ISA Board Certified Master Arborist®

EXAMINATION OUTLINE

About the Program

ISA Certification is a voluntary program that tests and certifies a professional's achievement of a standard level of knowledge and skill in the field of arboriculture. When a professional becomes an ISA Board Certified Master Arborist®, they should be recognized by their peers and the public as a tree care professional who has attained the highest level of certification offered by ISA. Current ISA Certified Arborists® may earn this credential by meeting additional education and/or experience eligibility criteria and passing a comprehensive exam that tests their knowledge and skills of the science, managerial and practical application of arboriculture in areas such as risk assessment, safety, tree preservation, pruning, diagnostics, among other subject and practice areas within the tree care profession as identified through periodic job task analyses.

Domains

Domains are the major responsibilities or duties that characterize the practice of arboriculture. The weight or percentages denote the amount of the exam that is devoted to each domain.

- **Science (37%)**
  - Tree Biology 9%
  - Soils 7%
  - Tree Identification and Selection 7%
  - Abiotic Disorders 7%
  - Biotic Disorders 7%

- **Practice (37%)**
  - Installation 4%
  - Soil Treatment and Irrigation 4%
  - Plant Health Care 6%
  - Pruning 7%
  - Supplemental Support and Lightning Protection Systems 2%
  - Climbing, Rigging, and Removal 5%
  - Tree Risk 7%
  - Plant Appraisal 2%

- **Management (26%)**
  - Safety 9%
  - Inventory and Management Plans 5%
  - Business Relations 5%
  - Trees and Construction 7%

Domain 1: Tree Biology – Science — Weight: 9%

Task 1: Explain and apply knowledge of tree anatomy, physiology, and biomechanics in the assessment and management of trees.

Knowledge of:

- Complex physiology and growth (e.g., meristems, hormones, resource allocation)
- Root system anatomy and functions
- Trunk, branch, twig, and leaf anatomy and functions
- Wood and bark anatomy and functions
- Photosynthesis, respiration, and translocation
- Water movement within the tree (i.e., root uptake, transpiration, and water transport structures)
- Nutrient needs and uptake (i.e., absorption versus adsorption)
- Role of mycorrhiza and nitrogen-fixing bacteria
- Compartmentalization of decay in trees (CODIT)
- Mechanical stress and response growth

Task 2: Apply knowledge of tree structure and biomechanics to make informed assessments and recommendations.

Knowledge of:

- Common tree growth patterns
- Branch attachment structures
- Types of roots and how they contribute to stability, and nutrient and water absorption
- Codominant stems
- Reaction wood
- Trunk flare (e.g., root flare, root collar), root plate

Task 3: Explain the role of water in tree health.

Knowledge of:

- Photosynthesis and light-dependent reactions
- Transpiration
- Transport
- Turgor pressure
- Osmosis
- Hydration, desiccation, and super cooling
- Plant age, condition, species, and impact of water or irrigation
- Drought tolerance and adaptation mechanisms

Skills in:

- Explaining how cavitations occur in the vascular system

Task 4: Identify tree needs and appropriate intervention practices, when needed, based on knowledge of tree growth and development.

Knowledge of:

- Vegetative growth
- Physiology (e.g., nutritional needs, immune system responses)
- Reproduction (i.e., sexual, asexual)
- Propagation (e.g., softwood cuttings, layering, grafting)
- Phenology (e.g., dormancy, flowering, bud break, senescence)
- Tree death (e.g., dying process, mortality/decline spiral, retrenchment)
- Environmental effects and responses (e.g., fall colors, halophytes, desert adaptations, pneumatophores)
- Ratios or formulas used to assess tree growth and health (e.g., root-shoot ratio, live wood-dead wood ratio, live crown ratio)

Skills in:

- Identifying primary versus secondary contributing factors in tree decline and mortality
- Determining feeder root health
- Evaluating pruning and other maintenance recommendations based on life stage and condition (e.g., pruning young versus mature trees, veteran tree management)

Domain 2: Soils – Science — Weight: 7%

Task 1: Perform soil assessments that include the soil's physical, chemical, and biological components, and its relationship in supporting tree development and growth.

Knowledge of:

- Industry-accepted standards related to soil management (e.g., ANSI A300 Tree Care Standards; ISA Best Management Practices - Soil Management for Urban Trees)
- Soil formation and horizons
- Physical characteristics of soil (e.g., texture, structure, bulk density)
- Chemical characteristics of soil (e.g., pH, buffering capacity, cation exchange capacity)
- Biological components of soil (e.g., mycorrhizae, rhizosphere, macroinvertebrates, organic matter, soil microbiome)
- Urban soils (i.e., disturbed and degraded soils found in urban landscapes, possibly containing altered and engineered soils)
- Methods for sampling soil
- Relationship between soil and root distribution

Skills in:

- Collecting soil samples
- Interpreting soil test results
- Analyzing soil characteristics (e.g., determining soil texture, drainage)

Task 2: Assess interactions between water and soil and how it affects tree growth and development, and recommend intervention options when needed.

Knowledge of:

- Types of water available in soil (e.g., gravitational, capillary)
- Water table (e.g., unsaturated zone, aquifer, perched water table)
- Water movement and drainage (e.g., surface, underground, storm water)
- Soil structure and water behavior in soil
- Relationship between drainage, available water, and soil characteristics
- Water budgets (i.e., rate of change of water stored in an area or soil surrounding trees and balanced by the quantity and rate at which water flows in and out of the same area)
- Supplemental water, irrigation and water harvesting systems (e.g., application, scheduling, recycled water)
- Local climatic conditions affecting availability and uptake of water from soil (e.g., humidity, temperature, average rainfall)

Skills in:

- Assessing drainage and water-holding capacity

Task 3: Distinguish between disturbed and undisturbed (i.e., native, natural) soils and how disturbed soils can be modified to mimic natural growing conditions.

Knowledge of:

- Fungal and/or bacterial ratio
- Importance of different biological groups in each system (e.g., decomposition, soil structure, nutrient cycling)
- Urban soils (e.g., imported, altered and engineered soils; types of disturbances and degradation of soils found in urban landscapes)

Skills in:

- Distinguishing between soil physical, chemical, and biological properties of forests and managed turf systems.

Domain 3: Tree Identification and Selection – Science — Weight: 7%

Task 1: Distinguish important physical structures used to identify tree species based on morphology.

Knowledge of:

- Root, trunk, and branch anatomy
- Twig anatomy (e.g., buds, nodes, internodes, leaf scars, lenticels)
- Leaf anatomy (e.g., blade, midrib, petiole)
- Leaf types, characteristics, and arrangements (e.g., leaf type and arrangement on branches/stems, apices, margins, bases, leaflet arrangement on compound leaves)
- Flower and inflorescence types
- Fruits, seeds, and seedpods
- Tree profiles (i.e., form, architecture), growth habits, and silhouettes
- Characteristics of tropical and desert trees (e.g., anatomical, morphological, and physiological adaptations)

Skills in:

- Recognizing notable features in key anatomical structures (e.g., roots, trunk, bark, leaves, buds, flowers, fruit) associated with tree classification
- Collecting tree samples that aid in tree identification
- Utilizing available tree identification tools and resources (e.g., dichotomous keys, field guides, software, apps, expert advice)

Task 2: Explain tree classification systems and appropriate nomenclature during tree identification and communication.

Knowledge of:

- Tree classification (e.g., angiosperms, gymnosperms, monocots, eudicots, deciduous, semi-deciduous, evergreens)
- Plant taxonomy

Skills in:

- Using and notating plant scientific names (i.e., binomial nomenclature) in report writing and communication

Task 3: Summarize species tolerances and ranges.

Knowledge of:

- Climate tolerance and hardiness (i.e., cold hardiness and heat tolerance)
- Tree species natural habitat and ecological distribution (e.g., upland versus bottomland plants and riparian species, required chilling hours, fire dependency to complete life cycle)
- Soil types and nutrient availability
- Physical, biological, and chemical characteristics of soil (e.g., salinity, pH tolerance)
- Extreme events (e.g., flooding, fire, wind)
- Pest susceptibility and tolerance

Skills in:

- Reading cold hardiness and heat tolerance charts
- Explaining how cold hardiness and heat tolerance changes with tree age (i.e., life stage) and biology
- Explaining the distribution of use and geographic range of different tree species

Task 4: Assess how tree identification impacts diagnosis and tree management.

Knowledge of:

- The relationship between accurate tree identification, tree species characteristics and needs, and problem diagnosis

Skills in:

- Using tree identification reference materials and tree identification systems
- Explaining how to identify and distinguish the biotic and abiotic factors that contribute to symptom development

Task 5: Assess if a selected and/or planted tree species is appropriate taking into consideration short- and long-term tree requirements, site requirements, and maintenance goals.

Knowledge of:

- Characteristics of tree species (e.g., growing needs, wildlife use, air quality and sustainability, benefit-cost ratio, invasiveness)
- Species-specific considerations and potential vulnerabilities (e.g., biotic factors, abiotic factors, climate resilience, and site characteristics)

Skills in:

- Collecting soil samples
- Analyzing soil physical characteristics (e.g., soil texture, density, penetrability, drainage, available rooting space)
- Assessing soil chemical and biological characteristics (e.g., soil pH, salinity, and nutrient availability, contaminants, soil organic matter and organisms)
- Assessing site characteristics (e.g., sun and wind exposure, water availability and drainage, soil volume)
- Assessing whether tree species will thrive at a given planting site
- Recommending tree species for the planting site to other parties (e.g., project managers, customers, engineers, general public)
- Communicating tree requirements and site considerations to other parties (e.g., project managers, customers, engineers, general public)
- Justifying recommendations based on tree requirements and site considerations to other parties (e.g., project managers, customers, engineers, general public)

Task 6: Select plants for a diverse and resilient landscape using knowledge of the interrelationships among plant species, and climate change.

Knowledge of:

- Ecological succession
- Climate change
- Interaction between native, non-native, and invasive species
- Wildlife interactions
- Allelopathy

Skills in:

- Recognizing tree species impacted by climate change and proposing changes to current species selection and recommendations

Domain 4: Abiotic Disorders – Science — Weight: 7%

Task 1: Identify and evaluate the effects of temperature stress and other meteorological events on plant health.

Knowledge of:

- Wind (e.g., prevailing wind, storms)
- High temperature and sun exposure, intensity, and duration on tree health (e.g., scald, scorch)
- Low temperature on tree health (e.g., low-temperatures injury, frost crack, late frost, early freeze)
- Temperature stress on containerized plants
- Lightning injury (e.g., direct impact, root and soil transfer, side flash)
- Extreme weather (e.g., heat waves, freezing, heavy downpours, tornadoes, tropical cyclones, floods)
- Precipitation (e.g., volume, type, intensity, patterns)
- Humidity and microclimates

Skills in:

- Identifying how climate change and extreme weather events impact tree growth, health, and structure

Task 2: Summarize the effects of water stress on plant health.

Knowledge of:

- Field capacity
- Permanent wilting point
- Saturation
- Reclaimed water
- Water quality
- Turf and tree issues with water management

Skills in:

- Recognizing stress associated with excess water (e.g., flooding)
- Recognizing stress associated with water deficiency (e.g., drought)

Task 3: Identify and evaluate soil properties (e.g., chemical, physical, biological) and other site conditions that affect plant performance.

Knowledge of:

- Physical conditions that impact root development and growth (e.g., compaction)
- Soil and root microbiome
- Soil biology and its impact on root growth and tree health
- Soil chemistry imbalances/issues (e.g., pH, nutrient deficiencies and toxicities, high salinity, soil contamination)
- Improper planting (e.g., poor drainage, excessive backfill, inadequate oxygen and water availability, organic matter over stem and bark tissue, cauterizing from auger)
- Impact of site history on soil properties

Skills in:

- Assessing chemical and biological soil conditions by smell
- Managing trees growing indoor and containerized environments (e.g., humidity, soil moisture, manufactured soils)

Task 4: Identify and evaluate mechanical injury, natural stress, and growth habit issues.

Knowledge of:

- Vehicles (e.g., tractors, cars, trucks)
- Equipment (e.g., trenchers, excavators, weed whips, mowers, rototillers)
- Vandalism (e.g., nails, wounds, graffiti, wires)
- Tree protection systems (e.g., ties, grates, staking)
- Other plants (e.g., constriction, light obstruction, weight)
- Root girdling, circling roots, and competition
- Included bark and codominance
- Lightning injury (e.g., direct impact, indirect impact, root – soil transfer)

Task 5: Diagnose and evaluate chemical stress and pollution injury.

Knowledge of:

- Chemical damage/injury (e.g., herbicides, miticides, insecticides, fungicides, antibiotics, heavy metals)
- Plant growth regulators (e.g., paclobutrazol at different concentrations [i.e., 8% versus 22.3%])
- Other substances (e.g., antidesiccants, horticultural oils, horticultural soaps, fertilizers, surfactants, spreaders, spreader-stickers, inert ingredients)
- Air pollution (e.g., gases, particulates, aerosols, phytotoxic chemicals, ozone, carbon monoxide, sulfur, vehicle exhaust)

Domain 5: Biotic Disorders – Science — Weight: 7%

Task 1: Differentiate between different types of biotic life cycles, disease cycles, and how they relate to plant injury and management.

Knowledge of:

- Diseases (e.g., disease cycles for different types of pathogens, viral diseases, fungal diseases, bacterial diseases, nematode diseases, and vectors)
- Disease triangle
- Pathogen disease cycle and life cycles
- Pest life cycles

Skills in:

- Identifying pest arthropods and their associated biocontrol agents (i.e., parasitoids, predators, antagonists, competitors)

Task 2: Identify symptoms and signs of pest arthropods, pathogens, diseases, and wildlife which cause damage to trees.

Knowledge of:

- Types of pest arthropods (e.g., insects, mites)
- Symptoms and signs associated with arthropod activity (e.g., stippling, rasping)
- Types of pathogens (e.g., fungi, bacteria, viruses, nematodes, higher parasitic plants, phytoplasmas)
- Symptoms and signs associated with disease (e.g., blight, canker, blotch)
- Symptoms of injury caused by wildlife

Task 3: Evaluate tree response(s) to different types of biotic injury.

Knowledge of:

- A tree's physiological response and defense against biotic injury (e.g., hypersensitive response (HR), tylose production, resin or gum exudation, essential oil production, cavitation, volatile organic compound (VOC) production)
- A tree's structural response and defense against biotic injury (e.g., cuticles, leaf hairs, corky layers, increased lignification, abscission zones, wound wood production, reaction wood)
- Compartmentalization of Decay in Trees (CODIT)
- Tree and pest interactions

Domain 6: Installation – Practice — Weight: 4%

Task 1: Create planting and transplanting plans according to industry-accepted standards, best practices, and project/site needs and specifications.

Knowledge of:

- Industry-accepted planting and transplanting standards (e.g., BSI/BS 8545 Trees – From nursery to independence in the landscape; ANSI A300 Tree Care Standards; ISA Best Management Practices – Tree Planting; Z60.1 American Nursery Stock Standard; BSI/BS 3936-1 Nursery stock – Part 1: Specification for trees and shrubs; CSLA Canadian Landscape Standard)
- How trees are propagated and grown by the nursery industry
- Factors that influence planting timing (e.g., season, stock type, water availability, temperature, sunlight availability, region)
- Proper placement of the tree
- Impact of soil amendments
- Backfilling
- Root ball interaction with planting hole and soil (e.g., impact of soil amendments, soil settlement, potential for root burn, desiccation, or drainage issues)
- Advantages and disadvantages of different types of nursery stock
- Specifications for transport and installation of large trees

Skills in:

- Assessing the quality and health of planting stock
- Inspecting the root system of the planting stock before purchasing
- Handling of planting stock
- Selecting appropriate sites for tree planting to ensure long-term survival and service
- Preparing the planting site (e.g., determining planting hole width and depth)
- Inspecting/excavating root balls to locate problematic root structures
- Pruning roots and shaving root balls to prevent girdling and/or circling roots
- Planting and transplanting trees according to industry-accepted standards and best practices
- Removing root ball package materials (e.g., wire baskets, burlap and twine/straps, wood crates, plastic containers)
- Backfilling and adding a soil and/or mulch berm to support tree establishment
- Transplanting large trees (e.g., viability, preparation, equipment, transport, installation, post-planting care and monitoring)

Task 2: Formulate plans for the care of newly planted trees to ensure survival, growth, and good structure.

Knowledge of:

- Characteristics of tree species (e.g., pest susceptibility, growth patterns, mature form)
- Cultural and environmental requirements associated with different tree species (e.g., sun and heat exposure; soil type, water, and drainage needs; available root space; pest susceptibility; nutrition)
- Trunk wrap and support systems (e.g., staking, guying, bracing)
- Root regeneration (i.e., annual feeder root growth and shedding cycles, average life span on feeder roots)
- How competing plants impact newly planted trees

Skills in:

- Determining watering requirements for establishment
- Selecting and applying mulch
- Installing support for newly planted trees when needed
- Pruning young trees for good structure
- Pruning and developing pruning recommendations (i.e., developing a pruning plan including pruning specifications)
- Recommending and/or discussing a plant health care plan
- Recognizing improper planting techniques
- Recommending mitigation options for improper planting techniques
- Recognizing tree species impacted by climate change and proposing changes to current species selection and recommendations
- Including and engaging local community partners and constituents to ensure plant survival and long-term maintenance (e.g., local communities, residents, students, NGOs)

Domain 7: Soil Treatment and Irrigation – Practice Weight: 4%

Task 1: Create holistic soil management plans that incorporate amendments and other intervention strategies, when needed, based on specific tree needs, and soil volume and structure.

Knowledge of:

- Tree nutritional and uptake requirements (i.e., macro- and micronutrient requirements)
- Industry-accepted standards and best practices (e.g., ANSI A300 Tree Care Standards; ISA Best Management Practices: "Soil Management for Urban Trees" and "Tree and Shrub Fertilization")
- Soil management, amendment, and enhancement strategies to support soil function and tree health
- Types of fertilizer (e.g., natural/synthetic, liquid/dry, soluble/controlled release) and soil nutrition strategies
- Fertilization application strategies, timing, and techniques (e.g., surface, subsurface, foliar, injection)
- Soil management and amendments (e.g., mulching, salt remediation, compost, biochar, inoculants)
- Soil volume and structure requirements for trees

Skills in:

- Recommending management and mitigation strategies to avoid fertilizer/chemical intervention
- Recommending and applying fertilizer on a need basis and according to applicable, industry-accepted standards
- Recommending soil management and development strategies to support tree growth and development in urban spaces (e.g., root paths, soil trenches, soil vaults, structural soils, structural cells, critical root zone)
- Identifying soil improvement and remediation strategies (e.g., mulching, aeration, vertical mulching, pH remediation, soil replacement and amendments, biochar)

Task 2: Evaluate whether existing or planned/planted trees have water needs that are or will be met and recommend mitigation strategies when needed.

Knowledge of:

- Water budgets
- Water harvesting (i.e., passive and active water harvesting systems)
- Irrigation systems (e.g., sprinkler, drip, reclaimed water)
- Low Impact Design (LID) practices and devices (e.g., curbless parking lot islands, permeable pavers, rain gardens, rain barrels, tree box filters)
- Irrigation and irrigation system management

Domain 8: Plant Health Care – Practice — Weight: 6%

Task 1: Diagnose plant disorders using field and clinical resources.

Knowledge of:

- Tree identification
- Site history and prior site/tree management practices
- Tree life stage and implications on tree vulnerability
- Difference between signs and symptoms
- Difference between biotic and abiotic disorders
- Key/common biotic stresses and disorders (e.g., insects, mites, nematodes, vectors, other animals, pathogens)
- Key/common abiotic stresses and disorders (e.g., extreme weather and climate, compaction, limited rooting space, nutrient deficiency, improper planting, mechanical damage, chemical damage, competition)
- Diseases (e.g., disease cycle, fungi infections, bacterial diseases, vectors)
- Field tree diagnostic tests (e.g., smelling the roots, looking for vascular streaking, identifying feeder root health, infrared thermography, resistance drilling, sensors, sonic tomography, soil and root scans)
- Lab tree diagnostic tests (e.g., ELISA, culturing, PCR)
- Lab procedures (e.g., culturing, light microscopy, moist chambers, isolation, baiting, basic dendrochronology)

Skills in:

- Using diagnostic instruments and tools (e.g., rubber mallet, shovel, pocketknife, draw knife, hand lens, penetrometers)
- Identifying emerging regional problems and trends in plant pests and disease recognition, monitoring, and reporting
- Identifying common causes of tree health disorders (e.g., pests, diseases, abiotic disorders)
- Collecting metadata
- Collecting field samples
- Interpreting results and analyzing data
- Generating diagnostic reports

Task 2: Apply plant health care (PHC) and integrated pest management (IPM) strategies.

Knowledge of:

- PHC principles (e.g., prevention, early detection, treatment)
- IPM principles (e.g., action and economic thresholds, monitoring, pest control/management tactics, record keeping)
- Site history and implications on feasibility of treatment and/or management options
- Stress factors (i.e., predisposing factors, primary factors)
- Compounding factors (i.e., inciting and contributing factors; secondary problems)

Skills in:

- Differentiating between plant health care and integrated pest management

Task 3: Conduct monitoring, inspection, and documentation of landscape problems.

Knowledge of:

- Monitoring processes (e.g., based on schedules, site, plants, disorders; growing degree days; plant developmental phase [i.e., plant phenology]; indicator plants)
- Data and details need to be collected and documented (e.g., date, host name, growing degree days, symptoms and signs, field tests completed, plant parts examined, tools used during inspection)

Skills in:

- Developing an IPM monitoring plan (e.g., different strategies [e.g., calendar, GDD, plant phenology, indicator plants], identify goals)
- Inspecting plant parts (i.e., leaves, fruits, flowers, canopy, branches, trunk, roots) for signs and symptoms
- Reporting findings

Task 4: Evaluate stress as a contributing factor to disease.

Knowledge of:

- Natural defenses of trees (e.g., primary and secondary immune system responses)
- Environmental stress (e.g., pollution, extreme weather events, climate change)
- Plant and pest interactions (e.g., herbivory, symbiosis, parasitism)

Skills in:

- Differentiating between acute and chronic stress
- Assessing trees for symptoms and signs of stress from biotic or abiotic sources

Task 5: Evaluate cultural, biological, mechanical, and chemical management options.

Knowledge of:

- Cultural management (e.g., sanitation, environmental modification)
- Biological management (e.g., organic treatments, beneficial organisms)
- Mechanical management (e.g., pruning, mastication)
- Chemical management (e.g., fungicide, bacteriostat, antibiotic)

Skills in:

- Determining the feasibility of different management and application options

Task 6: Develop, manage, and/or assess a plant health care (PHC) approach that takes integrated pest management (IPM) and the holistic needs of the client, landscape, and environment into consideration.

Knowledge of:

- PHC principles (e.g., prevention, early detection, exclusion and avoidance, new plant development, management and treatment)
- IPM principles (e.g., action and economic thresholds, monitoring, pest control tactics, documentation and record keeping)
- Industry and regional standards and laws associated with chemical control (i.e., chemically organic, inorganic, agriculturally organic) use, storage, proper waste management, and application
- Tree identification
- Tree diagnostics and treatment

Skills in:

- Developing a PHC management plan
- Implementing a PHC management plan
- Communicating findings and associated management plan and recommendations to key community partners and constituents (e.g., project managers, tree owners)
- Monitoring pest resurgence, treatment success, and follow-up care

Task 7: Explain regulatory practices.

Knowledge of:

- Quarantine
- Eradication
- Suppression
- Reporting

Domain 9: Pruning – Practice — Weight: 7%

Task 1: List and justify the main industry-accepted pruning systems, objectives, types of cuts, and general practices.

Knowledge of:

- Accepted industry standards for tree pruning (e.g., ANSI A300 Tree Care Standards – Clause 5: Pruning, Best Management Practices – Pruning, BSI/BS 3998 Tree Work - Recommendations)
- Pruning practices and considerations associated with optimal timing and quantity depending on species type, condition, and environmental factors
- Outcomes of tree pruning (e.g., benefits, consequences, cost, flowering, fruiting)
- Wound response
- Pruning objectives (e.g., structural development, risk mitigation, clearance, density reduction, restoration, size management)
- Pruning systems for flower or fruit production

Skills in:

- Assessing tree and site conditions that influence pruning decisions and short- versus long-term outcomes
- Communicating how pruning trees promotes good structure (e.g., reduce the likelihood of failure) while minimizing the impact on tree health to a lay audience
- Explaining the difference between unacceptable and acceptable pruning techniques to a lay audience

Task 2: Distinguish between commonly used, industry-accepted pruning tools and their use.

Knowledge of:

- Scissor-type pruning tools (e.g., pruning shears, loppers, shears, pole pruners)
- Pruning saws (i.e., hand saw, pole saw)
- Chain saws

Skills in:

- Cleaning, sanitizing, and maintaining pruning tools
- Selecting the appropriate pruning tool for a given scenario
- Safe handling of pruning tools according to industry-accepted practices

Task 3: Assess if tree pruning was conducted in a manner which minimizes the impact on tree health and promotes longevity while recognizing improper pruning practices.

Knowledge of:

- Anatomy, physiology, and characteristics of tree parts, branches, and branch unions/structures (e.g., branch collar, branch bark ridge, codominant stems, branch weight)
- Compartmentalization of decay in trees (CODIT)
- Pruning systems (e.g., natural, pollarding, espalier, for fruit production and harvesting)
- Improper pruning techniques (e.g., topping, stub cuts, lion-tailing, excessive pruning)
- Root pruning
- Utility pruning
- Types of pruning cuts (e.g., branch removal cut, reduction cut, heading cut, shearing cut, coronet cuts)
- Industry-accepted safety standards and requirements (e.g., ANSI Z133 Safety Requirements for Arboricultural Operations, local requirements, ISO 11681-2:2011/AMD 1:2017 Machinery for forestry — Portable chain-saw safety requirements and testing — Part 2: Chain-saws for tree service — Amendment 1)
- Disinfection of tools (e.g., use of alcohol-based disinfecting solutions)
- Consequences of improper cuts on tree health and structure

Skills in:

- Writing pruning objectives and specifications
- Performing pruning cuts (e.g., branch removal cut, reduction cut, heading cut, shearing cut)
- Determining where the pruning cut should be located according to branch union anatomy and industry-accepted best management practices
- Anticipating potential impacts of detrimental pruning practices to tree health and structure
- Predicting tree response to pruning cuts depending on tree species, age, wound size, timing, and overall tree health
- Sequencing cuts to facilitate ease of handling removed material and to minimize the potential for bark tearing beyond the point of branch attachment
- Explaining why certain pruning strategies, cuts, and wound dressings may be detrimental to tree health and longevity

Task 4: Create and justify pruning specifications based on accepted industry standards and best management practices.

Knowledge of:

- Accepted industry standards for tree pruning (e.g., ANSI A300 Tree Care Standards; ISA Best Management Practices – Tree Pruning, BSI/BS 3998 Tree Work - Recommendations)
- Veteran tree management practices and how pruning practices can support preservation while reducing risk (e.g., retrenchment pruning)
- Listing and comparing different pruning systems (e.g., natural, topiary, pollard, espalier, pleach, fruit production, bonsai)

Skills in:

- Listing and recommending different pruning objectives (e.g., improving structure, risk mitigation, clearance, sanitation and health, restoration, reducing density, size management, shrub rejuvenation, flower/fruit production, improving a view/aesthetics, managing wildlife habitat)

Domain 10: Supplemental Support and Lightning Protection Systems – Practice Weight: 2%

Task 1: Assess needs and make recommendations, when needed, for supplemental support systems using industry-accepted best management practices.

Knowledge of:

- Accepted industry standards for supplemental support and lightning protection installation (e.g., ANSI A300 Tree Care Standards; ISA Best Management Practices – "Tree Support Systems" and "Lightning Protection Systems", BSI/BS 3998 Tree Work - Recommendations)
- Cabling and bracing
- Guying
- Propping

Skills in:

- Prescribing, implementing, and monitoring (i.e., follow-up inspections) support systems

Task 2: Assess needs and make recommendations, when needed, for installation of lightning protection systems according to industry-accepted standards and best management practices.

Knowledge of:

- Tree rigging hardware (e.g., lowering devices, blocks, pulleys, double sheave pulleys)
- Tree rigging systems and techniques (e.g., tagline, butt tie/tip tie)
- Tree characteristics and strength in relation to anchor point and anticipated forces in use during rigging

Domain 11: Climbing, Rigging, and Removal – Practice Weight: 5%

Task 1: Explain critical climbing tasks necessary to safely perform tree work.

Knowledge of:

- Industry-accepted safety standards and requirements (e.g., ANSI Z133 Safety Requirements for Arboricultural Operations)
- Climbing ropes and rope access systems used in arboriculture
- Knots or rope tools which provide safe entry and activity in the tree
- Climbing techniques used for tie-in and ascent
- Procedures for a safe and controlled ascent, descent, and tree work while aloft

Skills in:

- Evaluating the tree to determine suitability for safe climbing operations

Task 2: Explain methods and techniques for tree rigging used in arboriculture.

Knowledge of:

- Tree rigging hardware (e.g., lowering devices, blocks, pulleys, double sheave pulleys)
- Tree rigging systems and techniques (e.g., tagline, butt tie/tip tie)
- Tree characteristics and strength in relation to anchor point and anticipated forces in use during rigging

Task 3: Developing a work plan for tree removal by considering the tree's size and shape, species attributes, and its health and structural condition as well as the layout of the work zone.

Knowledge of:

- Techniques for felling (e.g., assisted fell)
- Techniques for aerial dismantlement (e.g., free fall, cut and fall)
- Rigging techniques for tree removal (e.g., butt/tip tie, speedline, balancing)
- Techniques for estimating weight of tree parts
- Tree characteristics that impact tree removal
- Cutting techniques (e.g., directional notch, spear cut, drop cut, snap cut)

Skills in:

- Evaluating how situational factors (e.g., wood fiber strength, wind, lean, cone or seed weight) impact tree removal
- Developing a felling strategy considering surrounding conditions (e.g., terrain, built structures, lean, wind, natural direction of fall, targets, direction of safe drop zone) to aid the workflow
- Developing a felling escape route strategy
- Identifying the drop zone when removing sections from the canopy
- Identifying appropriate cutting technique(s) to guide tree parts into drop zone
- Identifying appropriate rigging technique(s) for guiding tree parts into the drop zone

Domain 12: Tree Risk – Practice — Weight: 7%

Task 1: Examine obligations, liability, and negligence.

Knowledge of:

- Duty of care
- Standard of care
- Breach of duty
- Purpose for performing a tree risk assessment

Skills in:

- Discussing the long- and short-term implications of conducting or not conducting a tree risk assessment (e.g., costs, liability)

Task 2: Determine which level of assessment is appropriate for a given scenario considering the objectives for the assessment and limitations of each level of assessment.

Knowledge of:

- Levels of tree risk assessment (i.e., limited visual, basic, advanced)
- Basic assessment tools
- Assessment of internal decay
- Root assessment
- Change of lean
- Advanced assessments and tools
- Terms and concepts pertaining to site assessment (e.g., site change, wind exposure, disturbance)
- Common indicators of previous failures on a site (e.g., stumps, logs)

Skills in:

- Defining scope of work
- Discussing how site changes, adjacent trees, and weather affect likelihood of failure
- Recommending advanced assessments (e.g., aerial inspection, assessment of internal decay, root assessment, load tests)
- Performing advanced assessments

Task 3: Evaluate potential targets.

Knowledge of:

- Terms and concepts pertaining to target assessment (e.g., target zone, occupancy rate, likelihood of impact)
- Target types (i.e., static, moveable, mobile)
- Factors that influence the likelihood of impact (e.g., occupancy rate, direction of fall, target protection)
- Factors that influence the consequences of failure (e.g., distance of fall, part size, target protection)
- Reasons for stratifying or prioritizing targets

Skills in:

- Considering trees as assets and the potential for damage or loss of those assets
- Discussing how target types and occupancy rates affect likelihood of impact
- Listing factors that may increase or decrease consequences of failure

Task 4: Assess the site.

Knowledge of:

- Terms and concepts pertaining to site assessment (e.g., history of failures, site change, wind exposure, disturbance)
- Site factors that influence the likelihood of tree failure (e.g., drainage patterns, new exposure, saturated soil, topography)
- Effects of wind exposure on tree or tree part failure
- Weather conditions that affect trees and site conditions (e.g., temperature, snow/ice, extreme weather events, climate change)
- Common indicators of previous failures on a site (e.g., stumps, logs)

Skills in:

- Identifying site features that pose a potential safety risk to the assessor
- Discussing how site changes, adjacent trees, and weather affect likelihood of failure

Task 5: Assess biological and mechanical tree factors that impact structural stability as part of the tree risk assessment process.

Knowledge of:

- Wood structure and how wood components function in tree stability (e.g., cellulose, lignin, vascular cambium)
- How tree maturity and lifespan can affect tree structure and health (e.g., retrenchment, compartmentalization)
- Common response growth adaptations and how they may affect likelihood of failure (e.g., reaction wood, flexure wood, woundwood)
- CODIT process and how it defends the tree against the progression of decay
- Types of wood decay (i.e., white rot, brown rot, soft rot)
- How decay affects the mechanical properties of wood based on its type and location
- Factors that influence the load and tree stability (e.g., branch length, bending moment, live crown ratio [LCR])
- Internal stresses of trees that are generated by loads (i.e., compression, tension, shear, torsion)
- Cross-sectional area formulas, including threshold guidelines and their limitations

Skills in:

- Listing definite and potential indicators of decay
- Describing how tools (e.g., mallet, probe, sonic tomography) are used to help detect and assess decay

Task 6: Perform a tree risk assessment within the scope of and as defined by the tree risk manager.

Knowledge of:

- Resources required to perform the assessment
- Biological and mechanical tree considerations that impact structural stability
- Safety related to tree risk assessment
- Methods for categorizing the likelihood-of-failure
- Methods for categorizing likelihood-of-impact ratings
- Methods for categorizing consequences-of-failure
- How multiple target/failure type risk can and should be assessed
- How to determine an overall risk rating

Skills in:

- Identifying, prioritizing, stratifying, assessing, and recording targets
- Assessing direction of fall and protection factors
- Assessing and recording occupancy rates
- Assessing and recording site factors that contribute to the likelihood of failure (e.g., topography, soil, common weather)
- Identifying and recording tree health and potential loads that can affect the likelihood of failure (e.g., vigor, wind exposure, crown density)
- Assessing and recording common tree defects and conditions that may impact structural stability (e.g., cracks, decay, unbalanced crown)
- Analyzing how features of the target affect likelihood of impact
- Analyzing how site conditions affect likelihood of failure and impact
- Analyzing how defects and loads affect the likelihood of failure
- Categorizing likelihood of failure for each condition of concern using information regarding tree and site data gathered
- Categorizing likelihood of impact for each target and condition of concern using target and tree information
- Determining the combined likelihood of failure and impact
- Categorizing the consequences of failure for each target and condition of concern
- Determining risk ratings for each target and condition of concern
- Developing an overall tree risk rating based on the highest risk rating for each target and condition of concern

Task 7: Assess and recommend mitigation options for identified risks based on findings from the assessment.

Knowledge of:

- Terms and concepts pertaining to tree risk mitigation (e.g., tree-based, target-based)
- Tree-based mitigation actions (e.g., pruning, structural support systems, removal)
- Target-based tree mitigation actions (e.g., relocation, rerouting traffic, restricting access)
- Long-term risk mitigation options for improving tree health or reducing growth rates (e.g., site modification, tree growth regulators [TGRs])
- How a tree risk manager's acceptable risk level impacts risk mitigation
- How to determine residual risk
- Prioritization of mitigation activities

Skills in:

- Developing mitigation options based on level of risk and conditions present
- Assessing the expected residual risk following mitigation actions
- Formulating timelines for performing risk mitigations

Task 8: Communicate with the tree risk manager regarding the assessment process, findings, and recommendations.

Knowledge of:

- Options for communicating risk of tree to a tree risk manager (e.g., written, verbal, photograph, video)
- Key components of written reports (e.g., scope of work, methodology used, options for mitigation, residual risk)
- Limitations of tree risk assessment (e.g., scope of work, time frame, extreme weather events)
- Considerations for determining an assessment interval
- Advantages and limitations of written and oral reports

Skills in:

- Communicating the outcomes of the tree risk assessment to the tree risk manager
- Determining the recommended assessment interval

Domain 13: Plant Appraisal – Practice — Weight: 2%

Task 1: Describe the core concepts involved in plant appraisal.

Knowledge of:

- Concepts related to price, cost, and value (e.g., depreciation, willingness to pay, highest and best use)
- Types of property (e.g., personal property, real estate)
- Implications of appraising many trees on a site/property on relative value
- Economic principles relevant to plant appraisal (e.g., substitution, anticipation, consistent use, conformity)
- Steps in an appraisal process (e.g., define the appraisal problem, data collection, reconciliation)
- Use of quantitative and qualitative data in plant appraisal
- Tree data used for plant appraisal (e.g., plant identification, plant placement, plant function)

Skills in:

- Discussing the long- and short-term implications of conducting or not conducting a tree risk assessment (e.g., costs, liability)

Task 2: Apply tree appraisal approaches, methods, and techniques.

Knowledge of:

- Cost approach (e.g., extrapolated cost, depreciated cost, Direct Cost Technique [DCT], Trunk Formula Technique [TFT], Cost Compounding Technique [CCT])
- Income approach (e.g., direct capitalization, discounted cash flow analysis)
- Sales comparison approach (e.g., hedonic regression analysis technique, pared sales analysis technique, extraction technique)

Task 3: Generate plant appraisal reports.

Knowledge of:

- Report types (i.e., appraisal analysis, restricted appraisal report)
- Contents of a plant appraisal report (e.g., use of the appraisal, scope of work, description of approach, result)

Skills in:

- Writing and reviewing reports

Domain 14: Safety – Management — Weight: 9%

Task 1: Explain and comply with industry-accepted safety standards, local laws, directives, and regulations for performing tree work and ensuring the safety of workers, climbers, and other persons near the work zone.

Knowledge of:

- Industry-accepted safety standards and requirements (e.g., ANSI Z133 Safety Requirements for Arboricultural Operations, BSI/BS3998 Tree work – Recommendations, ISO 11681-2:2022 Machinery for forestry — Portable chain-saw safety requirements and testing Part 2: Chain-saws for tree service)
- Fire safety (e.g., safe use of gas-powered and electric tools, fuel storage, emergency response protocols)
- Work-zone security, work planning, and communication best practices

Skills in:

- Referring to relevant laws and regulations from all levels of government
- Accessing and maintaining reference materials

Task 2: Develop safety protocols to mitigate risk present within the tree of interest, work site, or equipment being used.

Knowledge of:

- Signs and symptoms of trunk and/or root decay (e.g., crown dieback, fungal fruiting bodies, sloughing bark, termites, boring insects, carpenter ants)
- Mechanical or physical damage done to a tree and/or root system (e.g., trenching, broken tree parts, trunk damage, soil heaving)
- Species-related patterns of whole tree or tree part failure
- Local insects, animals, and plants that are potential hazards to workers (e.g., arboreal mammals, bees, ticks and Lyme disease, mosquitoes and dengue fever, snakes and other reptiles, poison ivy, poison oak)
- Visual tree inspection
- Common structural/mechanical defects in trees
- Ergonomics
- Fire safety (e.g., safe use of gas-powered and electric tools, fuel storage, emergency response protocols)
- Command and response communication system
- In-field communication systems (e.g., hand signals, two-way communication)
- Safety communication plans (e.g., hazard communications, safety data sheets [SDS], pesticide labels)

Skills in:

- Reviewing documentation regarding the work, creating a safe work plan, job briefing
- Visually identifying tree defects and conditions that could impact trees structural integrity and stability
- Assessing tree structure (i.e., shape, lean, cracks, splits, excessive weight)
- Visually inspecting the area immediately surrounding the tree
- Determining if the tree can withstand the forces to be applied during the work
- Managing traffic hazards
- Preparing the work zone
- Communicating hazards identified and seeking alternative measures and/or next steps with pertinent stakeholders
- Developing and communicating a job briefing
- Securing hazardous materials (e.g., fuel, chemicals) when not in use

Task 3: Comply with safety standards when working or managing work near electrical hazards.

Knowledge of:

- Industry-accepted safety standards and requirements (e.g., ANSI Z133 Safety Requirements for Arboricultural Operations, Best Management Practices - Utility Pruning of Trees)
- Common electrical systems and other services structures and hardware (e.g., pole/line hardware)
- Basic properties of electricity (e.g., voltage, conductance)
- Sources of electrical shock (i.e., direct and indirect contact)
- Minimum approach distance (MAD)

Skills in:

- Identifying what stage of electrical distribution is being carried by the line (e.g., transmission, primary distribution, secondary distribution)
- Identifying electrical hardware and line features (e.g., bare wires, insulated wires)
- Maintaining minimum approach distances and wearing industry-accepted personal protection equipment (e.g., hydro gloves, flame-resistant clothing)

Task 4: Choose tools and equipment that are used to safely conduct tree work.

Knowledge of:

- Scissor-type tools (e.g., pruning shears, loppers, shears, pole pruners)
- Pruning saws (i.e., hand saw, pole saw)
- Chain saws and applicable safety standards and best practices (e.g., ISO 11681-2:2011/AMD 1:2017)
- Chippers and stump grinders
- Aerial lifts (i.e., Mobile Elevating Work Platform [MEWP])
- Large equipment/vehicle (e.g., crane, loader trucks) applications and regulations

Skills in:

- Inspecting tools and equipment for suitability prior to usage
- Recognizing operational flaws
- Selecting the appropriate hand or mechanical tools to perform arboricultural work
- Using hand and mechanical tools in accordance with manufacturing specifications
- Coordinating arboriculture work with large equipment/vehicle operators

Task 5: Utilize and assess the use of appropriate personal protective equipment (PPE) to protect the health and safety of the arborist according to accepted-industry standards.

Knowledge of:

- Industry-accepted safety standards and requirements (e.g., ANSI Z133 Safety Requirements for Arboricultural Operations)
- Head protection systems (e.g., climbing helmets, hardhats)
- Headsets and communication systems (e.g., personal and team headsets and microphones)
- Eye protection systems (e.g., protective glasses, goggles, face shields)
- Hearing protection (e.g., earplugs, earmuffs)
- Leg protection (e.g., chainsaw protective chaps, chainsaw protective pants)
- Foot protection (e.g., working boots, adequate ankle support)
- Hand protection (e.g., cut resistant, flame resistant, and anti-vibration gloves)
- Industry-accepted tree climbing saddle/harness, connecting links, work positioning lanyard, friction management devices, and spurs/gaffs
- Other PPE according to local regulations

Skills in:

- Selecting appropriate PPE
- Inspecting PPE for usage
- Wearing and adjusting PPE
- Maintaining PPE
- Selecting tree climbing equipment that is appropriate for specifications of the project and meets regulations and industry-accepted standards for tree climbing

Task 6: Assume responsibility for the removal of trees using appropriate techniques to ensure accuracy and safety of the removal as well as processing of the tree parts.

Knowledge of:

- Techniques for felling (e.g., assisted fell)
- Techniques for aerial dismantlement (e.g., free fall, cut and fall)
- Chain saw safety features
- Cutting techniques (e.g., directional notch, spear cut, drop cut, snap cut)
- Tree removal safety hazards (e.g., barber chair, loss of directional control, lean, wind, power lines)
- Work positioning techniques to reduce repetitive strain injuries and minimize exposure to chain saw kickback

Skills in:

- Developing a felling strategy considering terrain, built structures, lean, wind, natural direction of fall, targets, and direction of safe drop zone to aid the workflow
- Developing a felling escape route strategy
- Selecting and recommending appropriate tools to achieve directional control (e.g., tagline, rigging rope and mechanical advantage, falling wedges)
- Work positioning to maximize comfort and control and minimize exposure to kickback while handling a chain saw

Task 7: Plan for and/or provide oversight during emergency situations involving physical harm or hazardous conditions that pose a safety risk to workers, climbers, and other persons near the work zone.

Knowledge of:

- Emergency action plan
- First aid
- CPR
- Aerial rescue

Skills in:

- Assessing environmental hazards
- Securing the emergency site/scene
- Communicating with emergency responders during an emergency
- Documenting and communicating with interested parties after the emergency
- Work positioning to maximize comfort and control and minimize exposure to kickback while handling a chain saw

Task 8: Promote the importance of safety training.

Knowledge of:

- Safety procedures and behaviors
- Relevant guidelines and standards for arboriculture work
- Importance of safety training (e.g., injury prevention, emergency preparedness, productivity)

Skills in:

- Communicating the benefits of safety training and procedures to coworkers, leadership, and other interested parties

Domain 15: Inventory and Management Plans – Management — Weight: 5%

Task 1: Plan, implement, analyze, and maintain tree inventories based on community resources and management needs.

Knowledge of:

- GIS and remote sensing technology
- Purpose of asset inventories
- Types of asset inventories (e.g., sample, partial, complete, periodic, continuous)
- Information that is gathered as part of asset inventories (e.g., location, species, diameter, height, condition, risk rating, maintenance, work prioritization)
- Methods of conducting a tree inventory

Skills in:

- Tree identification, assessment, and measurement
- Collecting, analyzing, and managing tree inventory data
- Collecting and maintaining canopy cover data and analysis
- Leading, training, supporting, coordinating, and managing participants taking part in the asset inventory (e.g., staff, volunteers)
- Overseeing the data management and updating of the tree inventory

Task 2: Develop and/or implement a community's urban forest management program.

Knowledge of:

- Climate change
- Urban ecology
- Forest ecology
- Remote sensing technologies
- Geographic information systems [GIS]
- The benefits of trees
- Program planning and development
- Standards of practice for arboriculture, urban and community forestry, and natural resource management
- Tree equity principles

Skills in:

- Explaining the benefits of trees to the community and other interested parties
- Managing a project
- Developing and implementing a planting plan
- Creating work schedules for crews, volunteers, and partners to enact the community forest management plan
- Reviewing and evaluating site plans and/or specifications by considering the wellbeing of the tree
- Setting goals and objectives for management plans
- Describing, understanding, and evaluating components of management plans

Task 3: Implement management plans.

Knowledge of:

- Resource assessment and analysis
- Program evaluation
- Program reporting (i.e., documentation)
- Methods for budgeting to create, maintain, and/or implement a diverse and resilient community forest
- Methods for budget forecasting at different time frames (e.g., monthly, quarterly, annually, multi-year)
- Monitoring and reporting
- Mechanisms for recording work

Skills in:

- Differentiating between planned and unplanned maintenance activities
- Reassessing management plans
- Monitoring programs and evaluating project outcomes to identify avenues for program improvement and adaptation
- Reporting program and project outcomes, challenges, and adaptations
- Developing budget proposals that illustrate and justify operational needs and expenditures to secure funding
- Monitoring changes and control costs in the operating budget (i.e., programmatic expenditures)
- Planning for and implementing storm response actions

Domain 16: Business Relations – Management — Weight: 5%

Task 1: Interpret and follow legal requirements.

Knowledge of:

- Property rights
- Resource protection
- Arboriculture case law
- Land use and urban planning
- Regulatory compliance and jurisdiction
- Public safety

Skills in:

- Interpreting applicable arboricultural case law

Task 2: Write management plans and conduct business operations according to accepted industry best practices, standards, project specifications, and client expectations.

Knowledge of:

- Client communication strategies
- Employee management (e.g., training, licensing)
- Measurement of success
- Market and client information gathering
- Insurance

Domain 17: Trees and Construction – Management — Weight: 7%

Task 1: Develop and implement tree protection plans for individual trees or population of trees on or near construction, development, or demolition sites.

Knowledge of:

- Accepted industry standards related to trees and construction (e.g., ANSI A300 Tree Care Standards; ISA Best Management Practices – Managing Trees During Site Development and Construction; BSI/BS 5837 – Trees in Relation to Design, Demolition and Construction)
- Site plans (i.e., two- or three-dimensional diagrams and renderings that can include existing and proposed buildings, structures, plants and landscaping features, roads, terrain, utilities and other features).
- Construction team structure and interdependencies
- Construction phases (i.e., planning, design, pre-construction, construction, post-construction)
- Tree Protection Zone (TPZ)
- Critical Root Zone (CRZ)
- Species-specific resilience/vulnerability to construction
- Methods for soil and root protection
- Roles of developers and contractors within a tree protection plan
- Tree protection measures (e.g., trunk/canopy protection, limiting ingress/egress, fences and signage)

Skills in:

- Interpreting a site plan
- Assessing each tree's contribution to the site and project and relation to other trees on the site or larger property
- Utilizing the site plan to aid in implementing the tree protection plan
- Recommending measures to protect trees from damage before and during construction
- Coordinating tree protection activities with developers/contractors
- Assessing the effectiveness of tree protection plans
- Consulting stakeholders
- Surveying trees and sites
- Assessing trees and landscape for preservation and conservation
- Identifying and marking protection zone(s)
- Assessing potential construction impacts

Task 2: Create a tree protection plan using best management practices to minimize impacts on trees.

Knowledge of:

- Construction practices and techniques
- Construction activity's impact on tree root systems (e.g., soil compaction, root severing, drainage changes and water stress, chemical pollution)
- Construction activity's impact on tree trunk and branches (e.g., wounding, scald, mechanical damage)
- Construction activity's impact on tree health and stability (e.g., destabilization, secondary pests/infection, cultural and environmental changes)
- Grading and drainage considerations
- Placement and design of structures
- Placement of access corridors, utility corridors, and machine corridors to preserve trees
- Pavement and sub-grade considerations
- Landscape design and plant selection
- Construction specifications and practices
- Timelines and schedules
- Temporary tree protection measures, materials, and location

Skills in:

- Predicting the impact of construction activities on tree health and stability

Task 3: Prescribe pre-construction treatments.

Knowledge of:

- Treatments to improve tree and landscape health
- Clearance for construction activities
- Physical tree and landscape protection measures

Task 4: Monitor tree protection and recommend treatments for trees that have been impacted during construction.

Knowledge of:

- Short- and long-term impact of construction to the longevity of a tree
- Conditions when tree removal and replacement is necessary

Skills in:

- Assessing risk related to construction injury to the tree
- Developing a treatment and mitigation plan
- Providing care to the tree to promote recovery (e.g., mulching, watering, soil/drainage remediation, pest/disease management)
- Recommending short- and long-term treatments to promote recovery