant growth.

- Identify various physical soil conditions deficiencies
- Describe aeration/porosity
    - compaction
    - moisture retention
- Identify grade changes

- Describe practices for improving physical soil condition deficiencies
    - Aerating soil
    - Grogun and air spade techniques
    - Correcting drainage
    - Removal or addition of soil as required

3450.04 Explain methods for treating chemical deficiencies in soil.

- Describe soil reactions such as pH (acidic, alkaline and neutral), Cation Exchange Capacity (C.E.C) and buffering capacity
    - Identify pH adjustment requirements

- Describe the procedures for improving soil nutrients/element deficiencies
    - Addition of macro-nutrients and micro-nutrients
        - fertilizing using broadcast, systemic and deep root methods

3450.05 Explain methods for treating biological deficiencies in soil.

- Describe the soil food web

- Describe amendments and techniques used to improve biological soil deficiencies
    - adding humus
    - mycorrhizal inoculation
    - radial trenching

Instructional & Delivery Strategies
Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3451		
Title:	**Tree Identification II**		
Duration:	Total Hours: 33	Theory: 33 hours	Practical: 0 hours
Prerequisite:	3446 Tree Identification 1		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to describe the tree genera, species, cultivars and characteristics of an additional 52 woody plants found in Ontario.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3451.01 Describe 52 additional common woody plants in all seasons according to species and morphological characteristics using the International System of Plant Nomenclature.

- Identify various plant groups
  - Herbaceous/woody
  - Deciduous/evergreen
  - Conifers / broadleaf
  - native/exotic
  - invasive

- Define plant nomenclature
  - Family
  - Genus
  - species / hybrid
  - variety/cultivar
  - common name

- Describe characteristics for each plant
  - leaves
  - flowers/fruit
  - buds
  - bark
  - growth habit and form

3451.02 Describe types of tree species using various characteristics (Reference appendix iii).

- Define characteristics of evergreen and deciduous trees
- Define bud/leaf arrangements on evergreen and deciduous trees

3451.03 Describe types and characteristics of trees and shrubs that are compatible and those that are not compatible in the electrical environment.

- Define characteristics of trees that are compatible with the electrical environment
- Define characteristics of trees that are non-compatible with the electrical environment
- Define environmental or other factors that may determine if trees or shrubs remain compatible with the electrical environment

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3452		
Title:	**Arborist Crane Assisted Rigging**		
Duration:	Total Hours: 24	Theory: 18 hours	Practical: 6 hours
Prerequisite:	Level 1		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to describe how to plan, communicate and perform tree limb removals using crane-assisted rigging with consideration for calculating load weights and distribution, assessing, and determining choker locations and balance points before ascending and descending from work points.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3452.01 Describe how to plan and set up work sites when using crane-assisted rigging

- Interpret worksite documentation/job specifications to determine:
  - size of crane, rigging and other equipment required for tree removal
  - load weights, load capacity charts, green log charts
  - working radius/ landing zone location
  - hook height
  - load path i.e. route from lift to landing
  - job site limits
    - property lines, overhead structures, safe limits of approach
    - underground structures such as septic systems, cisterns, wells, gravesites, utilities, gas
- Determine equipment requirements
  - butt rope
  - tag line
  - sling
  - rigging devices
  - ground protection mats
- Identify environmental hazards, tree hazards, ground hazards in relation to proximity to other workers/equipment

Environmental Hazards ▪ Restricted visibility, i.e. glare, fog, darkness ▪ Wet/ice/snow conditions ▪ Wind ▪ Thunder & lightning ▪ Temperature extremes/seasonal fluctuations ▪ Ice ▪ Storm damage	Tree Hazards ▪ Hangers and split branches ▪ Deadwood ▪ Excessive fill over root zone ▪ Root, stem/trunk and branch rot and cavities ▪ Cracks, seams and ribs ▪ Chicot ▪ Wood under tension- tension wood compression wood ▪ Wind-thrown trees ▪ Wildlife, i.e. stinging insects, raccoons
Ground hazards ▪ Debris ▪ Unstable ground ▪ Slippery ground ▪ Slopes/uneven ground/embankments ▪ Structures, i.e. Bridges, culverts, foundations, retaining walls ▪ Wildlife, holes and dens ▪ Trip hazards ▪ Deep snow	Overhead hazards ▪ Live conductor ▪ Danger trees ▪ Drop Zone Hazards

3452.02 Describe methods to establish and maintain worksite communication when using crane assisted rigging.

- Describe the requirements for designating a signal person
- Perform the required command response communication (verbal/hand signals) with all workers located within the work perimeter
  - Verbal/Direct communication – *clear command equals clear response*
  - Use of 2-way radios/cell phones
  - Perform specific hand signals with crane operator including:
    - establish a hoist line pretension signal
    - raise load, lower load, raise boom, lower boom
    - stop, “dog it”, go
    - back up, straight, to the right, to the left
    - emergency stop, all clear
    - shut down power

3452.03 Explain the planning required prior to performing tree and limb removals when using crane-assisted rigging.

- Describe the requirements for site setup according to job plan and jurisdictional regulations
    - safe limits of approach for electrical utilities and conductors
    - traffic controls including road closure permits
    - controlling worksite access (public, vehicular)
    - dedicated observer/signal person
    - controlling load path
    - blind lifts
    - communicating job plan to all personnel

- Calculate load weights and distribution, allowing for seasonal variations such as seed / fruit foliage and sap content and wood characteristics

- Identify the procedures for assisting the crane operator to set up crane, using green log weight charts/other resources to determine balance points and sequence of lifts according to weight being lifted

- Describe the considerations for selecting rigging equipment
    - types of sling, i.e. synthetic fibre, wire rope, chain
    - configuration, i.e. eye to eye, endless loop, spreaders,
    - length and diameter
    - hardware i.e. clevis, spreader

- Describe the procedure for inspecting rigging equipment according to manufacturer's recommendations
    - rating tags attached and legible
    - excessive wear and damage i.e. abrasion, crushing, bends, bird caging, kinks

- Describe how to determine balance point, assessing and determining choker locations when using crane-assisted rigging

3452.04 Describe the procedures to set up, inspect and remove hazards while ascending and descending the tree using crane assisted rigging.

- inspecting the structural integrity of the tree- checking for loose bark or decay
- assessing and selecting attachment point(s)
- positioning boom relative to load and repositioning to cutting location
- checking the orientation of the sling(s) on the load
- installing guidelines or butt lines if required
- removal of any branches interfering with cutting operation
- signaling to pretension hoist line to estimated weight of load

3452.05 Explain the procedure for limb and tree removal using crane-assisted rigging

- Identify steps including:
  - assessing cutting position for inadvertent load movement
  - determining type of cut to perform based on job requirements
    - Simple straight cut
    - V-cut/seat cut
    - Bypass/mismatch cut
    - Dust cut
    - Traditional cuts
  - communicating with crane operator the intent to begin the cutting operation
  - performing cutting operation as required
  - preparing the load to transfer to landing area
  - removing butt line if installed
  - signaling crane operator to land load

3452.06 Describe what is required for basic maintenance and storage of rigging equipment according to manufacturers' recommendations including:
Maintenance of rigging equipment includes:

- cleaning
- lubricating
- oiling
- drying as required
- repairing as required

Storage of rigging equipment includes:

- coiling
- wrapping
- hanging and out of direct sunlight
- protect from nicks or abrasions and away from destructive substances

Instructional & Delivery Strategies
Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency. In all practical assignments, the unit is to evaluate the "Method of work" which includes application of theory

Number:	3453		
Title:	**Aerial Devices**		
Duration:	Total Hours: 27	Theory: 8 Hours	Practical: 19 Hours
Prerequisite:	Level 1		

General Learning Outcomes

On the completion of this reportable subject, the apprentice is able to demonstrate the setup, inspection and transportation process according to manufacturer's recommendation and legislative requirements.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3453.01 Explain the legislative requirements for operating aerial devices.

- State the legislative requirements and Electrical Safety Rule Book governing the operation of aerial devices
- State the function of the operator's manual and identify location of the document
- Describe and locate relevant sections of the operator's manual

3453.02 Describe the application of hydraulic theory to the principles of operation of an aerial device.

- force pressure pascal's law
- law of conservation of energy liquid as a force multiplier
- atmospheric pressure
- energy in a hydraulic system

3453.03 Explain the characteristics, types, operation and applications of aerial devices.

- Describe the types of aerial devices - on road, off road, self-propelled, and work platforms
- Identify hydraulic components on an aerial device
  - hydraulic pump
  - hydraulic oil filter
  - oil reservoir
  - lower control
  - lower control valves
  - selector valves
  - outrigger control valves
  - emergency by-pass valve

- upper arm hydraulic cylinders
- holding valves
- directional control valves
- fluid site glass indicator
- emergency lowering devices
- elevator components

- Describe the application of aerial devices
- Describe the operation of aerial devices
- Identify mounting configurations such as trailer-mounted, truck-mounted and track mounted
- Explain the applications for the various types of aerial devices

3453.04 Explain the preparation required for setting up an aerial device.

- Identify the requirements for conducting an aerial device pre-operation (PTO check)
- Describe how to locate and identify pre-operation information
- State what is inspected as a part of the aerial device pre-operation inspection
  - check tire pressures
  - PTO check
  - bucket inspection
  - hand line
  - dielectric test certificate
  - holding valve check
  - safety interlock check
  - control valve checks
  - hydraulic system check
  - leaks
  - loose fittings
  - hydraulic oil level
  - breather cap
  - fall protection systems check
  - bucket escape equipment
  - bucket rescue equipment
  - outriggers and pads
  - elevators if applicable
- Demonstrate the procedures to warm up and pre-check the hydraulic fluid
- Demonstrate the procedures used to complete daily equipment logbook during the pre-operations

- Identify the considerations and requirements when setting up an aerial device such as:
  - use of traffic control devices for vehicular and pedestrian
  - use of Traffic Control Person
  - vehicle warning lights
  - site selection – determining surface slope/terrain
  - overhead obstructions
  - electrical system configuration

- Explain the steps for positioning and setting up an aerial device
  - engaging the parking brake
  - use of wheel chocks (for wheeled units)
  - engagement of PTO
  - use of axle lockouts
  - setting of outriggers and pads
  - removing covers
  - connecting hydraulic tools

3453.05 Demonstrate the operation of aerial device for arborist operations

- Review manufacturer's recommendations/operation manual

- Describe legislative requirements as it applies to the operation of an aerial device

- Demonstrate the use of PPE and Fall arrest systems including body harness and shock-absorbing lanyard required and attached to an approved anchor while operating an aerial device

- Describe the considerations for operation such as:
  - job requirements
  - hydraulic tool attachment
  - availability of emergency equipment
  - coordination with ground crew
  - Limits of Approach maintained
  - identification of ground person responsibilities
  - work positioning

- State the requirements and procedure for loading tools, equipment and materials and accessing/exiting the bucket
  - manufacturers' instructions
  - use of 3 points of contact

- Demonstrate the procedure for operating aerial devices.
    - engaging PTO
    - lower outriggers/stabilizers if applicable
    - upper/lower controls
    - raise bucket
    - rotate boom
    - lower bucket
    - raise elevator, if equipped

- Explain the operations that are continually monitored on aerial device
  Monitoring to include:
    - aerial device condition
    - operator & bucket security
    - boom positioning
    - surface conditions
    - disengaged PTO

3453.06 Describe the requirements and considerations prior to transporting a track or trailer-mounted aerial device.

- Identify manufacturer's instructions and legislative requirements for device transport such as:
    - disengagement of PTO Aerial device for transport
    - securing aerial device on trailer for transport
    - stowing and securing boom
    - retracting outriggers
    - debris removal

3453.07 Explain what basic preventative maintenance is required on an aerial device according to manufacturers' recommendations and legislative requirements.

3453.08 Explain aerial device emergency action plan for escape and rescue procedures.

- Describe the steps for handling an emergency situation when working with an aerial device
    - assess the emergency/ scene survey
    - assess contributing factors
    - assess the condition of operator
    - determine need for ems
    - calling for assistance
    - determine feasibility/appropriateness of aerial rescue

- Describe the considerations for escaping from a disabled aerial device
    - condition of operator
    - proximity to energized conductors
    - ability to use lower controls with the emergency pump
    - availability of second aerial device or tree for transferring the operator

- Demonstrate various emergency escape methods

3453.09 Demonstrate how to remove a disabled operator from an aerial device

- use of the lower controls to bring bucket to the ground and position bucket to flat surface
- tipping bucket or using a rescue rig to remove disabled worker
- administer emergency first aid if required

Instructional Delivery Strategies
Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency. In all practical assignments, the unit is to evaluate the “Method of work” which includes application of theory.

Number:	3454		
Title:	**Tree Planting Practices**		
Duration:	Total Hours: 12	Theory: 12 Hours	Practical: 0 Hours
Prerequisite:	Level 1		

General Learning Outcomes

On the completion of this reportable subject, the apprentice is able to explain best practices for selecting, planting/installing, transplanting, maintaining and monitoring woody plants according to the Ontario Landscape Tree Planting Guide* (refer to Appendix iv).

Learning Outcomes and Content

3454.01 Explain the best practices for selecting woody plants.

- Identify characteristics and considerations for selecting nursery stock prior to transporting/planting
  - quantity
  - size
  - species
  - health
  - structure
  - field or nursery
  - containerized
  - in ground fabric bags
- Identify what is inspected upon delivery of plants from nursery

3454.02 Describe the procedures for planting/installing woody plants.

- Identify the factors that determine the viability of a plant for transplanting
  - Identify considerations such as site conditions and cultural requirements
- Identify the factors for determining the planting location
- State the considerations and requirements such as planting depth drainage provisions, evacuation and tree pit configuration
- Describe the fundamental steps and techniques for installing woody plants
  - preparation of the planting site and planting medium
  - hole preparation - depth and width based on tree requirements
  - placement, protecting, loosening of root containment, root placement orientation and straightening

- removal of burlap, not more than ¼ of basket wire, containers, labels, seals and ribbons.
- backfilling
- mulching
- watering
- correcting compaction and nutrient deficiencies
- root and crown pruning
- anchoring/stabilizing
- site clean-up

3454.03 Explain the steps, techniques and requirements to maintain and monitor the health of transplanted trees.

- Describe the procedures for irrigating, pruning, fertilization, protecting, stabilizing, mulching and monitoring for plant health
- Describe the procedures for assessing the need for anchor and trunk guard removal

3454.04 Explain the best practices for transplanting woody plant materials.

- Describe the application for manually versus mechanically transplanting woody plants
- Describe the procedures for manually transplanting woody plants in various containment systems
  - bare root
  - ball and burlap
  - container grown
  - inground fabric bags
- Describe the procedures for mechanically (tree spade) transplanting woody plants

3454.05 Describe the procedures for transporting woody plants including the handling, protecting, loading and interim storage.

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency.

Reportable Subjects Summary Utility Arborist Level 2

Summary of Total Program In-School Training Hours Level 2

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
3455	Utility Arborist Safe Work Practices	18	18	0
3456	Vegetation Management	30	18	12
3457	Utility Arborist Practices - Tree Climbing	144	0	144
3453	Aerial Devices	27	8	19
3458	Utility Arborist Tools and Equipment Practical	18	6	12
3459	Utility Arboricultural Sciences	15	15	0
3451	Tree Identification II	33	33	0
3460	Utility Transmission Line Clearing	15	9	6
	Total	**300**	**107**	**193**

Number:	3455		
Title:	**Utility Arborist Safe Work Practices**		
Duration:	Total Hours: 18	Theory: 18	Practical: 0
Prerequisite:	Level 1 (3441 Arborist Workplace Safety Practices 1)		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to interpret legislation relevant to Utility Arboriculture, identify electrical circuit hardware and electrical system configurations, explain methods of eliminating or controlling electrical and other hazards when working in close proximity to energized electrical apparatus.

Learning Outcomes and Content

3455.01 Interpret legislation relevant to Utility Arboriculture.

- Specify the Electrical Utility Safety Rules related to Line Clearing with a focus on Proximity, Di-Electric Tools and their testing requirements, Job Planning and Authorization for Work.
- Describe the sections of the Utility Work Protection Code that focus on Holders of Record, Safe Work Zones, Work Groups, Work Permits and Hold-Offs
- Describe the sections of the Construction and Industrial regulations related to Utility Arboriculture
- Describe the intent of the Pesticides Act and the Exemption for Public Works

3455.02 Identify electrical circuit hardware and electrical system configurations.

- Define electrical system configuration, multi-phase circuits, cross arm construction, primary voltages, secondary voltages, transmission voltages
- Identify circuits
  - Distribution Circuit – voltage ranges, construction type, joint use poles
  - Transmission Circuits – voltage ranges, construction type
  - Service voltage wire identification
  - Neutral identification

Electrical System Configuration

- Loop feeds
- Radial feeds
- Delta feeds (2 and 3 phase)

Electrical Equipment identification to include:

- switches
- reclosuers
- capacitors
- insulators
- transformers
- lightening arresters
- pole anchors
- guy wires
- conductor
- transmission shield wire
- underground hardware
- distribution station
- transmission station
- generating station (Hydroelectric, nuclear, wind farm, solar, biomass)

3455.03 Explain methods of eliminating or controlling electrical hazards on the work site.

- Describe the following:
  - safe limits of approach
  - isolation and de-energization for worker protection
  - use of hold offs for equipment protection
  - use of cover up
  - use of insulated tools and aerial device
  - use of safe limits of approach table
  - use of point of work grounding

- Identify requirements and use of personal protective equipment (PPE) when working around energized apparatus
  - Identify the requirements for PPE such as rubber gloves and Arc Rated clothing
  - Describe difference between Flame Resist and Arc Rated,
  - Identify various classifications of Arc Rated clothing

3455.04 Identify vegetation hazards in relation to energized electrical systems.

- State risk factors with vegetation and electricity
  - proximity concerns
  - flash-over – minimum voltage clearances
  - wood as a conductor
  - conductor under tension by a fallen tree
  - storm damage and wind-thrown trees
  - station ground grids and vegetation control

- Describe the difference between an energized environment and non-energized environment

3455.05 Identify overhead and underground hardware, environmental, ground and tree hazards and poisonous plants.

Environmental Hazards ▪ Restricted visibility, i.e. glare, fog, darkness ▪ Wet/ice/snow conditions ▪ Wind ▪ Thunder & lightning ▪ Temperature extremes/seasonal fluctuations ▪ Storm damage Poisonous plants ▪ Poison Ivy ▪ Poison Sumac ▪ Poison Wild Parsnip ▪ Giant Hogweed ▪ Monkshood	Tree Hazards ▪ Hangers and split branches ▪ Deadwood/severed limbs ▪ Excessive fill over root zone ▪ Root, stem/trunk and branch rot and cavities ▪ Compression and tension wood ▪ Spring poles ▪ Barber chair ▪ Cracks, seams and ribs ▪ Chicot ▪ Wind-thrown / Free-standing trees and adjacent trees ▪ Wildlife, i.e. stinging insects, raccoons ▪ Falling debris
Ground hazards ▪ Debris ▪ Unstable/ slippery ground ▪ Slopes/uneven ground/embankments ▪ Structures, i.e. Bridges, culverts, foundations, retaining walls ▪ Wildlife, holes and dens ▪ Trip hazards ▪ Deep snow	Underground hardware ▪ Natural gas markers ▪ Water line markers ▪ Electrical transformers ▪ Septic systems, wells ▪ Communication lines Overhead hazards ▪ Live conductor ▪ Danger trees ▪ Drop Zone Hazards

Number:	3456
Title:	**Vegetation Management**
Duration:	Total Hours: 30 Theory: 18 hours Practical: 12 hours
Prerequisite:	Level 1 (3441 Arborist Workplace Safety Practices)

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to describe the objectives and considerations for removing incompatible vegetation around energized electrical systems to meet clearance standards.

Learning Outcomes and Content

3456.01 Describe the objectives and considerations of vegetation management.

- Define the objectives of vegetation management
- Define cycle clearing requirements
  - economics versus safety with longer clearing cycle
- Describe the considerations for managing vegetation
  - Define electrical system reliability measurements- SAIFI, SAIDI, CAIDI and impacts on pruning cycles

Additional considerations to include:

- determining when to prune versus tree removal
- species characteristics (native species, growth habits, invasive species, and species at risk)
- tree condition/tree canopy
- geography
- clearance cycles
  - higher voltage circuits versus lower voltage circuit
- Proximity of conductor to worksite
  - pole hardware e.g. guy lines, primary conductors, service conductors
  - customer consideration
- Consideration of vegetation compatibility based on
  - voltage classification
  - line height at max sag
  - Terrain on corridor (flat ground, valley, knoll/hill at mid-span)

3456.02 Describe mechanical methods for controlling vegetation in proximity to energized electrical apparatus.

- Describe mechanical techniques that are used in various situations for controlling vegetation
  - Defining grinding and grubbing underbrush applications
  - Explaining use of mechanical tree harvesters
  - Use of excavators and bulldozers
- Describe safety precautions taken when mechanically removing vegetation
  - protection from flying projectiles
  - the requirement to identify underground and overhead utilities and danger zones

3456.03 Describe methods to prune and remove trees using an aerial device in proximity to energized electrical apparatus.

- Identify equipment required such as bucket truck, crane, off-road unit
- Identify hand tools and equipment required
  - fiberglass reinforced plastic (frp) pole pruner
  - fiberglass reinforced plastic (frp) pole saw
  - guide ropes pull ropes
  - hand saw
  - hydraulic tools for pruning and removing trees using an aerial device
    - hydraulic, pruner, chainsaws, circular saw, pole saw

3456.04 Describe the process for sectional removal of a tree while using a chainsaw aloft.

- Describe the considerations for determining method for sectional tree removals:
  - use of aerial device or climbing
  - wood size and weight
  - identifying the equipment to be used, (manual, power and rigging equipment)
  - conductor location
  - the need for rigging and lowering devices
- Describe the methods for sectional removal
  - Free fall sectional removal
  - Conventional rigging sectional removal
    - rigging using lowering devices
    - rigging using lifting devices

- Describe the process for controlling the movement of cut limbs and trunk sections from aerial device
    - raising/lowering of limbs using ropes and mechanical advantage
    - cutting limbs so they will not bridge conductors
    - controlling limbs using hinge cuts
    - lowering cut limbs using friction devices
    - topping tree using ropes and rigging equipment

3456.05 Explain the procedures for the use of pesticides when managing vegetation around energized electrical systems.

- Identify hazards associated with pesticides use
    - Describe the effects of pesticides on the body
    - Define the LD 50 Rating of active ingredients in products
    - Symptoms and treatments
- Identify application techniques such with back-packs and high-volume spray equipment and the hazards they present
- Identify application equipment
- Describe the use of pesticide concentrate and mixing solutions
- Explain the procedure for handling, applying, disposal and storage of pesticides according to Pesticides Act, RSO 1990 O. Reg 63/09

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3457
Title:	**Utility Arborist Practices – Tree Climbing**
Duration:	Total Hours: 144 Theory: 0 hours Practical:144 hours
Prerequisite:	Level 1 – (3442 Arborist Safe Work Practices-Climbing)

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to demonstrate safe work practices to manage vegetation in proximity to energized electrical apparatus.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3457.01 Demonstrate job planning.

- Interpret job documents such as work orders and municipal bylaws to determine:
  - scope of work
  - plans and specifications
  - equipment, personnel and material required
  - cycle clearance requirements
  - compliance with jurisdictional regulations
- Determine job site limits
  - property lines
  - safe limits of approach to electrical conductors
  - overhead utilities and buried utilities
- Identify job tasks, hazards and required barriers
  - job task sequence
  - hazards and barriers
  - tools/equipment required
  - communication needs
  - emergency response plan

3457.02 Demonstrate safe work practices when working within proximity to energized electrical apparatus.

- Identify overhead and underground hardware, environmental, ground and tree hazards and poisonous plants (refer to chart 3455.05)
- Demonstrate application of the Electrical Utility Safety Rule Book and safe limits of approach
  - Verification of proximity to energized electrical apparatus
  - Notification to controlling authority

- Application of appropriate job planning
- Application of utility work protection code
- Use of hold offs for equipment protection
- Use of cover up
- Isolation/de-energization of circuits
- Use of rubber gloves and live line tools

3457.03 Demonstrate the procedure for inspecting, adjusting, maintaining and wearing required personal protective equipment when working around energized electrical apparatus.

- Inspect all work positioning or fall protection equipment according to manufacturer's recommendations

Tree climbing application

- Approved body harness inspected

Aerial Device application

- CSA approved full body harness
- Shock Absorbing Lanyard
- Di-electrically insulated rubber gloves
  - voltage class
  - pre-use inspection
  - air tested
  - expiry date checked
  - leather covers
- Arc Rated clothing is intact (i.e., no rips or missing fabric)

3457.04 Demonstrate the selection, inspection and maintenance of basic tools and equipment used in pruning operations for working in proximity to energized electrical apparatus.

3457.05 Demonstrate various methods of ascending and descending trees to access required work position.

3457.06 Demonstrate pruning of woody plants in proximity to energized electrical apparatus from the ground and from aloft.

- Describe considerations for determining methods considering such as:
  - species characteristics (native species, growth habits, invasive species, and species at risk)
  - tree condition/tree canopy
  - clearance cycles
  - higher voltage circuits versus lower voltage circuit
  - proximity of conductor to worksite
  - customer consideration

- Demonstrate location of pruning cuts using the branch collar and branch bark identifiers

- Demonstrate pruning methods:
  - side pruning
  - dead wooding
  - overhang pruning
  - directional pruning
  - crown/limb reduction

- Perform limb raising and lowering to cut limbs so that they don't span conductors.
  - controlling limbs using hinge cuts
  - using ropes, knots, pulleys, slings and rigging equipment
  - assessing weight and controllability of limb
  - removing hangers

3457.07 Demonstrate felling techniques for tree removal in proximity to energized electrical apparatus.

- Prepare felling plan that considers hazards, obstacles, height/lean and escape route equipment to be used, notch selection, back cut plan

- Determine tree felling technique based on various considerations
  - Tree health
  - Tree characteristics and structural defects
    - balanced/unbalanced/leaning tree
    - tree with splits or cavities
  - "Hung up" trees

- Perform felling techniques using notches and cuts as required
  - Open face notch
  - Conventional notch
  - "V" notch (Birds mouth) and back cut
  - "Humboldt" notch and back cut
  - Boring and back cut

- Describe the process for removing trees that have fallen during storm conditions

  - Identify hazards and barrier requirements
    - electrical hazards (isolated and de-energized)
    - mechanical energy forces applied to conductor
    - tree tension and compression wood
    - surrounding hazards
  - Use of rubber gloves and live line tools
  - Perform inspection of worksite
    - hangers and chicots removed
    - rigging equipment removed

3457.08 Demonstrate sectional removal while aloft when climbing and/or from an aerial device.

- Determine method for sectional tree removal by considering:
  - use of aerial device or climbing
  - wood size and weight
  - identifying the equipment to be used
  - conductor location
  - the need for rigging and lowering devices
- Perform free fall sectional removal
- Perform conventional rigging sectional removal
  - rigging using lowering devices
  - rigging using lifting devices
- Demonstrate the process for controlling the movement of cut limbs and trunk sections from aerial device
  - Raising/lowering of limbs using ropes and mechanical advantage-pulleys and slings
  - Cutting limbs so they will not span conductors
  - Controlling limbs using hinge cuts
  - Lowering cut limbs using friction devices, port-a-wrap
  - Topping tree using ropes and rigging

3457.09 Demonstrate how to control underbrush in proximity to transmission and distribution voltage conductors.

- Identify underbrush felling area
  - determine: limits of approach (distance from conductors)
  - method of removal -mechanical or manual method
  - hazards
  - tools and equipment requirements
- Identify, eliminate/control hazards
- Fell underbrush using predetermined methods
  - Reduce stump height
- Apply herbicide treatments as required
  - Stump application using water
  - Brush application using water

3457.10 Perform site cleanup using techniques for handling and disposal of debris generated on the job site based on size and location of materials.

Techniques to include:

- lifting/carrying/piling brush
- loading brush and large wood on vehicles
- dispose of brush and wood using wood chipper
- lowering of stumps
- raking and disposing of small debris

Instructional & Delivery Strategies

Instruction using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency. In all practical assignments, the unit is to evaluate the “Method of work” which includes application of theory.

Number:	3453		
Title:	**Aerial Devices**		
Duration:	Total Hours: 27	Theory: 8 Hours	Practical: 19 Hours
Prerequisite:	Level 1		

General Learning Outcomes

On the completion of this reportable subject, the apprentice is able to demonstrate the setup, inspection and transportation process of aerial device according to manufacturer's recommendation and legislative requirements.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3453.01 Explain the legislative requirements for operating aerial devices.

- State the legislative requirements and Electrical Safety Rule Book governing the operation of aerial devices
- State the function of the operator's manual and identify location of the document
- Describe and locate relevant sections of the operator's manual

3453.02 Describe the application of Hydraulic Theory to the principles of operation of an aerial device.

- force pressure pascal's law
- law of conservation of energy liquid as a force multiplier
- atmospheric pressure
- energy in a hydraulic system

3453.03 Explain the characteristics, types, operation and applications of aerial devices.

- Describe the types of aerial devices - on road, off road, self-propelled, and work platforms
- Identify hydraulic components on an aerial device
  - hydraulic pump
  - hydraulic oil filter
  - oil reservoir
  - lower control
  - lower control valves
  - selector valves
  - outrigger control valves
  - emergency by-pass valve
  - upper arm hydraulic cylinders
  - holding valves
  - directional control valves

- fluid site glass indicator
- emergency lowering devices
- elevator components

- Describe the application of aerial devices
- Describe the operation of aerial devices
- Identify mounting configurations such as trailer-mounted, truck-mounted and track mounted
- Explain the applications for the various types of aerial devices.

3453.04 Explain the preparation required for setting up an aerial device.

- Identify the requirements for conducting an aerial device pre-operation (PTO check)
- Describe how to locate and identify pre-operation information
- State what is inspected as a part of the aerial device pre-operation inspection

  - check tire pressures
  - PTO check
  - bucket inspection
  - hand line
  - dielectric test certificate
  - holding valve check
  - safety interlock check
  - control valve checks
  - hydraulic system check
  - leaks
  - loose fittings
  - hydraulic oil level
  - breather cap
  - fall protection systems check
  - bucket escape equipment
  - bucket rescue equipment
  - outriggers and pads
  - elevators if applicable

- Demonstrate the procedures to warm up and pre-check the hydraulic fluid
- Demonstrate the procedures used to complete daily equipment logbook during the pre-operations

- Identify the considerations and requirements when setting up an aerial device such as:
    - use of traffic control devices for vehicular and pedestrian
    - use of Traffic Control Person
    - vehicle warning lights
    - site selection – determining surface slope/terrain
    - overhead obstructions
    - electrical system configuration

- Explain the steps for positioning and setting up an aerial device
    - engaging the parking brake
    - use of wheel chocks (for wheeled units)
    - engagement of PTO
    - use of axle lockouts
    - setting of outriggers and pads
    - removing covers
    - connecting hydraulic tools

3453.05 Demonstrate the operation of aerial device for arborist operations

- Review manufacturer's recommendations/operation manual
- Describe legislative requirements as it applies to the operation of an aerial device

- Demonstrate the use of PPE and Fall arrest systems including body harness and shock-absorbing lanyard required and attached to an approved anchor while operating an aerial device

- Describe the considerations for operation such as:
    - job requirements
    - hydraulic tool attachment
    - availability of emergency equipment
    - coordination with ground crew
    - Limits of Approach maintained
    - identification of ground person responsibilities
    - work positioning

- State the requirements and procedure for loading tools, equipment and materials and accessing/exiting the bucket
    - manufacturers' instructions
    - use of 3 points of contact

- Demonstrate the procedure for operating aerial devices.
    - engaging PTO
    - lower outriggers/stabilizers if applicable
    - upper/lower controls
    - raise bucket
    - rotate boom
    - lower bucket
    - raise elevator, if equipped
- Explain the operations that are continually monitored on aerial device Monitoring to include:
    - aerial device condition
    - operator & bucket security
    - boom positioning
    - surface conditions
    - disengaged PTO

3453.06 Describe the requirements and considerations prior to transporting a track or trailer-mounted aerial device.

- Identify manufacturer's instructions and legislative requirements for device transport such as:
    - disengagement of PTO Aerial device for transport
    - securing aerial device on trailer for transport
    - stowing and securing boom
    - retracting outriggers
    - debris removal

3453.07 Explain what basic preventative maintenance is required on an aerial device according to manufacturers' recommendations and legislative requirements.

3453.08 Explain aerial device emergency action plan for escape and rescue procedures.

- Describe the steps for handling an emergency situation when working with an aerial device
    - assess the emergency/ scene survey
    - assess contributing factors
    - assess the condition of operator
    - determine need for ems
    - calling for assistance
    - determine feasibility/appropriateness of aerial rescue

- Describe the considerations for escaping from a disabled aerial device
    - condition of operator
    - proximity to energized conductors
    - ability to use lower controls with the emergency pump
    - availability of second aerial device or tree for transferring the operator

- Demonstrate various emergency escape methods

3453.09 Demonstrate how to remove a disabled operator from an aerial device

- use of the lower controls to bring bucket to the ground and position bucket to flat surface
- tipping bucket or using a rescue rig to remove disabled worker
- administer emergency first aid if required

Instructional Delivery Strategies
Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods
Ongoing assessment, tests, assignments, demonstration of proficiency. In all practical assignments, the unit is to evaluate the “Method of work” which includes application of theory.

Number:	3458		
Title:	**Utility Arborist Tools and Equipment Practical**		
Duration:	Total Hours: 18	Theory: 6 hours	Practical: 12 hours
Prerequisite:	Level 1 - (3444 Arborist Equipment I)		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to operate live line tools, brush chippers and aerial devices used in utility arboricultural practices.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3458.01 Demonstrate how to select, inspect, adjust, maintain, set up and store live line tools.

- Select appropriate tool based on pruning methods, voltage level, diameter of limb and work to be completed
- Identify Live Line Tools
  - fiberglass reinforced plastic pole pruner
  - fiberglass reinforced plastic pole saw
  - hydraulic pruner
  - hydraulic pole saw
  - hydraulic circular saw
- Inspect tools for defects
  - test sticker (legible and current)
  - loose components
  - leaks
- Describe tool and equipment maintenance requirements
  - sharpen blade
  - lubrication
  - spot clean
  - daily clean
  - wipe with drying agent
  - tool disinfection
- Demonstrate storage of live line tools

3458.02 Describe the requirements and process for testing insulated aerial devices and dielectric tools used in proximity to energize electrical apparatus.

- State Electrical Utility Safety Rules, 134 related to dielectric testing
- Describe what is meant by a certified testing laboratory and the process of cleaning for dielectric testing
- Describe testing frequencies for dielectric components of aerial devices
    - insulated aerial device
    - bucket liner
    - tools

3458.03 Demonstrate the procedure to inspect and set up "insulated aerial devices" used in proximity to energized apparatus.

- Verify dielectric inspection and stability test stickers are current
- Identify that voltage limits of the aerial device are not exceeded based on what voltage the unit has been tested to
- Confirm that auxiliary hydraulic hoses are dielectric in nature
- Clean booms and dielectric tools according to manufacturer's recommendations
    - Address moisture concerns that could impact dielectric integrity
    - Wipe down insulated sections of the boom using approved products i.e. methyl hydrate
- Set up aerial device to achieve maximum boom reach and maneuverability to maintain Limits of Approach for personnel and equipment

3458.04 Demonstrate the operation of insulated aerial devices around energized apparatus.

- State Electrical Utility Safety Rules, rule 123
- Maintain a safe limit of approach to electrical conductors while operating the insulated aerial device aloft
- Demonstrate the safe handling of conductive tools such as chainsaw and conductive material and woody stems when working around energized conductors

Instructional & Delivery Strategies
Instruction is presented using a variety of teaching methodologies, presentations, demonstration and assignments.

Evaluation Methods
Demonstration of proficiency. In all practical assignments, the unit is to evaluate the "Method of work" which includes application of theory.

Number:	3459		
Title:	**Utility Arboricultural Sciences**		
Duration:	Total Hours: 15	Theory: 15 hours	Practical: 0 hours
Prerequisite:	Level 1 (3445 Arboricultural Sciences I)		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to describe the principles of IPM as they apply to the management of vegetation harmful to the integrity of the electrical system; describe the scientific principles and the administration of pesticides; identify the impact of insects, diseases, disorders, wounds and defects and work operations on woody plants, vegetation and environmentally sensitive locations.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3459.01 Describe Integrated Pest Management principles (IPM) as it relates to utility arboricultural.

- pest identification
- establishing thresholds
- selection of control methods- manual, biological, chemical mechanical or cultural
- evaluation and monitoring of effectiveness of method

3459.02 Describe the scientific principles and the administration/ classification of pesticides in Ontario.

- Describe Health Canada's process for registration of pesticides use
- Identify the classifications system for pesticides based on the intended use
- Explain the impact and mode of action of systemic and contact herbicides on woody and herbaceous plants

3459.03 Explain the impact of work operations on environmentally- sensitive locations.

- Describe the sources of impact including, chemicals, heavy machinery, noise, incidental habitant destruction
  - herbicide application
  - soil erosion/compaction
- Identify environmental sensitive concerns such as specifies at risk, riparian zone habitat and water stewardship and other areas of concern.

3459.04 Identify insects, diseases, disorders, wounds and defects of woody plants and vegetation to determine the impact on woody plants and the need for removal or preservation.

- Identify structural defects of woody plants
  - included bark
  - splits/cracks
  - co-dominant stems

- Identify insects and the impact on woody plants
  - natural and invasive
  - signs and symptoms
  - impacts to trees and vegetation

- Identify pathogens that cause disease - fungus, bacteria, virus,
  - Disease life cycle
  - Impact of disease to trees and vegetation

- Identify leaf diseases
  - deciduous
  - coniferous
  - signs and symptoms
  - impact to trees and vegetations

- Identify branch and stem diseases –e.g., Cytospora canker, Hypoxylon Canker
  - signs and symptoms
  - impact to trees and vegetation

- Identify root diseases -e.g., Armilleria and root rot
  - signs and symptoms
  - impact to trees and vegetation

- Identify signs, symptoms and potential damage of vascular diseases -e.g., Dutch elm disease
  - Impact to trees and vegetation

- Identify biotic disorders
  - wood boring insects – Heartwood borer, Locust borer
  - shoot borer – Bronze Birch Borer
  - stem borer - Asian Long Horn Beetle
  - Carpenter Ants
  - animal damage

- Identify abiotic disorders that impact on woody plants and vegetation caused by factors such as:
  - temperature and moisture extremes,
  - mechanical damage,
  - chemicals,

- nutrient deficiencies or excesses
- environmental factors- lightning strikes, frost cracks, pollution (air, soil, salt)

- Identify the impact of human activities on woody plants and vegetation such as:

  - soil compaction
  - contact with equipment
  - off-target pesticide damage
  - improper pruning
  - change of grade
  - under/overwatering.

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3451		
Title:	**Tree Identification II**		
Duration:	Total Hours: 33	Theory: 36 hours	Practical: 0 hours
Prerequisite:	Level 1 (3446 Arborist Tree Identification 1)		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to describe the tree genera, species, cultivars and characteristics of 52 additional woody plants commonly found in Ontario.

Learning Outcomes and Content

On completion of the learning outcomes the apprentice is able to:

3451.01 Describe an additional 52 common woody plants in all seasons according to species and morphological characteristics using the International System of Plant Nomenclature.

- Identify various plant groups
  - Herbaceous/woody
  - Deciduous/evergreen
  - Conifers / broadleaf
  - Native/exotic
  - Invasive

- Define plant nomenclature
  - Family
  - Genus
  - Species / hybrid
  - Variety/cultivar
  - Common name

- Describe characteristics for each plant
  - Leaves
  - Flowers/fruit
  - Buds
  - Bark
  - Growth habit and form

3451.02 Describe types of tree species using various characteristics (Reference appendix iii).

- Define characteristics of evergreen and deciduous trees
- Define bud/leaf arrangements on evergreen and deciduous trees

3451.03 Describe types and characteristics of trees and shrubs that are compatible and those that are not compatible in the electrical environment.

- Define characteristics of trees that are compatible with the electrical environment
- Define characteristics of trees that are non-compatible with the electrical environment
- Define environmental or other factors that may determine if trees or shrubs remain compatible with the electrical environment.

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency.

Number:	3460		
Title:	**Utility Transmission Line Clearing**		
Duration:	Total Hours: 15	Theory: 9 hours	Practical: 6 hours
Prerequisite:	Level One		

General Learning Outcomes

On completion of this reportable subject, the apprentice is able to describe reliability standards for transmission circuits, identify Right-of-Ways (ROW) system information from maps and drawings, perform a condition patrol inspection to assess hazards to line integrity and document findings for future actions.

Learning Outcomes and Content

On completion of the learning content the apprentice is able to:

3460.01 Describe the standards related to Transmission Reliability.

- Describe NERC and FERC and their governance functions as it relates to transmission reliability
- Describe FAC-003 including all of the requirements and measures
- Describe a Transmission Vegetation Management Plan (TVMP) and its components

3460.02 Interpret maps, drawings and diagrams to identify features of the transmission system.

- Identify system information including voltages, structures and access routes using maps and drawings
- Interpret special considerations on maps and drawings for work planning:
  - water
  - AOC
  - property owner specifications
- Describe ROW status
  - Identify Right- of-Ways (ROW) property information from maps and drawings and determine type:
    - owned
    - easement acquired on private land
    - land use agreement in place

- Interpret system operating diagrams to identify:
    - transmission circuits
    - generation
    - station locations
    - system configuration

3460.03 Describe the process for conducting a condition patrol inspection.

- Identify requirements for access permission
- Describe the process for acquiring authorization on both private and crown land
- Describe sag and sway as a consideration when performing condition patrols
- Describe consideration of cycle lengths when assessing vegetation compatibility

3460.04 Identify the application of drones for the completion of ROW inspections and work planning.

- certification requirements
- regulatory considerations

3460.05 Perform a condition patrol inspection to identify hazards to line integrity by assessing vegetation for compatibility within the ROW.

- Use tree measuring devices e.g., clinometer, laser range finder and measuring sticks to measure the height of vegetation in the ROW
- Document findings from condition patrol

Instructional & Delivery Strategies

Instruction is presented using a variety of teaching methodologies, lectures, presentations, demonstration and assignments.

Evaluation Methods

Ongoing assessment, tests, assignments, demonstration of proficiency.

Tools and Equipment

Hand Tools

Chisels Mallets Axes Sledge Hammers Shovels/Spades Picks Rakes Brooms Ladders Knives Pole Pruners Pole Saws Compressors Extension Cords Maintenance and Adjustment Tools Drills Augers and Bits Brush Saws Handsaw Rigging ropes Friction saver Slings (Whoopie, nylon web)	Rope Throw pouch Sling shot Loppers Secateurs Friction devices Friction savers / cambium savers Connectors Carabiners Clevis Felling levers Wedges Rigging blocks Wire rope Synthetic rope Tackle blocks Multi-sheave block Rope pullers Diametre tape Biltmore stick Calipers

Power Tools and Motorized Equipment

Power Tools	**Battery Operated**	**Motorized Equipment**
Chainsaws Brush saws (clearing saw) Gas powered drills Extenda/pole saws Gas Powered Tools	Drills Chainsaws Extenda/pole saws Leaf blowers/vacuum's	Aerial Devices – on and off road, rubber tired/tracked ATV/UTV Brush Chippers Stump Grinding Units Grinders Drones

Electrical Utility Safety Rules

Description	Sections
Sections related to Line Clearing	100-118, 122-124, 127-130, 134-135, 143, 145, 147 EUSR Supplemental Rules

Construction Regulation 213

Elevating Work Platforms Aerial devices (Not buckets attached to the boom of a crane)	143, 144, 145, 146, 147, 148, 149

Highway Traffic Act (R.S.O. 1990, CHAPTER H.8

Description	Sections
CVOR	16, 17, 18, 19, 20, 21, 22, 23
License requirements	32
Inspection of vehicle	82, 84,
Circle checks /Maintenance Logs	107
Dimension limits	108, 109, 110, 111,
Weight Limits	120, 121, 122, 123, 124, 125, 126, 127
Trip logs	190
Off road vehicles on highways	191.8

Pesticides Act (RSO, 1990)

Description	Sections
Licenses relating to exterminations	5
Prohibitions- pesticides used for cosmetic purposes	7

Off Road Vehicle Act R.S.O. 1990, c. O.4

Description	Sections
Application of Act	191.8 – ss. 2, 3, 4,

Level One Tree List

Conifers – Evergreen and Deciduous			
	Common Name	***Botanical Name***	**Family**
1.	Balsam Fir	*Abies balsamea*	Pinaceae
2.	White Fir	*Abies concolor*	Pinaceae
3.	Nootka False Cypress	*Cupressus nootkatensis*	Cupressaceae
4.	Eastern Red Cedar	*Juniperus virginiana*	Cupressaceae
5.	European Tamarack	*Larix decidua*	Pinaceae
6.	Native Tamarack	*Larix laricina*	Pinaceae
7.	Dawn Redwood	*Metasequoia glyptostroboides*	Cupressaceae
8.	Norway Spruce	*Picea abies*	Pinaceae
9.	White Spruce	*Picea glauca*	Pinaceae
10.	Black Spruce	*Picea mariana*	Pinaceae
11.	Serbian Spruce	*Picea omorika*	Pinaceae
12.	Colorado Spruce	*Picea pungens*	Pinaceae
13.	Jack Pine	*Pinus banksiana*	Pinaceae
14.	Mugo Pine	*Pinus mugo*	Pinaceae
15.	Austrian Pine	*Pinus nigra*	Pinaceae
16.	Red Pine	*Pinus resinosa*	Pinaceae
17.	Eastern White Pine	*Pinus strobus*	Pinaceae
18.	Scots Pine	*Pinus sylvestris*	Pinaceae
19.	Douglas Fir	*Pseudotsuga menziesii*	Pinaceae
20.	Yew	*Taxus spp.*	Taxaceae
21.	Eastern White Cedar	*Thuja occidentalis*	Cupressaceae
22.	Eastern Hemlock	*Tsuga canadensis*	Pinaceae
Deciduous – Opposite Arrangement			
	Common Name	*Botanical Name*	Family
23.	Amur Maple	*Acer ginnala*	Sapindaceae
24.	Manitoba Maple	*Acer negundo*	Sapindaceae
25.	Japanese Maple	*Acer palmatum*	Sapindaceae
26.	Striped Maple	*Acer pensylvanicum*	Sapindaceae
27.	Norway Maple	*Acer platanoides*	Sapindaceae
28.	Sycamore Maple	*Acer pseudoplatanus*	Sapindaceae
29.	Red Maple	*Acer rubrum*	Sapindaceae
30.	Silver Maple	*Acer saccharinum*	Sapindaceae
31.	Sugar Maple	*Acer saccharum*	Sapindaceae
32.	Mountain Maple	*Acer spicatum*	Sapindaceae
33.	Common Horsechestnut	*Aesculus hippocastanum*	Hippocastanaceae
34.	Northern Catalpa	*Catalpa speciosa*	Bignoniaceae
35.	Pagoda Dogwood	*Cornus alternifolia*	Cornaceae
36.	Dogwood	*Cornus spp.*	Cornaceae
37.	Witchhazel	*Hamamelis virginiana*	Hamamelidaceae
38.	White Ash	*Fraxinus americana*	Oleaceae

Conifers – Evergreen and Deciduous			
	Common Name	***Botanical Name***	**Family**
39.	European Ash	*Fraxinus excelsior*	Oleaceae
40.	Black Ash	*Fraxinus nigra*	Oleaceae
41.	Green Ash	*Fraxinus pennsylvanica*	Oleaceae
42.	Amur Cork Tree	*Phellodendron amurense*	Rutaceae
43.	Ivory Silk Tree Lilac	*Syringa reticulata 'Ivory Silk'*	Oleaceae
44.	Common lilac	*Syringa vulgaris*	Oleaceae
45.	Nannyberry	*Viburnum lentago*	Adoxaceae.
46.	High Bush Cranberry	*Viburnum trilobum*	Adoxaceae.
Deciduous – Alternate Arrangement			
47.	American Beech	*Fagus grandifolia*	Fagaceae
48.	European Beech	*Fagus sylvatica*	Fagaceae
49.	White Oak	*Quercus alba*	Fagaceae
50.	Bur Oak	*Quercus macrocarpa*	Fagaceae
51.	Pin Oak	*Quercus palustris*	Fagaceae
52.	Pyramidal English Oak	*Quercus robur 'Fastigiata'*	Fagaceae
53.	Red Oak	*Quercus rubra*	Fagaceae
54.	Bitternut hickory	*Carya cordiformis*	Juglandaceae
55.	Shagbark Hickory	*Carya ovata*	Juglandaceae
56.	Butternut	*Juglans cinerea*	Juglandaceae
57.	Black Walnut	*Juglans nigra*	Juglandaceae

Poisonous Plants

	Common Name	Botanical Name	Family
1.	Poison Wild Parsnip	*Conium maculatum*	Apiaceae
2.	Giant Hogweed	*Heracleum mantegazzianum*	Apiaceae
3.	Poison Ivy	*Toxicodendron radicans*	Anacardiaceae
4.	Poison Sumac	*Toxicodendron vernix*	Anacardiaceae
5.	Monkshood	*Aconitum ssp.*	Ranunculaceae

Level Two Tree List - Arborist and Utility Arborist

Deciduous – Alternate Arrangement			
	Common Name	Botanical Name	Family
1	Japanese Angelica Tree	*Aralia elata*	Areliaceae
2	Staghorn Sumac	*Rhus typhina*	Amacardiaceae
3	European Alder	*Alnus glutinosa*	Betulaceae
4	Yellow Birch	*Betula alleghaniensis*	Betulaceae
5	River birch	*Betula nigra*	Betulaceae
6	White Birch	*Betula papyrifera*	Betulaceae
7	European White Birch	*Betula pendula*	Betulaceae
8	Hornbeam, Blue Beech	*Carpinus caroliniana*	Betulaceae
9	Turkish Hazel	*Corylus colurna*	Betulaceae
10	Hophornbeam, Ironwood	*Ostrya virginiana*	Betulaceae
11	Honey Locust	*Gleditsia triacanthos*	Caesalpiniaceae
12	Kentucky Coffee Tree	*Gymnocladus dioicus*	Caesalpiniaceae
14	Russian Olive	*Elaeagnus angustifolia*	Elaeagnaceae
15	Black Locust	*Robinia pseudoacacia*	Fabaceae
16	Ginkgo, Maidenhair Tree	*Ginkgo biloba*	Ginkgoaceae
17	American Sweetgum	*Liquidamber styraciflua*	Hammamelidaceae
18	Eastern Redbud	*Cercis canadensis*	Leguminoceae
19	Tuliptree, Yellow Poplar	*Liriodendron tulipifera*	Magnoliaceae
20	White Mulberry	*Morus alba*	Moraceae
21	Red Mulberry	*Morus rubra*	Moraceae
22	London Plane Tree	*Platanus x acerifolia*	Platanaceae
23	Sycamore	*Platanus occidentalis*	Platanaceae
24	European Buckthorn	*Rhamnus cathartica*	Rhamnaceae
25	Downy Serviceberry	*Amelanchier arborea*	Rosaceae
26	Hawthorn	*Crataegus spp.*	Rosaceae
27	Apple, crabapple	*Malus spp.*	Rosaceae
28	Pin Cherry	*Prunus pensylvanica*	Roseceae
29	Black Cherry	*Prunus serotina*	Rosaceae
30	Choke Cherry	*Prunus virginiana*	Rosaceae
31	Chanticleer pear	*Pyrus calleryana 'Chanticleer'*	Rosaceae
32	American Mountain Ash	*Sorbus americana*	Rosaceae
33	European Mountain Ash	*Sorbus aucuparia*	Rosaceae
34	White Poplar	*Populus alba*	Salicaceae

35	Balsam Poplar	*Populus balsamifera*	Salicaceae
36	Carolina Poplar	*Populus x canadensis*	Salicaceae
37	Bigtooth Aspen	*Populus grandidentata*	Salicaceae
38	Lombardy Poplar	*Populus nigra 'Italica'*	Salicaceae
39	Trembling Aspen	*Populus tremuloides*	Salicaceae
40	Weeping Willow	*Salix alba 'Tristis'*	Salicaceae
41	Crack Willow	*Salix fragilis*	Salicaceae
42	Black Willow	*Salix nigra*	Salicaceae
43	Tree of Heaven	*Ailanthus altissima*	Simaroubaceae
44	American Basswood	*Tilia americana*	Tiliaceae
44	Littleleaf Linden	*Tilia cordata*	Tiliaceae
45	Common Hackberry	*Celtis occidentalis*	Ulmaceae
46	American Elm	*Ulmus americana*	Ulmaceae
47	Scots Elm	*Ulmus glabra*	Ulmaceae
48	English Elm	*Ulmus procera*	Ulmaceae
49	Siberian Elm	*Ulmus pumila*	Ulmaceae
50	Slippery Elm	*Ulmus rubra*	Ulmaceae
51	Magnolia	*Magnolia acuminata*	Magnoliaceae
52	Tupelo	*Nyssa sylvatica*	Nyssaceae

	Common Name	Scientific Name
1	Barberry	*Berberis spp.*
2	European Buckthorn	*Rhamnus cathartica*
3	Wild Carrot	*Daucus carota*
4	Coltsfoot	*Tussilago farfara*
5	Dodder	*Cuscuta* spp.
6	Goatsbeard	*Tragopogon* spp.
7	Poison Hemlock	*Conium maculatum*
8	Johnson Grass	*Sorghum halepense*
9	Knapweed	*Centaurea* spp.
10	*Dog-strangling Vine*	*Vincetoxicum spp.*
11	Poison Ivy	*Toxicodendron radicans*
12	Proso Millet	*Panicum miliaceum* L. (black-seeded biotype)
13	Ragweed	*Ambrosia* spp.
14	Yellow Rocket	*Barbarea* spp.
15	Sow Thistle	*Sonchus* spp.
16	Cypress Spurge	*Euphorbia cyparissias*
17	Leafy Spurge	*Euphorbia esula*
18	Bull Thistle	*Cirsium vulgare*
19	Canada Thistle	*Cirsium arvense*
20	Nodding Thistle	*Carduus* spp.
21	Russian Thistle	*Salsola pestifer*
22	Scotch Thistle	*Onopordum acanthium*
23	Tuberous Vetchling	*Lathyrus tuberosus*
24	Giant Hoqweed	*Heracleum mantegazzianum*

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This guide is a comprehensive revision of 'A Reference Guide for Developing Planting Details' published by the Landscape Ontario Horticultural Trades Association in 1994, revised in 2005 and June 2019. The most recent version is available on the Landscape Ontario website: https://horttrades.com/ontario-landscape-tree-planting-guide

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