Ontario Landscape Standard

Please click on the links to access the appropriate .PDF file.

CHAPTER 1. General

1.1 Scope

1.1.1 This Guideline applies to work that has historically been termed 'exterior landscaping'. 'Landscaping' for this Guideline has been outlined as work described by, but not limited to, the following sections and subsections:

.1 Site Preparation

.2 Grading and Drainage

.3 Growing Medium

.4 Plants and Planting

.5 Mulching

.6 Landscaping Over Structures

.7 Turfgrass/Ground Covers
- .1 Sodding
- .2 Seeding
- .3 Hydroseeding

.8 Landscape Construction
- .1 Aggregate Bases
- .2 Interlocking Concrete Pavers
- .3 Stone

.9 Maintenance
- .1 Establishment
- .2 Existing

.10 Integrated Pest Management

.11 Irrigation

.12 Lighting

.13 Snow Removal and Ice Control

.14 Interiorscaping

1.1.2 This Guideline is also applicable to the areas of administration, design, planning and review that affect the above sections and subsections.

1.1.3 There are many other areas of work considered in the landscaping realm having their own associated guidelines. These may not be dealt with or addressed, in this edition of this Guideline but maybe dealt with in future editions or addenda.

1.2 Administration Recommendations

1.2.1 It is suggested that the provisions of this Landscape Guideline be formally adopted by municipalities, corporations, towns, cities and other agencies that have an interest in establishing and maintaining a measurable base guideline of quality for landscape work and practices. The following procedures are recommended for other agencies and Authorities for the administration and enforcement of this Guideline.

1.2.2 Use by Owner

.1 This Guideline does not stipulate or formulate contractual arrangements between parties. This Guideline can be used as a guide to outline the various responsibilities of each party involved in ensuring quality landscape work. This Guideline outlines some of the pertinent legislation (Appendix "B") which could comprise or pertain to the landscaping sector.

.2 Any contract between the Owner and Contractor should provide for completion of work equal to or better than that as set out in this Guideline. A contract and associated specifications should clearly document the responsibility for adherence to each provision of this Guideline.

.3 Those projects that require a building or electrical permit may be subject to inspection by a municipal authority. The inspector appointed by a municipality or other Authority will be acting in the interest of the Authority, not that of the Owner. It is therefore recommended that a suitably qualified person be appointed to administer the contract in the best interest of the Owner.

1.2.3 Recommended procedures by the Owner or Owner's representative include:

.1 Provision of Working Documents to Contractor

.1 Testing

.2 Conducting field reviews and issuing reports

.3 Resolving and documenting changes in the work throughout the applicable construction and maintenance practices

.4 Documentation of a guarantee and maintenance agreement between Owner and Contractor are recommended but not mandatory in this Guideline.

.2 In referring to the Landscape Guideline for a given contract, an Owner and their representative should review the following provisions and include them as a part of their contract with the Contractor:

.1 Site review

.2 Testing of all soil or growing medium intended for use on site

.3 Organic content

.4 Nutrient values

.5 Establish amendment requirements

.6 Construction procedures and equipment

.7 Approval procedures for plant material at nursery and on-site.

.8 Guarantee/Warranty

.9 Approval of plant layout.

.10 Acceptance
.1 Partial
.2 Full

.11 Scheduling

.12 Terms of take over, Sign-off procedures.

.13 Payment procedures

.14 Establishment maintenance procedures.

.15 Maintenance requirements.

.16 Provision for ensuring maintenance requirements are fulfilled, either by using a maintenance guide or by the use of a professional maintenance company/or individual.

1.2.4 Working Documents: The Authority should require that a copy of all the working documents be submitted to the Authority and approved in writing before the work begins. This should be coordinated with the obtaining of any building or other permit approval processes for each Authority.

1.2.5 Changes: The Authority should require that all changes in design, materials, or existing conditions from those shown in the approved Working Documents be reported immediately in writing to the Authority.

.1 The Working Documents should be revised to show all changes.

.2 All proposed changes in the field shall be submitted in writing to the Authority for approval.

.3 The Authority should also approve all changes in writing before the changes are administered on-site.

1.2.6 Alternate Materials:

.1 No substitutions shall be permitted which have not been approved in writing by the client or authorized representative. Sufficient descriptions, literature and/or samples must be furnished for any material submitted as "equal" substitute.

.2 Alternate materials must be and remain compatible with the original materials in performance, aesthetically, functionality and other important characteristics so as not to compromise the extent of the design or intent.

.3 The alternate material proposed must be installed according to specifications or manufacturer's recommendations.

1.2.7 Field Reviews:

.1 Field reviews by an independent reviewer or appropriate consultant are recommended to ensure fair interpretation of the contract and complete execution of the Work. Field review requirements may be simplified for small or simple projects or increased for larger or more complex projects. The following guidelines for field reviews are suited to projects of medium size and complexity.

.2 The Authority should identify and designate in writing a qualified Reviewer before the work is to begin.

.3 The minimum qualifications for Reviewers should include a combination of formal training and practical experience in landscape industry, such as:

.1 Graduate from a provincially accredited landscape horticulture program or equivalent training or experience.

.2 Current Trade Qualification (TQ) Certificate from the Ontario Ministry of Labour.

.3 Degree or Diploma in Horticulture.

.4 Degree in Landscape Architecture.

.5 Certified Horticultural Technician (CHT) as per the national program established by the Canadian Nursery Landscape Association.

.5 Minimum of three year's experience in landscape construction with an active member of Landscape Ontario Horticultural Trades Association.

.6 Certified ISA (International Society of Aboriculture) Arborist.

.4 The contract between Owner and Contractor should clearly define who is responsible for the testing, certification, and acceptance of products and materials.

.5 Unless the contract sets out other provisions, the Owner shall be responsible for all fees for testing and obtaining all certifications of compliance with this Guideline. The exception being that if any product or material does not meet with this Guideline, the costs incurred of all subsequent re-testing shall be born by the Contractor.

.6 The Reviewer shall have access to the work at all reasonable times for the above purposes.

.7 Field reviews and reports shall not interfere with the Contractor's control and management of the work and of their employees or sub-contractors.

.8 The Reviewer should take necessary actions to ensure compliance with this Guideline with all working documents and approved changes, including, but not limited to:

.1 Reviewing the work as often as deemed necessary to ensure work reasonably conforms to the approved plans and specifications.

.2 Examples of issues that require review are but not limited to:

.1 Specification documentation.

.2 Project Startup meeting.

.3 Existing Conditions Review. (Confirm site conditions, proposed layout, and approved substitutions or contract changes to date, prior to construction)

.4 Sub-grade Field Review

.5 Field Review for Acceptance.

.6 Plant Material Field Review

.7 Calling for samples and tests of materials and products as necessary

.8 Interpreting test results.

.9 Reporting to the Authority on the results of tests and field reviews.

.10 Generation of Deficiency report.

.11 Advising the Contractor, the authority and the Owner of any and all work found unacceptable according to the Guideline, specifications and terms of contract.

.12 Warranty Field Review (confirm completion of all necessary replacements and corrections at the conclusion of the guarantee period.)

1.2.8 Acceptance

.1 Generally, the work will be reviewed by the Owner's representative to determine compliance with the contract for the work and to accept the work on the Owner's behalf.

.2 It is anticipated that in the above case, as well as when there is no separate professional reviewer, the Reviewer appointed by the Authority will review to ensure compliance with this Guideline, and will determine acceptance independently in accordance with this Guideline, contract and specifications with the Authority's procedures.

1.2.9 Financial Security

.1 It is recommended that the Authority require: a letter of credit, a holdback or a security deposit (i.e. bond) for each project to ensure that the work is done:

.1 to this Guideline
.2 and as shown in the working documents
.3 and that maintenance is carried out at least to this Guideline.

1.2.10 Administration of Guarantee

.1 The Authority should ensure that the work is maintained during the guarantee/warranty period by conducting field reviews near the end of the guarantee/warranty period. An opportunity and sufficient time shall be provided to allow rectification of the deficiencies documented in the field review(s). If the deficiencies are not rectified, the Authority may exact a penalty, such as forfeiture of a bond if the maintenance, construction specifications and guarantee requirements have not been met.

.2 In order that the Contractor's one-year guarantee (or mutually agreed to date) be valid, the Owner must arrange to have the provisions of Chapter 17, Establishment Maintenance, carried out during the guarantee period by a suitably qualified person/contractor. (See Section 2.10).

.3 It is recommended that this maintenance be carried out by the Contractor who originally did the work, but maintenance may be carried out by persons/companies other than that Contractor, as long as all the requirements of Chapter 17 are met.

.4 Regardless of who performs the maintenance, that company should maintain a log book stating:

.1 When maintenance work is carried out
.2 What operations are carried out
.3 Noting any site conditions requiring attention
.4 Subsequent work performed (if any)

.5 In addition, maintenance personnel should report in writing the above information to the Owner's representative each time they are on-site.

1.2.11 Reports

.1 The Authority should have a procedure set up for:

.1 Receiving reports of changes
.2 Deficiencies or discrepancies found in the course of the work
.3 Reports of damage as required by this Guideline.

.2 The Contractor should be advised of procedures for reporting before work begins. Reports of changes, etc. shall be made promptly and in such a manner that the work schedule and administration procedures are not unduly hampered.

1.2.12 Insurance: Recommended minimum insurance requirements are included in this Guideline, however, it is important that the Authority and the Owner and other parties involved review these requirements with their insurance advisors and adjust them as required. The Owner should ensure that proof of insurance is provided (see Insurance-Chapter 2.18).

CHAPTER 2. General Requirements

2.1 Planning/Design

2.1.1 The planning, design and documentation of landscape work shall be such that all bylaws, legislation, applicable codes, regulations and guidelines, including this Guideline, can be met during the construction and maintenance phases and upon completion of the Work.

2.1.2 The potential for retaining existing site elements should be thoroughly examined during the initial site planning. Preliminary planning and subsequent design development should include, and be based on the findings of a review of the existing site elements by a qualified professional, such as a Registered Landscape Architect or an ISA Certified Arborist.

2.1.3 The Owner shall be responsible for ensuring that the provisions of 2.1.1 are met, and shall ensure that its consultants, agents and contractors for the Work, comply with all bylaws, legislation, applicable codes, regulations and guidelines, including this Guideline.

2.1.4 Professional consultants having expertise appropriate to the needs of the project should be engaged in the planning and designing of the work.

2.2 Working Documents

2.2.1 Existing conditions and new work shall be adequately and accurately described in a set of working documents and specifications to be provided to the Contractor and the Authority/Owner (see General, 1.2, Administration Recommendations).

2.2.2 Working documents shall include both drawings and specifications.

2.2.3 Specifications may be included as part of the drawings or may be bound separately.

2.2.4 Specifications shall be specific to the requirements of the project, stipulating products, execution by description or by reference to recognized guidelines, performance criteria and or classes of execution.

2.2.5 Specifications for the project should conform to or exceed this Guideline. (Listing of Specification Numbers, See Appendix “C”)

2.2.6 Landscape Construction Documents may be divided into separate drawings, varying upon the scope and degree of complexity of the project or owner, and should minimally contain or outline the following:

.1 Site Plan

.1 A scaled drawing that should include:

.1 Locations of legal property lines
.2 Any easements in force
.3 Center lines of adjacent streets
.4 Compass directions
.5 Fixed structures

.2 Landscape Plan

.1 The landscape plan maybe incorporated with the site plan or submitted as a separate document.

.2 A scaled drawing including all pertinent features of the site, both existing and proposed.

.3 Enlarged portions of the plan may be included for intricate or generalized construction details.

.4 Plant materials list or hardscape specifications maybe included as sidebars or boxes

.5 The location of the following features should be included:

.1 Existing vegetation/trees to be retained or removed
.2 Existing natural features
.3 Location and type of protection measures for the existing vegetation/trees to be retained
.4 Elevations at the base of trees to remain
.5 All proposed plant material, planting beds and sodded areas
.6 Plant list showing index, type, size, quantity, species, spacing, etc.
.7 Composition of all hard surfaced areas (driveway, walks)
.8 Height and materials of all fences, screen walls and retaining walls, etc.
.9 Storm water management landscape features
.10 Above and below ground utilities including lighting facilities
.11 Proposed grades, existing grades along the property lines
.12 Any other landscape element that contributes to site development.

.3 Demolition Plan

A scaled plan should include existing features or elements that are or/not part of the final design.

.4 Grading Plan

.1 Map of existing and proposed, changes to the contours.

.2 The grading plan is used to delineate elevations and drainage patterns. It also forms the basis of erosion, sediment and storm water control plans.

.3 A scaled drawing should include:

.1 Indications of benchmark location(s) and elevation(s)
.2 Elevations of permanent features on the property
.3 Alterations to existing grade
.4 Final grading plan
.5 Site boundaries
.6 Existing landform contours with a benchmark to indicate the base for the elevations shown
.7 Existing site features
.8 Proposed site structures
.9 Degree and length of finished slopes
.10 Drainage areas and patterns
.11 Erosion and siltation control plans
.12 Existing and proposed slopes/terraces or retaining walls
.13 Location of the slope, cut and fill areas and finished elevations

.5 Planting Plan

.1 The planting plan shows the location and types of proposed plant material in the project as noted in the plant schedule.

.2 The plant schedule should contain the following elements, if applicable:

.3 Common and botanical names including:

.1 Plant size
  .1 Height
  .2 Width
  .3 Caliper

.2 Condition
  .1 Container grown (specify size)
  .2 Balled and burlapped (field-dug)
  .3 Bare-root

.3 Form
  .1 Guideline (single trunk)
  .2 Multi-trunk
  .3 Foliated to ground
  .4 Grafted
  .5 Dwarf
  .6 Weeping
  .7 Columnar

.4 Quantities

.1 Total number of each plant type, container size and spacing

.5 Notes or special requirements

.6 Irrigation Plan

.1 An irrigation plan is a schematic representation of the equipment and materials necessary for the preservation or installation of the irrigation system.

.2 Depicting irrigation elements should use consistent symbols. The symbols should be listed and described in an irrigation schedule or legend as well as cross-referenced to the appropriate irrigation details.

.3 A properly designed irrigation plan should identify: location, specifications, quantities, installation information of the following irrigation components and features:

.1 Water source and point-of-connection
.2 Electrical power source
.3 Electric wires for timers and controls
.4 Meter (if required)
.5 Emergency shutoff valve(s)
.6 Irrigation electronic and manual controller
.7 Sprinkler heads, pipes, and valves
.8 System drain valves: Automatic and manual
.9 Back-Flow prevention device
.10 Pressure regulators
.11 Drip emitters
.12 Filters
.13 Moisture sensor

.7 Construction Details

.1 Generally, on larger jobs, construction details are included separately from the landscape plan.

.2 Construction details provide specific information for executing a landscape project.

.3 Examples of landscape elements that should be scaled and detailed:

.1 Pavements
.2 Planting pits
.3 Retaining walls
.4 Paver stones
.5 Irrigation system components
.6 Berms

.7 Swales
.8 Benches
.9 Fences

2.2.7 Specifications:

.1 Control the quality and direct the method of construction for a landscape project.

.2 Take precedence over all drawings and notes and are crucial to the execution of a project.

.3 Include technical data to support the information contained in the drawings.

2.2.8 Contract

.1 This Guideline sets out to define the fundamental components for a contract for the Landscaping industry. These fundamentals do not in any manner detail the specifics or legal vernaculars. These components should be considered when producing documentation. A lawyer should notarize the resultant document.

.2 The contract is the document that clearly states the expectations and responsibilities of the parties involved in a project and protect each party's rights concerning the project. The signed contract is a legally binding document.

.3 A contract may contain the following sections and information:

.1 Scope of work

.1 All work that is to be performed should be clearly defined. Include the overall scope plus individual aspects such as color, style, and manufacturer.

.2 Landscape plans are generally referred to in the scope of work.

.3 This section includes the Landscape construction plans or maintenance work, plus individual aspects such as planting, grading and site maintenance.

.2 Materials and Equipment

.1 All equipment that will be required to complete the work should be listed.

.2 All materials and products should be identified and specified by name, style, quality, quantity, weight, colour, manufacturer and any other pertinent facts.

.3 Schedule

.1 The duration of the project should be defined.

.2 The workers' daily working times and days of work should be clearly outlined.

.3 Provisions for any of the numerous factors that can delay a project, such as weather, change orders, and unforeseen circumstances should be addressed.

.4 Insurance

.1 The contract should state the contractor is required to show proof of all the requested insurance, particularly general liability and Workplace Safety Insurance Board coverage for their employees.

.2 The contract should also require the contractor to verify that any subcontractors have their own required valid insurance.

.5 Warranties

All written warranties provided with any equipment or materials used in the project should be noted.

.6 Payment

.1 For large projects a schedule of progress payments is recommended for inclusion in the contract. The schedule should include the date, amount of each payment or the completion stage of the project required before payment is made.

.2 A percentage of the final payment or contract price maybe withheld by the owner until all work is satisfactorily completed and sign off by both parties is completed.

.7 Arbitration

All contracts should contain clauses specifying what form of arbitration should be conducted and by whom if disputes cannot be resolved amicably between owner and contractor.

.8 Miscellaneous

.1 The following are some specific issues to consider addressing in the contract:

.1 Contractors' operating regulations and parameters pertaining to the site:

.2 Contractual points to verify before submittal to or from the owner or representative:

.3 The first paragraph should state the correct legal names of the parties involved. For individuals, include full first, middle initials and surname. If applicable, other identifying titles or degrees such as M.D. should be used.

.4 The issue of using legal terms for descriptive nouns should be considered. The use of the word "Contractor" should not be used unless that party is legally a contractor.

.5 If the document is to be a legally binding contract the word "Contract" should be in the title. A document entitled "Proposal" may not necessarily be a legal a contract even though signed by both parties.

.6 The word "biweekly" could be interpreted as one of two meanings: twice per week and every other week. The same is applicable to "bimonthly." The phrases "every other week" or "twice a week" should be used as appropriate.

.7 Numbers should be described using words and numerals, for example, ten (10).

.8 Consistent word usage should be adhered to. If the initial reference to the subject matter in the contract is "goods", that term should be used throughout the contract, not alternating between the terms "goods" and "items".

.9 Technical terms and concepts should be clearly explained. The owner or representative may not understand technical jargon.

.10 Every page of the contract should be initialized.

.11 Identify the parties and witnesses who sign by providing blank lines below their signature lines for their printed names and addresses.

2.3 Site Examination

2.3.1 The Contractor shall examine the site before starting work to verify that all surfaces are properly prepared and graded. No landscaping work shall be carried out in areas or over surfaces that are not properly prepared and graded. See General, 1.2, Administration Recommendations for procedures for reporting improperly prepared surfaces.

2.4 Supervision

2.4.1 The Contractor shall ensure competent supervision for the duration of the work on-site.

2.4.2 The person designated responsible for supervision shall ensure that the required guidelines of work, materials and safety are achieved.

2.4.3 This includes, but is not limited to, confirmation of safety codes, utility layout, records of changes, on-site coordination, scheduling and management.

2.4.4 Personnel supervising all landscape work should have post secondary education and have demonstrated expertise at supervising landscape projects.

2.5.5 The post- secondary education may include such disciplines as follow:

.1 Horticultural degree or diploma from a provincially accredited Institution

.2 Certification as a Landscape Technician under the CNLA's Certified Horticultural Technician (CHT) landscape certification program.

2.5 Scheduling

2.5.1 The Contractor shall schedule all operations to ensure optimum environmental protection, grading, planning, planting, construction, demolition, seeding or sodding operations as outlined in these Guidelines.

2.5.2 Scheduling shall be organized to ensure:

.1 A minimum duration of on-site storage of plants
.2 Minimum movement and compaction of growing medium
.3 Prompt mulching and watering operations
.4 Work schedule shall be coordinated with the Client's schedule and other on-site trades.
.5 Coordination and scheduling shall be such that no damage occurs to materials before or after installation.

2.6 Workmanship

2.6.1 The Contractor shall employ experienced personnel for all landscape and other work, and shall enforce good discipline, order and professionalism on the site at all times.

2.7 Changes

2.7.1 All substantial changes in design, materials or existing conditions shall be reported both verbally and in writing, and shall be resolved in a manner not detrimental to the quality or intent of the design or the work. (See General, 1.2, Administration Recommendations, Alternate Materials)

.1 The Owner may, without invalidating the contract, direct the company to make changes in the work.

.2 When a change causes an increase or decrease in the work, the contract price shall be increased or decreased by the application of unit prices to the adjusted proportion or in the absence of applicable unit prices, by an amount to be agreed upon between the Owner and Contractors.

2.8 Testing and Certification

2.8.1 All products and materials used in the work shall be subject to testing when the Reviewer determines that testing is required to ensure that this Guideline is met. This may include, but is not limited to, seed and seed mixes, fertilizers, manures, compost, plant tissues, mulches, growing medium and its components.

2.8.2 Testing shall be carried out by a provincially accredited, independent testing laboratory approved by the Reviewer, using commonly accepted testing methods, or methods set out in this Guideline. Payment for testing shall be made as stated in General, 2.2.8 Field Reviews, 1.2.7

2.8.3 The testing laboratory shall make the documentation of the test results available to the Contractor, the Reviewer and Owner and shall include either:

.1 certification that the tested samples meet the requirements of this Guideline or applicable federal and provincial legislation or specifications, or:

.2 recommendations for modifying the material or product to meet this Guideline or specification.

2.8.4 The Contractor shall carry out the recommended modifications and shall submit new samples for testing if required by the Reviewer.

2.8.5 The Contractor shall only be required to modify products or materials as necessary to meet this Guideline or specification, except when the contract with the Owner requires a different product or material of equal or better quality. (See General Requirements: Alternate Materials)

2.8.6 Samples:

.1 Samples of all materials shall be taken, handled and shipped (According to the methodological requirements of the testing labs) in such a manner that they are representative of the material or product sampled.

.2 Size of the sample is to be submitted shall be according to the amount requested by the analyzing laboratory.

.3 Samples shall be taken by the authority of the owner or designated representative and shall meet the following requirements:

.1 Commercial fertilizers: Properly labeled bags shall constitute assurance of conformity. Labels shall be accessible to the Reviewer on the job, and inventory taken at each delivery. (Where large installations are involved, it may be advisable to request the Canadian Fertilizer Quality Assurance Program from the Canadian Food Inspection Agency Fertilizer Section, to check the validity of the label. This can be done at minimum cost to the Owner or Contractor, and places full responsibility upon the supplier.)

.2 Seeds and seed mixtures: Certification by the seed supplier shall constitute assurance of conformity, except when the Reviewer has reason to verify such certification.

.3 Sand, rock, gravel and other aggregates.

.4 Soil and growing medium:

.1 Sub-samples shall be taken at the rate of one sub-sample per 1000 m^2 before stripping on–site soil, or one sub-sample per 200 m^3 for stockpiled on-site soil or for growing medium, to a minimum five sub-samples and maximum ten sub-samples.

.2 A well-mixed composite from 10 to 20 random locations should be sub-sampled to give the required sample size of soil to be sent to the laboratory for analysis. Greater amounts may be needed when physical properties of the soil (such as textural classification, available moisture, nematodes or pesticide residues) are to be measured.

.3 Sub-samples shall be taken using a spade or a 25-mm sampling tube. Sub-samples shall be thoroughly mixed to obtain a representative composite sample. Mix cores or slices together in a clean plastic container and take enough sub-sample to fill the special soil sample bag provided by the laboratory.

.4 Growing medium testing may be performed on samples provided to a testing laboratory by the supplier. The requirement for re-testing of material may be waived if the owner or designated reviewer is satisfied that the delivered material conforms to the soil test result provided.

.5 Organic growing medium components: when required, samples of peat moss, manure, compost and other proposed organic amendments shall be supplied.

.6 Tissue samples: When required to test nutrient levels or presence and identification of pathogens.

.4 A generic collection method of a tissue sample is as follows:

.1 Use a clean plastic container as the metal may contaminate the sample.

.2 Two hundred and fifty (250) grams of lightly packed material generally provides a sufficient amount to conduct an analysis.

.3 Should plant samples have soil, dust, fertilizer, or spray residues, wash as follows:

.1 In a plastic colander, immerse the sample in cool water containing a couple of drops of Phosphate free detergent, and gently agitate for 10 seconds.

.2 Remove the colander and quickly rinse the sample under flowing pure water.

.3 Either air-dry or blot-dry samples and ship as soon as possible in perforated bags to allow air movement and a degree of drying while in transit.

.4 Do not include roots with samples for nutrient analysis unless required.

.5 Samples in the quantities and conditions set out in the Guideline shall be provided to the Reviewer for testing within an agreed to reasonable time for the request for samples

.6 The Reviewer may, at their discretion, waive the requirement of testing for each particular project.

2.9 Field Reviews, Acceptance

2.9.1 Field review procedures are recommended in General, 1.2 Administration Recommendations.

2.9.2 The Reviewer shall have access to the work site at all reasonable times for ensuring compliance with this Guideline.

2.9.3 The Reviewer shall not interfere with the Contractor's control and management of the work and contractor's forces.

2.9.4 The Contractor shall give reasonable notice when the work will be ready for field reviews in order to avoid delays. Field reviews and reports shall be timed to avoid unnecessary delays in the execution of the work.

2.9.5 Conditions for Acceptance of work are shown in the General part of each section. Acceptance and turnover procedures are recommended in General, 1.2, Administration Recommendations.

2.10 Guarantee/Warranty Maintenance

2.10.1 The customary one-year guarantee period for the construction industry is accepted as the guideline for landscape work. The Contractor should guarantee all materials and workmanship for a period of one (1) full year from Acceptance, unless specified otherwise in the contract with the Owner.

2.10.2 If at any time prior to one year (or specified warranty/guarantee period) after the actual delivery date of the equipment (or completion of any work) any part of the equipment or work becomes defective or is deficient or fails due to defect in design, material or workmanship, or otherwise fails to meet the requirements of the contract, then the company, upon request, shall make good of every such defect, deficiency or failure without costs for parts and/or equipment both ways between company's factory or repair depot and the point of use.

2.10.3 The Landscape Guideline can never override provisions of a contract; however, there are usually three distinct periods to be considered:

.1 Before Acceptance and takeover by Owner: Generally, the Contractor maintains and is solely responsible for the plant material.

.2 During One-Year Warranty Period: In most cases the Owner is responsible for maintenance and protection, unless the contract includes one-year maintenance by contractor. Contractor is responsible to make good for faulty products or workmanship.

.3 After the Warranty Period: The Owner is responsible, unless otherwise stated.

2.10.4 Guarantee periods greater than one year for specific works, notably large trees, interlocking paving and decking should be clearly noted in the working documents or specifications.

2.10.5 The guarantee includes replacing all plants (and supplying required labour) that are determined by the Reviewer to be dead or failing at the end of the guarantee period. Plant replacements shall be made at the next appropriate season, and the conditions of the guarantee shall apply to all replacement plants for one full growing season, unless otherwise stated or the below conditions are applicable:

.1 The guarantee should not apply to plants or other products damaged after Acceptance by causes beyond the Contractor's control, such as inadequate maintenance by others, vandalism or abuse. The Contractor is considered responsible for the work until Acceptance. After Acceptance, unless otherwise specified, the Owner is considered responsible for the work, and for proper maintenance, repairs, and plant replacements.

.2 In circumstances where the landscape contractor responsible for the guarantee feels the owners are not providing adequate maintenance, the landscape contractor shall inform the owner(s) in writing of the limitations to the guarantee. In the case of a project subject to municipal development and/or building permits the notice of limitations to the guarantee must be copied to all participants in the original contract and contract review. A reasonable notice and period of time shall be allowed to permit the owners to respond.

.3 In circumstances where the owner feels the landscape contractor is not providing adequate maintenance, the owner should inform the landscape contractor in writing of the requirements of the guarantee. In the case of a project subject to municipal development and/or building permits, the notice of requirements of the guarantee must be copied to all participants in the original contract and contract review. A reasonable period of time and notice shall be allowed to permit the landscape contractor to respond.

2.10.6 The guarantee cannot be considered valid unless it can be proven that the requirements of Chapter 17 Establishment Maintenance has been carried out to a degree acceptable to the Reviewer. It is therefore recommended that the Owner should follow the recommendations of Chapter 16.

2.11 Environmental Protection

(See also Chapter 3 Site Preparation and Protection of Existing Elements)

2.11.1 Environmental damage shall be avoided by ensuring that all construction and maintenance operations are carefully planned and scheduled. Areas that are sensitive or that pose potential problems shall be noted and schedules and work methods shall be prepared and executed accordingly.

2.11.2 Soil stripping operations shall be carried out in such a manner as to avoid release of silt or sediment into any stream or storm drains or other water bodies. Retention ponds, siltation, screens, dikes etc. shall be installed where necessary to prevent rapid site runoff into watercourses, as directed by the civil engineer, professional consultant or environmental authority.

2.11.3 Stockpiled soil(s) shall not be placed in depressed areas where natural drainage or storm water could pond or erode these materials during inclement weather.

2.11.4 Temporary erosion control measures shall be provided to prevent excessive runoff on to adjacent sites or watercourses, or where a soil erosion hazard exists. Measures may include mulching, diking, ponding, and terracing or other means to reduce surface water flow.

2.11.5 Appropriate measures shall be taken to ensure that no spillage of fuels or toxic materials, occur, and where the use of such materials are required or produced, to ensure that adequate containment facilities and clean-up equipment are utilized.

2.11.6 No toxic materials, fertilizers, or fuels or waste materials shall be:

.1 Dumped into watercourses or any other water body either on or off the work site.

.2 Stored adjacent to watercourses or storm drains in a location where spillage/leakage could result in seepage into a watercourse or storm drains.

2.11.7 All toxic wastes and other construction material shall be disposed of in accordance with all municipal, provincial and federal regulations.

2.12 Site Protection

(See also Chapter 3 Site Preparation and Protection of Existing Elements)

2.12.1 All new and existing plants, site services, curbs, paving, structures, finishes and all other features shall be protected against damage during the work. Damage shall be reported (see 2.16) and shall be completely repaired to the satisfaction of the Authority or Owner.

2.12.2 Preservation of Existing Vegetation

.1 Existing trees and plants should be protected except where otherwise shown in the working documents or where designated for removal by appropriate qualified professionals.

.2 Appropriate means of protecting existing trees should be used throughout all phases of construction, including those stated in Chapter 3, Site Preparation and Protection of Existing Site Elements.

2.12.3 The onus shall be upon the contractor or bidder to investigate the project site and before the tendering of all the physical and working conditions and administrative practices.

2.12.4 The establishment of boundaries for tree protection zones, and all construction work near existing trees that are to be retained, should be directed and supervised by a professional consultant such as an ISA Certified Arborist.

2.13 Safety

2.13.1 The Contractor shall comply with all applicable laws, bylaws, rules, regulations and orders from any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss.

2.13.2 The Contractor shall erect and maintain, as required by existing conditions and progress of the work, all reasonable safeguards for safety and protection, as required by the Occupational Health and Safety Council, the Workplace Safety Insurance Board and other regulations and legislation.

2.13.3 The Contractor shall provide sufficient signage, barricades, safety guards, and/or warning devices for purposes of controlling traffic and pedestrians whenever necessary for the protection of persons and property.

2.13.4 The Company shall be responsible for being cognizant of all governing regulations including those established by the corporation, related to employee health and safety. The company shall keep all employees and subcontractors informed of such regulations.

2.14 Laws and Regulations

2.14.1 The Company shall comply with relevant federal, provincial and municipal statutes, regulations and by-laws pertaining to the work and its performance.

2.14.2 The Company shall be responsible for ensuring similar compliance by its suppliers and subcontractors.

2.14.3 The contract shall be governed by and interpreted in accordance with the laws of the province of Ontario.

2.15 Chemicals

.1 Handling and application of all chemicals, including but not limited to pesticides (which include but are not limited to: herbicides, fungicides and insecticides) shall be done solely by persons legally licensed or certified to do so under provincial and federal legislation.

.2 The use, handling and disposal of chemicals shall comply with all applicable legislation and regulations, including, but not limited to, the federal Pest Control Products Act, Fisheries Act, and Food and Drugs act; and the provincial Pesticide Control Act, Wildlife Act, Weed Control Act, Plant protection Act, and Waste Management Act, Transportation of Dangerous Goods Act, as well as any municipal or regional district legislation. (See Legislation Appendix "B").

2.16 Reporting Damage

2.16.1 Notification of danger or damage to property, persons, utilities, site features or the environment shall be given at once, verbally, and in writing, to the Authority/Owner and to the appropriate public agencies or authorities responsible for the safety and repair of such property such as public utilities or for the protection of the environment.

2.17 Water

2.17.1 Water used for the work shall be free from any organic or chemical contaminants detrimental to healthy plant growth.

2.17.2 Planning, scheduling and execution of the work shall include measures to ensure an adequate supply of water for landscape and construction usage purposes in adequate amounts and also at adequate pressures for satisfactory irrigation of all plant material.

2.17.3 Planning of the work shall include provision of a satisfactory means of water distribution. Such means include, but are not limited to, automatic sprinkler systems, drip systems, hose bibs and connection points, and truck-mounted water tanks.

2.18 Insurance

2.18.1 Unless other provisions are agreed to, the Contractor shall obtain, provide, maintain and pay for insurance. Evidence of insurance shall be signed by the insurer or his authorized representative and shall be submitted on the Certificate of Insurance for the duration of the work, providing at least the following coverage for the following categories of risk.

.1 Comprehensive General Liability Insurance protecting the Owner, the Contractor, subcontractors, and their respective agents or employees against damage arising from personal injury or death and against claims for property damage that may arise directly or indirectly out of the operations of the Contractor, their subcontractors or employees. The amount of coverage should be not less than $2,000,000 inclusive for any one occurrence. This policy shall contain a guideline cross liability clause, and shall cover all liability arising out of products, whether manufactured or supplied by the Contractor, contingent employer's liability and liability assumed by the Contractor under and applicable to the contract for the work.

.2 Automobile Insurance on the Contractor's owned and non-owned vehicles, protecting the Contractor and the Owner against damages arising from bodily injury or death and against claims for property damage arising out of their use on the operations of the Contractor and their subcontractors. The amount of coverage should be not less than $2,000,000 inclusive for any one occurrence.

.3 The Occupational Health and Safety Act

(Revised Statutes of Ontario 1980, Chapter 321 and Regulations for Construction Projects, Ontario Reg.213/91)

This Contract is deemed to be an individual "Project" for the purposes of the Occupational Health and Safety Act and the regulations made thereunder and the Contractor to whom the Contract is awarded unequivocally acknowledges that he is the "Contractor" as defined in the said "Act" of the "Project" and shall carry out all of the obligations and shall bear all of the responsibilities of the contractor as set out in the said Act and Regulations.

.4 A certificate from the Workplace Safety Insurance Board shall be provided prior to the commencement of work indicating all payments by the Contractor to the owner in conjunction with the subject contract have been made, and that the corporation will not be liable to the board for future payments in connection with the company's fulfillment of the contract.

CHAPTER 3.

Site Preparation and Protection of Existing Site Elements

3.1 General

3.1.1 Pertinent Guidelines and Legislation:

.1 The Canadian Wildlife Act
.2 The Canada Water Act
.3 Canadian Environmental Assessment Act
.4 Canadian Environmental Protection Act
.5 OPSS (Ontario Provincial Standard Specifications)
.6 Municipal Tree By-laws
.7 Ontario Ministry of Environment
.8 See Appendix “B” for other related Legislation.
.9 Qualified professionals for this section may include but are not limited to: Registered Landscape Architects, ISA Certified Arborists, Biologists, Ecologists and Civil Engineers.

3.1.2 Assessment of Existing Elements and Planning for Retention

.1 Site Elements are defined as the conditions or objects located on the tract of land under consideration. Site elements may include but are not limited to; trees, flora, water bodies, soil, fauna, historical or archaeological elements, geologic formations or other natural or man-made elements.

.2 Prior to any disturbances on the project site, all site elements that may be suitable for preservation should be reviewed by a qualified professional possessing pertinent knowledge of the characteristics of the subject element and the probable effects of the proposed development on those elements.

.3 Preservation of existing plants and trees, requires a thorough understanding of the biology and physiology of the subject species and the proposed construction techniques. Site elements should be considered in the context of their relationship and interaction with other elements located on the site. The feasibility of retention should be proposed and included as part of the contract documentation.

3.1.3 Site Planning for Tree Protection

.1 Trees shall not be destroyed or altered until final approval by the owner and that all applicable by-laws are adhered to, involving of the site design of buildings and utility systems.

.2 Areas such as flood plains, wetlands and steep slopes should be left in a natural condition or only partially developed as open space.

.3 Roadways should be located to cause minimal damage and disruption to valuable trees and stands.

.4 All excavations shall be kept away from the drip line of trees.

.5 Construction material storage areas and parking areas shall be noted and located on the site plan, such that they will not cause compaction to root systems or infringe on any protected areas.

3.1.4 Site Inventory and Identification/Survey

.1 All elements determined to be suitable for preservation or retention shall be surveyed before site planning is completed to determine the exact location, magnitude, elevation, and relationship to the existing features and proposed development.

.2 Surveys should accurately show the following information regarding existing vegetation:

.1 location
.2 elevation(s)
.3 drip line
.4 tree stumps and locations

.3 Tagging the elements with numbered tags is recommended to ensure preservation instructions are carried out and documentation will remain accurate throughout the entire development process.

3.1.5 Assessment

.1 All elements retained on site should be reviewed for hazard and safety by a qualified professional, specially trained in the assessment techniques required for the subject of inspection. The findings and recommendations of the inspection shall be submitted as part of the preliminary design work.

.2 Particular emphasis shall be placed on any element that has the potential to endanger people or property before, during, or after the development work takes place.

.3 An ISA Certified Arborist with specific training in hazard tree identification should complete tree Assessments. Trees that exhibit abnormal growth patterns or other characteristics that indicate instability shall be reviewed at the start of the project to verify whether they are safe to retain.
The followings items should be considered:

.1 tree species and characteristics
.2 tree species rating
.3 structural condition
.4 biological health

.5 growth habit
.6 trunk diameter (DBH) and crown radius
.7 crown reserve
.8 preservation priority
.9 recommended action to preserve/remove/relocate
.10 specific defects.

.4 All trees identified for preservation should have a condition and health rating recorded to ensure tree progress can be monitored through development.

3.1.6 Selecting Trees to be retained

.1 The proper development of a site requires the completion of a plan for tree preservation before clearing and construction begins. All trees should be identified by species, and located on a topographical map, either as stands or as individuals.

.2 Retention base on the following considerations:

.1 Present age and life expectancy, species
.2 Health and disease susceptibility.
.3 Structure.
.4 Aesthetic values.
.5 Importance to the landscape design
.6 Extent of preservation measures required
.7 Sentimental/historical considerations
.8 Potential adaptability to the new environment

3.1.7 Critical Zone or Root Protection Zone (RPZ)

.1 The critical zone or RPZ represents the area surrounding any element that must be preserved and protected to ensure the highest probability of survival of the element.

.2 The critical zone or RPZ of a tree and/or plant occurs where the majority of the root fibers are located. Generally, 95% of the roots of most trees will be contained in the upper 30-45 cm of soil.

.3 Since most trees develop root structure beyond the extension of the canopy radius, the drip line radius of a tree canopy should be used only as a guideline for the definition of the critical root zone.

.4 Actual tree/plant attributes should be assessed with care to determine the actual critical root zone for any particular site.

.5 The critical zone shall be kept moist by watering if required, throughout the entire work process.

3.1.8 Retention Documentation

.1 Site planning, design and construction documents shall be based on a scaled tree survey and inventory and the survey information shall become part of the construction documents.

.2 Individual trees, groups of trees or areas of vegetation to be protected shall be clearly identified on all plans, accurately surveyed and located.

.3 Site element specifications shall form part of the contract documents for all work on site, including:

.1 demolition
.2 tree preservation
.3 clearing and grubbing
.4 site preparation
.5 landscaping and maintenance

.4 Where the proposed development will result in changes to the finished grades within the critical zone around the site elements noted for preservation, site planning, design and construction documents should include instructions and specifications for protecting the site element.

.5 The project manager or qualified professional should provide verbal and written site instructions to the contractor and equipment operators so that all project personnel are informed of the exact location of site elements to be retained and any penalties associated with failure to comply with preservation requirements. Any special treatments or protection requirements shall be reviewed at a time prior to the start of the project.

3.1.9 Planning and Documentation for Moving Site Elements

.1 The practice of moving site elements such as large trees, has been very successful in the province of Ontario. This practice should be encouraged as an environmentally sound means of retaining existing elements when conditions permit.

.2 Recommendations regarding relocating existing elements shall be based on element and site specifics as determined by a qualified professional. Recommendations and the procedures to move existing elements should be provided in a written report that documents the existing conditions and possibility of successful preservation. In addition to 3.1.2.1, some factors to be considered are; element quality, size, species, health, value, historical significance, soil type, soil moisture, lead time for root pruning, method of relocation, distance of move, time of year and projected maintenance level after relocation.

.3 Relocation or transplanting of moveable elements shall be planned by a certified ISA arborist and scheduled to take place before any site development work takes place, or be scheduled to correspond with other site development work provided that the elements to be moved are protected as required by this Chapter both before and after relocation work.

3.1.10 Reporting Changes or Damage

The Owner shall be notified of any damage to any element or intrusion into any designated protection area. Any changes to the size or location of vegetation protection areas shall be approved in writing by the responsible professional and owner well in advance of the proposed changes.

3.2 Execution

3.2.1 Protection Areas

.1 The boundaries of protection areas for elements and their respective area of influence shall be established prior to any development activity on the site, inclusive of demolition. As a minimum guideline, the critical zone must be protected to ensure long term survival of the element and shall remain in place until all demolition and/or construction work is completed.

.2 The edge of the drip line of the plant with largest crown spread shall determine the location of the protection fencing except as otherwise specified or directed. In unusual or special circumstances such as leaning trees and columnar varieties, the drip line guideline shall not apply.

.3 Refer to table 3-1 for guideline protection distances for trees.

.4 Element boundary protection is dependent upon an accurate assessment of a number of factors:

.1 Species tolerance to disturbance
.2 plant age/longevity
.3 plant health and vigor
.4 root depth
.5 site exposure
.6 prevailing winds
.7 soil texture
.8 site hydrology, etc.

.5 Evaluation of the potential impact requires consideration of the changes that may occur on the site in association with the specific type of plant that will be affected.

.6 Protection requirements should be flexible to adjust for the species of each situation.

Table 3:1 Tree and Vegetation Protection Distance Guidelines

Trunk Diameter (cm)	Minimum Protection Area Around Tree Radius (m)
20	1.5
25	1.8
30	2.1
35	2.4
40	2.7
45	3.0
50	3.3
55	3.6
60	4.5
75	5.0
90	6.0
100	7.0
200	8.0

3.2.2 Fencing

.1 Physical protection barriers, silt fences, shade or erosion protection shall be erected at the edge of the protection boundaries before any work, including clearing and grubbing, occurs on the site.

.2 Physical protection barriers shall meet all applicable municipal by laws and regulatory requirements. The barriers should be erected on or outside the dripline or as in Table 3-1.

.3 Individual trees or areas of vegetation shall be fenced off by means of either:

.1 Chain link fence of at least 1.2 metres height mounted on steel or sturdy wooden posts. Fence posts should be placed no farther than 2.4 m apart.

.2 Solid plywood hoarding mounted securely on durable wooden posts. Fence posts should be placed no farther than 2.4 m apart.

.3 Board fencing consisting of 100 millimeter square posts set securely in the ground and extending at least 1 meter above the ground shall be placed as in Table 3-1, with a minimum of two horizontal boards fastened securely between posts. Fence posts should be placed no farther than 2.4 m apart.

.4 Plastic fencing, “international orange” plastic (polyethylene) web fencing securely mounted on a sturdy wooden framework that includes top and bottom rail. Fence posts should be placed no farther than 2.4 m apart, or;

.1 Plastic fencing, “international orange” plastic (polyethylene) web fencing secured to conventional metal “T” or “U” posts driven to a minimum depth of 450 millimeters on 2 meter minimum centers shall be installed at the limits of clearing. Plastic snow fencing should not be tied to metal stakes or rebar.

.4 Element protection areas and protective fences or devices shall be in place before any excavation or grading has commenced, and shall be kept in good repair for the duration of construction activities and maintained in good condition throughout all phases of development. Any damaged fencing shall be replaced immediately. Fencing and armoring devices shall only be removed after the completion of the project, following the final cleanup.

.5 Signage should be provided in association with protection fencing at regular intervals around areas designated for preservation. Signs should indicate the function of the fencing, i.e. “Tree Protection Area- Do Not Enter”.

.6 Armouring is a protective device used to protect the roots, trunk and tops of trees to be retained on the site. A tree trunk can be armored with burlap wrapping and 50 millimeter studs wired, not fastened in any way, vertically no more than 50 millimeters apart to a height of 1.5 meters encircling the trunk. The root zone within the drip line will still require protection.

3.2.3 Relocation of Existing Elements

.1 Relocation or transplanting of elements shall be performed, when conditions are favourable for a high success rate, prior to any site development work that takes place, or shall be scheduled to fit with other site development work, such that the elements to be moved are protected as required by this section both before and after relocation.

.1 Trees should be generally moved (transplanted) during their least active or dormant period. (see also Chapter 6, Plants and Planting, for more details on suitable transplant periods.)

.2 The soil should be irrigated to a depth of 50cm, two to three days prior to digging and the soil should not be saturated.

.2 The ball size for relocating trees varies depending on such factors as soil type, tree type and condition. Root ball size shall be as recommended by the qualified professional. As a minimum, root ball diameter should be ten (10) times the diameter of the trunk (or combined trunk diameters for multistemmed trees), measured 1.3 meter above the existing undisturbed grade at the base of the tree. See Chapter 6, Plants and Planting, Nursery Material, for Guideline sizes.

.3 Root pruning in advance of tree relocation is recommended. Root pruning should be scheduled for dormant season whenever possible. Roots should be pruned to the depth of the proposed excavation and 25 cm in from the line of excavation. Thorough watering after root pruning is recommended. Watering should be continued as required throughout the transplant establishment period. 3.2.3.2 Root pruning should be done by, or in consultation with an ISA Certified Arborist.

.1 In cases where any proposed excavation will affect existing trees to be retained, special attention should be given to proper root pruning and attention for the remaining root system.

.2 A tree should be root pruned only if less than 33 percent of the tree's roots, with no more than 25 percent from one side, can be performed.

.3 The accompanying Root Pruning Table 3-2, provides a guideline for root pruning different tree sizes.

Root Pruning Table 3-2.

TREE DIAMETER	DISTANCE FROM TRUNK	
(measured 1.3 m above ground)	Minimum	Preferred
15 cm	1.2 m	1.5 m
22.5 cm	1.2 m	1.5 m
30 cm	1.2 m	1.8 m
37.5 cm	1.5 m	2.1 m
45 cm	1.8 m	2.4 m
52.5 cm	2.1 m	2.7 m

.4 After excavation, cut roots cleanly with clean, sharp tools. Wounds may be dressed with a tree rooting hormone compound. Backfill the excavation as soon as possible and water the soil around roots to void air pockets.

3.2.4 Protection of Site Elements

.1 There shall be no storage or dumping of building materials, liquids, construction debris or equipment within the vegetation protection areas.

.2 There shall be no passage of machinery of any kind through or within the protection areas at any time, including, during the demolition and site preparation phases.

.3 There shall be no parking, fueling or servicing of vehicles or equipment within or close to protection areas at any time, including, during the demolition and site preparation.

.4 There shall be no stockpiling of soils, fill, sand, gravel or other excavated materials within the protection areas at any time, including, during the demolition and site preparation phases.

.5 There shall be no fires of any kind, within a distance equal to five times the drip line radius of the largest tree in the area of the protection area unless specified otherwise by a qualified professional.

.6 Except as otherwise approved at the planning stage in the field by qualified personnel, there shall be no trenching for drains or other services through or within protection areas. Where such trenching or tunneling is approved in advance, the work shall be done under the supervision of a Certified Arborist or qualified professional. See 3.2.5 Trenching and Tunneling.

.7 Water shall be protected from sources of infiltration of soil, silt, debris, ashes, fuel, chemicals or other foreign matter.

.8 There shall be no direct discharge of storm or site drainage waters through or into protection areas, watercourses or ravines. All such waters shall be filtered through acceptable sedimentation filtration systems before being discharged into the storm system. Drainage shall not be directed to a storm system unless it has been determined that; the direction and end location of the flow and that the system is capable of handling the water volume.

.9 There shall be no cutting of branches or roots of trees within the protection areas at any time without written approval from an ISA Certified Arborist.

.10 No attachments, fences, wires, other than those approved for tree systems support, shall be attached to any tree or element during construction.

.11 Trees being removed shall not be felled, pushed or pulled into other trees or elements to be retained. Equipment operators shall not clean any part of their equipment against the trunks of trees or elements to be retained.

3.2.5 Trenching and Tunneling

.1 Trenching shall be done as far away from the trunks of trees as possible, preferably outside the branches or crown spreads of trees.

.2 Trenches should avoid large roots or root concentrations.

.3 Tunneling generally causes less soil disturbance and physiological impact on the root system. The tunnel should not be located under the center of the tree.

.4 Roots shall not be left exposed to the air. They shall be covered with soil as soon as possible or protected and kept moistened with wet burlap or peat moss until the trench or tunnel can be filled.

.5 The ends of damaged and cut roots shall be cut off smoothly.

.6 Tunneling rather than trenching should be considered when installing underground utilities and drainage lines to minimize damage to existing trees. To ensure that the work is undertaken in the appropriate manner, a certified arborist or similarly qualified landscape professional should be consulted if the applicant decides to use this technique.

3.2.6 Clearing and Grubbing

.1 The OPSS 201 and OPSD Guideline for Clearing, Close Cut Clearing, Grubbing , Removal of Boulders and Mechanical Stump Cutting, should be considered in conjunction with this Chapter of the Guideline for protection of existing site elements shall be adhered to during clearing and grubbing operations unless specified otherwise.

.2 Unusual subsurface conditions encountered on site during clearing and grubbing shall be reported. See Administration Recommendations.

.3 All stumps and visible surface roots shall be removed except where removal might endanger the health or stability of a nearby tree or other preserved element that has been identified for retention.

.4 In natural areas, stumps and roots are considered to be an essential part of the natural system, adding stability, nutrients, protection and habitat components to the site. In such cases, a qualified professional shall determine if removal can be safely performed. If removal is not recommended, the stump can be retained as is, cut close to the ground or removed by means of a mechanical stump grinder. In some instances, it may be possible to cut away the roots without adversely affecting the health and stability of adjacent trees. Such a decision shall be made as a result of a review by a qualified ISA Certified Arborist and should be documented in a written report.

.5 Cleared and grubbed material shall be stockpiled in separate locations from growing medium stockpiles. Where noxious or undesirable weeds are found on site, grubbed materials shall not be used as a constituent of, or as a growing medium.

3.2.7 Tree Pruning

.1 Pruning shall conform to the ANSI A300, 2001 edition, “Pruning Standard,” and the ANSI Z133.1 2001, edition, Tree Care Operations. A qualified professional familiar with the tree species, site and preservation objectives should develop pruning specifications for all elements to be retained.

.2 Maintenance pruning shall be limited to crown cleaning to remove all dead, damage, weak and selective crossing branches.

.3 Hazard reduction pruning shall be completed under the direction of an ISA certified arborist. Tree conditions that are not correctable by reasonable pruning shall be brought to the attention of the owner.

3.2.8 Cabling and Bracing

.1 Mechanical support systems such as Cabling and Bracing are used to provide supplementary support to leaders and individual limbs to ensure a higher degree of safety and to prolong the tree retention opportunity. All applicable installations shall conform to the ANSI A300 Support System Guideline.

.2 A qualified professional familiar with tree growth habits, weights, and wood strength should provide all installation techniques for the objectives of the support system where required and recommendations in writing.

3.2.9 Insect and Disease Control

An Integrated Pest Management (IPM) and Plant Health Care (PHC) program should be developed to protect plants and trees which may have weakened or stressed due to disturbances during development of the site. Existing elements impacted to any degree by the development operation should be monitored closely for changes and appropriate instructions and maintenance procedures developed as required.

3.2.10 Watering

.1 Supplemental watering may be necessary during the absence of natural precipitation or when adequate water is not available. Elements that have undergone disturbance to the root system, under gone transplanting, planting or compaction of the soils in the immediate area should be provided with supplemental watering during periods of prolonged dry weather. Irrigation frequency and depth should be based on the needs of the materials.

.2 Irrigation design must recognize the need to avoid protection areas. Irrigation should be designed to spray water into the protection areas from outside the critical root zone.

3.2.11 Clean Up

Fences and barriers shall be removed, after the development operation has finished and the site debris is cleaned-up and moved offsite.

3.2.12 Maintenance

.1 Should damage to protected trees occur, the following maintenance guidelines should be followed:

.1 The ground shall be aerated if the soil has become compacted over the root zone of any tree.

.2 Damage to the crown, trunk, or root system of any tree retained on the site shall be repaired immediately.

.3 Damaged roots shall immediately be cleanly cut off inside the exposed or damaged area.

.4 All tree limbs damaged during construction or removed for any other reason shall be cut off above the branch collar at the preceding branch junction.

.5 An ISA Certified Arborist shall prescribe care and maintenance for all damage.

CHAPTER 4. Grading & Drainage

4.1 Grading

4.1.1 The purpose of grading is to provide a suitable topography for buildings and other land uses, to control surface runoff, to minimize soil erosion and sedimentation both during and after construction.

4.1.2 The preparation of the sub-grade shall, by rough grading and filling, provide a base that will allow the placing of growing medium to the specified depths (see section 4.3.9).

4.1.3 Applicable Guidelines and Legislation:

.1 Local building codes and guidelines.
.2 OPSS 206 November 2001, Grading Guidelines
.3 Surveyor's Act
.4 See Appendix "B" for other applicable legislation.

4.1.4 For the purposes of this guideline, grading refers to both the finish and sub-grade conditions.

4.1.5 Tolerances: The accuracy of the sub-grade elevations should be within the tolerances shown in Table 4-1, unless specified in the construction documents.

Table 4-1: Tolerances for Sub-grades Elevations in Soft Landscape Areas

Condition	Intended Growing Medium Depth		Tolerance	
Within 3m (10') from fixed elevations e.g. paving and curbs	0 - 150 mm	(0-6")	±25 mm	(1")
	151 - 300 mm	(6"-12")	±25 mm	(1")
	301 - 600 mm	(12"-24")	±50 mm	(2")
Other Areas	0 - 150 mm	(0-6")	±25 mm	(1")
	151 - 300 mm	(6"-12")	±50 mm	(2")
	301 - 600 mm	(12"-24")	±50 mm	(2")

4.1.6 Finished sub-grade surfaces shall be smooth, free of irregular surface changes, debris, foreign materials, properly compacted and provide for the growing medium depths as recommended in Table 5-4 Minimum Depths of Growing Medium. More specific tolerances for finish grading may be specified in the contract documents for projects such as sports fields, golf and lawn bowling greens.

4.2 Materials

4.2.1 Fill material shall be as specified.

4.2.2 Imported fill shall be clean, free from turf, ashes, debris, noxious weeds, roots, stones over 37 mm in diameter, harmful chemicals or other materials that are detrimental or toxic to plant growth or animal life, in part, in concentrations or leacheates.

4.2.3 Fill shall not be shipped, placed or graded in a wet, frozen or muddy state.

4.3 Execution

4.3.1 The grading plan shall be used to delineate elevations and drainage patterns. The plan shall also show site boundaries, existing landform contours with benchmarks to indicate base elevations, existing site features and proposed structures.

4.3.2 The sub-grade shall be prepared to a proctor density between 80% and 85%.

4.3.3 Soft and unstable areas below the sub-grade that cannot be compacted to a proctor density within the 80% minimum and 85% maximum range should be excavated and filled with a suitably approved fill material.

4.3.4 Fill materials shall be placed so as to achieve stability. This may require putting materials in lifts of 150 mm. Compact each layer of material in the proctor density range within the 80% minimum and 85% guideline.

4.3.5 Debris, roots, branches, visible and noxious weeds, stones, building material and other objectionable material that may interfere with proper growth and development of the planned finished landscaping shall be removed.

4.3.6 Areas showing excessive compaction shall be scarified to a minimum depth of 150 mm and re-compacted to a proctor density with a minimum of 80% to a maximum of 85%.

4.3.7 All sub-grade shall be scarified to a minimum depth of 150 mm immediately before placing growing medium.

4.3.8 Gradients should be within the ranges shown in Table 4-2, except where the Architect or Engineer has called for variation from this guideline based on site conditions.

4.3.9 Grade transitions of sub-grade shall be smooth, free from irregularities and be such that ponding will not occur on the sub-grade surface.

4.3.10 See Chapter 5. Topsoil for placement and finish grading of growing medium.

Table 4-2: MAXIMUM AND MINIMUM GRADIENTS IN LANDSCAPED AREAS

Location	Minimum	Maximum
Lawn and Grass	50:1 (2%)	3:1
Grass swales (without additional erosion protection)		
.1 Slope along invert	50:1 (2%)	10:1 (10%)
.2 Side Slopes	6:1	3:1
Unmown Areas	1%	2:1*
Planted Areas	2%	2:1* 3:1
Play Fields	2%	3%
Plazas and Open Spaces Hardscape	1%	2.5-5%
Turf Areas Drainage	1%	2.5%
Patios and Terraces	1.0%	2%
*Varies with soil types, cut vs. fill, other stabilizing procedures, and maintenance expectations		

4.4 Finish Grading

4.4.1 The growing medium shall be fine graded after placement. Positive surface drainage shall be maintained by means of filling irregularities. Finish grading shall conform to the grade elevations and contours shown on an approved landscaping plan shall be free of debris and other materials that would be detrimental to the sub-grade.

4.4.2 The finished surface shall be smooth and uniform, and be firm against deep footprinting, with a fine loose surface texture.

4.4.3 Finished grades should enable water to flow away from all buildings and structures (positive drainage). Positive surface drainage shall be assured, and there shall be no depressions, subsequent settling or irregularities in the finished grade.

4.4.4 Protection of the finished grade and correction of any irregularities caused by work operations over the finished grade shall be enforced.

4.4.5 Settling of any finish grade shall not be more than 30 mm from specified elevations, and if settling is greater, the contractor shall bring the grade to the specified elevations.

4.4.6 See Chapter 5. Topsoil for placement and finish grading of growing medium.

4.5 DRAINAGE

4.5.1 Drainage, General

.1 The basis for the design will generally be derived from the geotechnical design report. This report will include findings on subsurface conditions and recommendations.

.2 This section includes guidelines for materials and execution for work occurring within the "soft landscaped" areas within the site of the work.

.3 Appropriate measures and installations shall be made off-site and as part of the "hard" construction to ensure that the objectives of this section can be met.

.4 Surface and subsurface drainage systems shall be provided, as appropriate, for the interception, collection, conduction and disposal of storm runoff and subsurface water. The drainage systems shall be designed and sized to meet established criteria and deal efficiently with projected precipitation, infiltration and flow rates taking into consideration the potential for large fluctuations in groundwater levels.

.5 Drainage systems shall provide for the safety of the owner and the protection of dwellings, site elements and properties, from water damage, flooding and erosion. Where storm drainage is concentrated, permanently maintainable facilities, such as storm water retention ponds, shall be provided to prevent erosion and other damage or flooding on the site or on adjacent properties.

.6 Design and installation of drainage systems shall meet the requirements of the local Authority. The local authority or engineering consultant may require drainage requirements that vary from those described in this Guideline. In such cases, the more stringent requirements shall take precedent.

.7 Appropriate measures shall be taken to prevent siltation of existing drainage systems and watercourses during all phases of the work.

4.5.2 Applicable Legislation and Guidelines

.1 Local building codes and guidelines.
.2 Drainage Act
.3 All applicable OPSS (Ontario Provincial Standard Specifications) such as, but not limited to 1801,1802,1810,1820,1840,1853
.4 All applicable OPSD (Ontario Provincial Standard Drawings)
.5 CSA B182.1 and B137.3
.6 See Appendix "B" for other applicable legislation.
.7 The CGSB (Canadian General Standards Board) guidelines 41-GP-29 Ma for Corrugated Plastic Drainage Tubing.
.8 CSA B182.11-95 For non-pressure PVC pipes, latest installation requirements, "Recommended Practice for the installation of Thermo-Plastic Drain, Storm Sewer Pipe and Fittings", which includes:

.1 Trenches have been categorized as either: narrow unsupported, unsupported sub-ditch, wide trench, or supported trench.

.2 Specific bedding, haunching and initial backfill requirements have also been outlined.

.3 Bedding materials have been classified and references made to guideline soil types.

.4 Compaction techniques and resulting densities for the four allowable bedding materials classes are outlined.

.5 Pipe handling, storage, cutting and joining recommendations.

.6 Covers a full range of performance and acceptance testing following the installation of pipe and fittings.

.7 Rigid Plastic Pipe: PVC or polyethylene shall conform to CSA B 1800 Series.

.8 Underdrain outlets shall be constructed with PVC pipe meeting CSA B182.2, ASTM D 3034

4.6 Materials

4.6.1 Other Piping Materials: Flexible plastic, clay and concrete pipe shall be durable products and shall be used according to the manufacturer's recommendations.

4.6.2 Drain Rock: Drain rock shall be clean, round, inert, and durable, and have a maximum size of 19 mm and shall contain no material finer than 10 mm.

4.6.3 Filter Fabric / Soil Separator: A non-biodegradable blanket or other filtering membrane that will permit the flow of water but not fine soil particles shall be used to separate the growing medium from drain rock shall be designed or selected to meet the strength, durability and permeability requirements of each application.

.1 An envelope material is used to restrain the entry of base soil material, which surrounds the drain or pipe. The envelope should completely surround the drainpipe to prevent particle movement into the drain. The envelope material should be suitable for permanent underground use.

4.6.4 Drainage Structures: Silt traps, culverts, area drains, sumps, and catch basins shall be located and designed to achieve the intent set out in 4.5.1.

4.6.5 Rodent screen openings should not exceed 7 mm and should be fabricated from hardware cloth and a zinc coated steel wire fabric.

4.7 Execution

4.7.1 All buried cables, pipelines or other utilities should be located and marked by the appropriate public utility. Any necessary easements or permits shall be obtained in prior to the approval and execution of any work.

4.7.2 During construction, provisions shall be made for proper water management and drainage of the site during construction. This shall include silt traps, erosion control measures, temporary water collection ditches, as well as the proper maintenance of such throughout the construction period.

4.7.3 Secondary Drains: Pipe drains of adequate size from minor runoff concentration points shall be provided and connected to appropriate disposal lines when analysis and recommendations indicate that they are essential. Pipe drains are necessary when collected surface water flowing in swales may cause erosion of landscaped areas, or when water flow may interfere with pedestrian or vehicular traffic, or when the volume collected becomes excessive.

4.7.4 Drainage Swales and Gutters: Paved gutters shall have a minimum grade of 0.5%. Paved gutters and unpaved drainage swales shall have adequate depth and width to accommodate the maximum probable runoff without overflow. Swales and gutters shall be stabilized either vegetatively or paved as appropriate to minimize the erosion potential.

4.7.5 Open Channels: Channels shall be protected from erosion by appropriate vegetative covers, linings, or other treatments deemed as necessary by a civil engineer. Earthen channel side slopes shall be no steeper than 2:1, and shall be flatter to prevent erosion where analysis indicates the need. Open channels with linings shall have a maximum gradient on side slopes of 67% (1-1/2: 1), with adequate provisions for seep hole drainage. Channel side slopes steeper than 67% shall be designed with structural retaining walls with provisions for live and dead surcharge loads.

4.7.6 Drainage Pipe: Drainage pipe shall be installed with constant grades to drains, have smooth transitions and all appropriate fittings according to the manufacturer's recommendations. Cleanout risers shall be installed where junctions, grade or direction changes may cause siltation within the drain lines. Minimum slope for drainpipes shall be 0.5%.

.1 Laying Pipe

.1 The method of installation must be compatible with the drainage system design manufacturer's recommendations and the existing soil conditions.

.2 Pipes shall be laid to a true line and gradient on a firm bed, free from loose soil. Pipes are not to be laid on soil backfill or in slurry and are to be securely positioned to avoid displacement before backfilling the trench.

.3 The inside of the drainpipe shall be kept clean and free of debris during construction. All soil and debris should be removed before additional pipe is laid.

.4 Bedding: Drainage pipe shall be installed on bedding material to CSA B 182.11-95 and shall have the required cover of drain rock and filter fabric.

.2 Connections

.1 Lateral drainpipes should connect with main drainpipes so that their centre lines intersect.

.2 Manufactured fittings should be used for connections at the junction of two drains.

.3 Plastic tubing connections to rigid drain tile should be made with manufactured plastic adaptors.

.4 Plastic tubing connections to plastic tubing should be made with manufactured plastic fittings.

.5 Each connection should be made with a specially manufactured connector, except when silt traps and inspection holes are provided at the location.

.6 All fittings shall be compatible with the pipe used.

.7 Connections at sumps or catch basins shall be made and sealed according to the manufacturers specifications.

.3 Over Structures

.1 Drainage for landscaped areas over structures shall be designed to adequately drain the planting medium. See Landscaping Over Structures Chapter 13.

.2 Appropriate products, such as protection board, shall be used to adequately protect underlying and waterproofing layers when drainage material and soil are to be installed. Installation procedures for drain rock, etc. shall be such that this protection is maintained in its intended position.

.3 Where drain rock is installed under growing medium over structures, it should be to a minimum depth of 100 mm and the surface shall be completely covered with filter fabric. Filter fabric shall be overlapped a minimum of 150 mm and fitted tightly around drains and other features.

.4 Access shall be provided to all drains in planting areas for the purposes of inspection and cleaning by way of capped cleanout risers or other appropriate structures.

.4 Backfilling

.1 The minimum cover for main drains is 600 mm for pipe diameters under 150 mm. Minimum cover should be 750 mm for pipe diameters over 150 mm.

.2 Drain pipes should not be blinded by placing selected material not more than 40 mm in size, preferably top soil, around the pipe to a minimum depth of 75 mm above the top of the pipe.

.3 Plastic drain tubing should be blinded immediately after installation to hold it in position on planned grade and for protection of the tubing during backfilling.

.4 Trenches should be carefully backfilled with excavated material placed in such a way that the pipes are not damaged or displaced. Stones should not contact the drainpipe.

.5 The fill should be firm but not compacted so much as to prevent the passage of water to the pipe.

.6 Aggregates and backfilling shall be free frozen snow, ice, frozen materials, trash, brick, clay lumps, broken concrete, tree roots, sod, ashes, cinder, glass, plaster, vegetable matter and any other foreign matter.

.7 Foundry sand, crushed stone, or other material, which may be cementious or are not suitable for water percolation shall not be used.

Chapter 5. Topsoil Guidelines

5.1 General

5.1.1 As soil types vary widely in different parts of the province, and as general construction activities may have a serious impact on soil structure, modifications to the growing medium should be specified. Soil modifications should be carried out as necessitated by the site conditions, soil testing and the requirement of the specified plant types. Where ever possible, it is recommended that plant selection be made in accordance with on site soil conditions.

5.1.2 Related Guidelines and Legislation

.1 Topsoil Preservation Act
.2 Drainage Act
.3 Ministry of the Environment
.4 Canadian Fertilizer Act
.5 Canada Fertilizer Quality Assurance Program (CFQAP)
.6 OPSS Guidelines
.7 Agriculture Canada: Canadian System of Soil Classification
.8 See Appendix “B” for other applicable Legislation

5.2 Testing

5.2.1 In this Guideline, a range of measurable physical and chemical properties is set out as acceptable in a growing medium. Compliance with the Guideline is to be determined by testing for those properties. When imported or on-site soil is used, it shall be tested and modified as necessary by the admixture of other components and amendments to bring the properties within appropriate ranges, unless otherwise specified.

5.2.2 All testing shall only be performed by an OMAFRA accredited commercial lab.

5.2.3 When on-site soil is to be used, is should be tested before the landscape work is tendered. Where test results indicate that modifications are required to the on-site soil, these should be incorporated as part of the bid documents.

5.2.4 When imported growing medium is to be used, the bidding contractor shall have tested the proposed soil and include the required modifications in the price for work.

5.2.5 Failure to test and provide appropriate documentation of test results may be considered grounds for rejection of a proposed growing medium and removal of such material at the contractor’s expense.

5.2.6 When this Guideline is adopted as part of a contract, or when the contract requires testing of growing medium and its components, the contractor shall meet all requirements of this section, or the corresponding specifications of the contract. The contractor’s signature to the contract shall signify that the contractor has read and fully understands the requirements for growing medium and testing.

5.2.7 The contractor shall guarantee that the soil submitted for laboratory testing is a representative sample taken (according to the lab recommendations) from the soil that will be delivered to the site.

5.3 Soil Properties

5.3.1 The definition of the appropriate level, according to this Guideline, of soil properties is the responsibility of the design authority. If no specific reference is provided in the contract documents, Table 5-1 should be utilized. (see end of Chapter)

5.3.2 On-Site Topsoil

.1 The use of on-site native topsoil is encouraged, provided it meets the guideline for imported growing medium and can be modified to meet the requirements set out or specified for growing medium. Amended subsoil may be considered for use, provided that; additional organic matter is available, the soil structure is acceptable, and a soil test performed on the amended product prior to placement indicates the soil meets guideline growing requirements.

.2 Topsoil shall be defined as the existing “A” horizon containing organic matter. Soils lacking in organic matter and consequently not desired for growing medium will generally be recognized by a lighter colouration for the “B” horizon (“B” Horizon or subsoil, less weathered, low in organic matter) and “C” horizons of the soil profile (“C” Horizon or parent material, very little weathering, containing little to no organic matter).

.3 All areas of the site designated for hard landscaping, or the construction of structures, shall be stripped of all topsoil and organic matter. Topsoil shall be stripped to its full depth, exercising caution not to mix topsoil with subsoil.

.4 Topsoil stripping shall be commenced after the area has been cleared of all scrub, plants, weeds, grass, stumps, rock 75 mm and over, and other extraneous materials. All such resultant materials shall be removed from the site, unless provisions are made on site for the use of such fill.

.5 If testing shows it to be a suitable for growing medium, a sufficient quantity of stripped topsoil shall be stockpiled where shown, or in areas designated for stockpiling according to the site drawings, construction planning and scheduling.

.6 Topsoil shall not be moved, delivered or worked on while in a frozen, wet or muddy state or condition.

.7 Topsoil shall be fertile, friable, sandy loam topsoil. Admixture of subsoil and shall be free of stone over 30 mm in diameter, debris, organic or other deleterious contaminants and fragments larger than 75 mm in size, plants or their roots, sticks, noxious weeds, salts, soil sterilants or other materials detrimental to plant growth.

.8 Topsoil shall have acidity range of pH 6 –7.5 and contain not less than 5% OM.

.9 Topsoil shall have a salt conductivity of less than 2 millisiemens/cm.

.10 Soil Amendments shall be free from clay subsoil, sawdust, commercial wood products, stones, lumps, plants, roots, sticks, weed stolons and seeds, high seed content, chemical contaminants and other materials harmful to plant life.

.11 Topsoil and soil amendments should meet the mechanical analysis as set out in Table 5-2.

5.3.3 Imported Growing Medium

.1 Imported growing medium shall satisfy the requirements for texture and organic matter given in Table 5-2. Soils shall be virtually free from subsoil, wood including woody plant parts, weed or reproductive parts of weeds, plant pathogenic organisms, vegetation, debris, organic or other deleterious contaminants and fragments larger than 50 mm in size, stones over 30 mm, and foreign objects.

Table 5.2 Mechanical Analysis of Topsoil and Amendments

Topsoil	Passing Percent (%)	Retained Percent (%)
1 inch screen	100	0
0.5 inch screen	97-100	0-3
# 100 mesh sieve	40-60	40-60
Soil Amendment Mix		
2 inch screen	100	0
1 inch screen	90-100	0-10
0.5 inch screen	50-80	20-50
# 100 Mesh Sieve	0-15	85-100

5.3.4 Soilless Media

.1 Most container production uses specially prepared growing media called soilless media or potting soils, which are comprised of various organic and inorganic growing medium amendments.

.2 An effective soilless media should be:

.1 porous and well drained, and able to retain sufficient moisture to meet the water requirements of plants between watering;

.2 relatively low in soluble salts, with an adequate caution exchange capacity (CEC) to retain and supply the nutritional elements required for plant growth;

.3 Guidelines to permit the use of fertilization and irrigation programs for each successive crop;

.4 free from harmful soil pests; pathogenic organisms, chemical pollutants, nematodes and weed seeds;

.5 biologically and chemically stable following pasteurization.

5.3.5 Inorganic Components and Amendments

.1 Sand: Sand shall be clean, free from impurities, chemical or organic matter.

.2 Perlite: Perlite is a siliceous mineral of volcanic origin and is the most commonly used component in soilless growing medium. It is generally included to improve drainage and aeration. Perlite is chemically inert, pH Neutral, weed free, light-weight, sterile and odourless.

.3 Vermiculite: Vermiculite is mined as a mineral named hydrated laminar magnesium-aluminum-iron silicate. When heated the mineral exfoliates and expands producing a high water holding capacity and excellent exchange and buffering capacities.

5.3.6 Organic Components

.1 Sphagnum Peat Moss (Peat Moss) shall be of a horticultural grade. Peat Moss suitable for horticultural purposes should be medium to coarse shredded with a texture varying from porous to spongy fibrous, and substantially homogeneous with a pH value between 3.4 and 5.5.

.2 Commercially prepared compost shall be virtually free from all viable weed seeds, or other plant reproductive parts, pathogens, chemicals or toxic contaminates. Physical contaminants such as rock, plastic, metal or glass shall be less than 0.5%. Total carbon to nitrogen ratio in the resulting growing medium shall not exceed 30:1.

.3 Mushroom compost or animal manure and compost often provide excessive levels of water-soluble salts. The growing medium shall be leached, before planting with fresh water from irrigation or precipitation until an electrical conductivity of 2.0 mmhos/cm or less is achieved.

5.3.7 Fertilizers

.1 Fertilizers shall be commercial brands, having a guaranteed N-P-K analysis, meeting the requirements of the Canada Fertilizer Act and the CFQAP.

.2 All fertilizers shall be granular, pelletized or pill form, and shall be dry and free flowing, unless particularly specified.

.3 Fertilizer shall be packed in waterproof containers, clearly marked with the name of the manufacturer, weight and analysis.

.4 All fertilizer shall be stored in a weatherproof storage space and in such a manner that it will be protected from the elements and its effectiveness will not be diminished.

.5 The types, formulations, and rates of application for fertilizers shall be as recommended by the laboratory soil specialist, based on the test results of the growing medium, and as approved by the Consultant.

.6 Substitutions or variations in fertilizers and methods shall be made only upon pre-approval by the Consultant.

.7 Receipts and empty fertilizer bags should be retained until reviewed by the Consultant as verification that the required fertilizer has been applied.

5.3.8 Growing Medium

.1 Growing medium is any soil, soil substitute, or mixture whose chemical and physical properties fall within the ranges required by this Guideline for a particular Maintenance Level or as specified in the contract documents.

.2 Growing medium shall be virtually free of plants or their roots, sticks, clay, building materials, wood chips, chemical pollutants and other substances at level toxic to plants, and other foreign materials, that detract from the desirable physical and chemical properties for the purpose of landscaping.

.3 During the first year; death of plant material that can be attributed to plant pathogenic organisms or toxic materials in the growing medium may indicate that the growing medium did not meet this requirement at the time of installation, and may result in a requirement that the contractor be liable to remove and replace dead plants and replace faulty growing medium.

.4 Excessive growth of weeds (as determined by using the maintenance guide in Chapter 16 -Landscape Maintenance, for the level specified) in a growing medium during the first year may be an indication that unacceptable levels of weed seeds or weed parts were present in the growing medium at the time of installation. Such a determination may result in a requirement that the contractor be responsible to reduce the growth of weeds to acceptable levels.

.5 Restoration soils my contain roots and wood debris that is considered unacceptable for other uses. A qualified professional consultant should provide test results and amendment recommendations.

.6 Soil fertility, pH and organic matter may be modified either during mixing and screening, or after growing medium is placed, by the incorporation of lime and fertilizers.

.7 Salinity, the saturation extract conductivity shall not exceed 2.0 millisiemens/cm at 25 C. If it is higher, leaching with fresh water may be required to reduce salinity before planting. See Table 5-3.

Table 5-3 Salt Conductivity Levels

Conductivity "salt" reading millisiemens/cm	Rating	Plant Response
0-0.25	Low	Suitable for most plants if recommended amounts of fertilizer used.
0.26-0.45	Medium	Suitable for most plants if recommended amounts of fertilizer used.
0.46-0.70	High	May reduce emergence and cause slight to severe damage to salt sensitive plants.
0.71-1.00	Extremely High	May reduce emergence and cause slight to severe damage to most plants.
1.00	Extremely High	Expected to cause severe damage to most plants.

5.4 Execution

5.4.1 Growing Medium

.1 Commercial processing and thorough mixing of the growing medium components shall be done thoroughly by a mechanized screening process. No hand mixing shall occur. The resulting product shall be a homogeneous mixture having the required properties throughout. Product shall not be stored for excessive periods if a fertilizer component has been mixed.

.2 Contamination of components or finished media shall be avoided by keeping amendments in closed bags or by covering outdoor piles.

.3 Mixes containing a significant amount of peat moss shall not be permitted to dry out. The moisture content of the peat moss at the time of mixing shall be not less than 60% to 75%.

.4 Growing medium shall be moist (25% to 75% of field capacity) but not wet, muddy or frozen when placed.

.5 Growing medium in restoration sites must be handled in a way that is appropriate for the application, and should be detailed in the contract documents by a landscape architect or qualified professional.

5.4.2 Placing Growing Medium

.1 The sub-grade shall be examined before placing growing medium, and any variation from the requirements of Chapter 4 Grading and Drainage shall be reported and corrected before the placing of the growing medium.

.2 Any compacted sub-grade shall be scarified to a minimum depth of 75 to 100 mm immediately before placing growing medium.

.3 Growing medium shall be placed and spread over prepared sub-grade and shall be allowed to settle or compacted by light rolling such that it is firm against deep footprints. Growing medium shall not be compacted more than is necessary to meet this requirement.

.4 Finished surfaces shall conform to contour lines and elevations on the site or grading plan, by smoothing out variations, bumps, ridges, depressions.

.5 Table 5-4 sets out the minimum depths of growing medium after settlement for various types of sub-grade.

Table 5-4: Minimum Depths of Growing Medium

Application	Over Prepared Sub-grade, retaining the "A" horizon	Over rapidly draining soil	Over poorly draining soil
Lawns	100 mm	150 mm	225 mm
Ground Cover Areas	150 mm	300 mm	225 mm
Small Shrubs	300 mm	450 mm	225 mm
Large Shrubs	450 mm	600 mm	450 mm
Trees	600 mm	600 mm	600-900 mm

5.4.3 Fertilizers

.1 Fertilizers shall be added to bring growing media fertility within the ranges set out in this Guideline, as specified or as recommended by the laboratory soil specialist on the basis of testing of the growing medium.

.2 Fertilizers shall be uniformly spread over the growing medium with a suitable mechanical spreader.

.3 Fertilizers shall be raked into the growing medium to a minimum depth of 50 mm.

.4 Fertilizer requirements of restoration sites will depend on the site and the type of plant material used, and shall only be performed in consultation with a qualified professional.

Table 5-1: Properties of Growing Medium

	Canadian System of Soil Classification	Sand[1] to Loamy Sand[2]	Loamy Sand[2] to Sandy Loam[3]	Sandy Loam [3] to Loam[4]	
Texture	Diameter (mm)	[a]High Level Maintenance	[b]Medium Level Maintenance	[c]Low Level Maintenance	Planting Areas and Planters
Coarse Gravel	19-40	0-1%	0-1%	0-3%	0-1%
All Gravel	2-40	0-5%	0-5%	0-10%	0-5%
Sand	0.5-2	70-90%	43-90%	0-52%	50-70%
Silt	0.002-0.5	0-30%	0-30%	0-50%	10-25%
Clay	<0.002	0-10%	0-20%	0-27%	0-20%
Clay and Silt		Max 30%	Max 30%	Max 48%	Max 25%
Organic Matter		3-5%	3-5%	5-10%	15-20%
Acidity pH		6.0-7.0	6.0-7.0	6.0-7.0	4.5-6.5
Drainage		Percolation shall be such that no standing water is visible after 10 minutes of moderate to heavy rain or irrigation	Percolation shall be such that no standing water is visible after 10 minutes of moderate to heavy rain or irrigation	Grading shall be such that long term surface ponding is eliminated	

[1]SAND: soil material that contains 85% or more sand; the percentage of silt plus 1.5 X the percentage of clay does not exceed 15.

[2]LOAMY SAND: soil material that contains the upper limit 85% to 90% sand, and the percentage of silt plus 1.5 X the percentage of clay is not less than 15, at the lower limit it contains not less than 70% to 85% sand, and the percentage of silt plus twice the percentage of clay does not exceed 30.

[3]SANDY LOAM: soil material that contains either 20% or less clay, with a percentage of silt plus twice the percentage of clay that exceeds 30, and 52% or more sand; or less than 7% clay, less than 50% silt, and between 43% and 52% sand.

[4]LOAM: soil material that contains 7% to 27% clay, 28% to 50% silt, and less than 52% sand.

[a]Level High: Irrigation is recommended in all instances and is required in all areas. Plant selection, irrigation requirements and maintenance intensity should consistently respond to the exceptional nature of the growing medium.

[b]Level Medium: Automatic irrigation is recommended, however such areas can be adequately irrigated through consistent use of manual irrigation equipment. The growing media accommodate a wide selection of plants; create a balance between good drainage and water retention and are suited to moderate, normal maintenance practices.

[c]Level Low: Irrigation may be provided, but more frequently only temporary watering is done for establishment maintenance. These soils provide a quality growing medium, albeit with reduced percolation and resistance to compaction. These may be imported soils, however existing soils may meet these requirements or it may be possible to amended them to meet the requirements. Plant selections must respond to the limitations of the growing medium and to modest maintenance expectations. If soil must be imported to augment existing site topsoil,the imported growing medium should be similar to the on-site soil and should be thoroughly mixed with it, so as not to create a soil pan.

CHAPTER 6. Plants & Planting

6.1 General

6.1.1 Pertinent Guidelines and Legislation

.1 Canadian Nursery and Landscape Association; Canadian Standards for Nursery Stock 6th Edition, 1996
.2 ANSI Z-133-1; American Standards for Tree Care Operations
.3 ANSI A-300; Tree Pruning Guidelines
.4 For other applicable Legislation, see Appendix "B".

6.1.2 References

.1 Tree and Shrub Transplanting Manual, International Society of Arboriculture, latest edition.
.2 Canadian Certified Horticultural Technician Study Guide, CNLA, latest edition.
.3 Landscape Ontario Reference Guide for Developing Planting Details
.4 Landscape Ontario Plant Selection Guide

6.1.3 Transporting Plants to Site.

.1 Plant material should be protected during delivery to prevent damage to branches, root ball or desiccation of leaves.

.2 Adequate protection and spacing shall be placed between trees so that trunks are not scarred and branches are not broken.

.3 Plants should be transported in enclosed trucks or covered with a tarpaulin. For large material transported in open trucks, the trees shall be wrapped to prevent damage and windburn.

.4 Movement of container grown, ball and burlap (B&B) and wire-basketed (WB) plants should be restricted to closed van or well-covered trucks with mesh tarpaulin or similar material to protect the leaves or needles from windburn or desiccation.

.5 Dormant Plants

.1 Deciduous - Bare Roots (only in dormant period or condition): Adequate protection shall be given to preserve the moisture around the root system. For short transit periods of 4 hours or less, the maximum temperature in the truck should not exceed 20' Celsius. In all cases and at all times, roots should be protected from frost, wind and sun, by such means as a closed van or tarped vehicle with wet straw or other suitable moisture-holding materials placed over the roots. The temperature shall be maintained as uniformly as possible at all times by mechanical or other means.

.2 Evergreens: It is recommended that rootballs not be subjected to freezing temperatures below -5' Celsius for a period longer than 4 hours and that adequate protection from wind and sun be given to prevent desiccation.

.6 Non-Dormant Plants: Deciduous and Evergreens:

.1 Movement of container grown, ball and burlap (B&B) and wire-basketed (WB) plants should be restricted to closed van or well-covered truck with mesh tarpaulin or similar material to protect the leaves or needles from windburn or desiccation. If plants will be in transit for more than one day, they should be unloaded at interim points and stored away from direct sun for 24 hours at each interim point to avoid burning. When plants may be subject to wind during transportation and storage, tarpaulins and other protective measures may be supplemented by spraying the foliage with an anti-desiccant prior to shipping.

.7 Unloading Procedures

.1 BR (Bare Root): Roots should be covered and protected from frost, freezing, sun, and wind.

.2 Pots / Containers: Should be handled by the container only in order to reduce breakage of branches or leaves. Container plants shall not be held by the tops, stems or trunks.

.3 Ball & Burlap: Should be handled with caution to maintain the firmness of the root balls. Protect against damage to trunk, stems and branches.

.4 Trees should not be lifted by the trunk. Lift by attachments to the basket at three to four points or by supporting the tree below the rootball. Support the trunk as necessary to hold it in relation to the rootball to prevent tearing of roots or loosening of the rootball. Support shall be such that the cambium is not damaged.

.5 All plants should be unloaded and checked immediately upon arrival and watered if necessary. The supplier should be notified immediately both verbally and in writing of any plant damage.

.6 Plant material shall not be dropped, thrown or handled roughly.

6.1.4 Handling and Storage

.1 Plants and roots shall be kept in a moist condition at all times. All plants shall be well protected against damage, extreme temperatures, desiccation and theft.

.2 Protection Against Stem and Branch Damage

.1 During loading and unloading, transportation and planting, all trees should be protected against damage to the stems and branches. This is applicable especially to large wire-basketed trees.

.2 The bark should be protected against chafing from chains, cables, equipment or other trees by a wrapping of cardboard or burlap.

.3 Sudden or rapid movement of trees in transit or off-loading should be avoided. If the tree's branches are entangled with those of other trees, care shall be taken to separate them without damage to branches.

.4 If damage occurs, it shall be reported to the Authority immediately. If the Authority determines that the plant is acceptable despite the damage, proposed corrective measures should be carried out in accordance with arboricultural practices recognized by the International Society of Arboriculture. Shattered bark should be removed and broken branches should be pruned back to the appropriate branch collar or bud, with care to avoid the tearing of the stem bark.

.3 During Growing Season

.1 All plants in containers, B&B, or WB, if not planted immediately, shall be stored in a secure upright position. Care should be taken to provide enough space between plants so that light reaches all around to the bottom of the plant in order to avoid sunscald or burning when the plants are planted out.

.2 Balled & Burlapped Plants: Special attention should be given to the rootball, and unless weather is rainy or cool, rootballs shall be protected by heeling-in into material suitable (Examples: straw, peat moss, topsoil) to protect them from drying out. Plants intended to be planted in the open shall not be kept stored in a building or any area of low light intensity for a prolonged period. All plants shall be kept well watered and protected from extreme temperatures.

.3 Containerized plants shall be covered in a protective medium such as straw, peat moss or topsoil in extreme weather such as freezing or high dry heat. Plants shall not be kept stored in a building, truck, or any area of low light intensity for a prolonged period during the growing season.

.4 Plants shall not be taken directly from the greenhouse and planted in a drastically different environment. Such plants shall be acclimatized or "hardened off' against the environmental conditions of their final planting location.

.5 Preparation for the new environment should include an appropriate period of storage in an intermediate environment, managing fertilizer applications to avoid excessive growth, and a graduated watering program.

.4 During Dormant Period

.1 Plants shall be cared for according to the species requirements for winter protection, geographic location and hardiness.

6.1.5 Planting Time: Plant trees, shrubs and ground covers only during periods that are normal for such work as determined by local weather conditions, when seasonal conditions are likely to ensure successful adaptation of plants to their new location. See Table 6-6, Planting Calendar.

6.1.6 Recommended Conditions for Acceptance: Acceptance of plants and landscaped areas by the Authority and by the Owner for further maintenance should occur only when the following conditions have been achieved:

.1 Growing medium, fertility levels, depths and surface grading are as set out in Chapter 5 Topsoil. Chapter 4 Grading and Drainage.

.2 Plant quantities, species, sizes, quality and locations are as shown in the contract documents or as otherwise specified. All approved substitutions shall be noted. An approved list of substitutions shall be provided to the owner at the time of acceptance.

.3 All plants are installed properly, vertical and at the correct level relative to the finished grade.

.4 Trees are staked as required.

.5 All plants are healthy, disease and insect free.

.6 Pruning is completed where required.

.7 All pruning cuts shall be made with a sharp tool.

.8 All planted areas are free of visible weeds, and substantially free of underground weed parts, to the guideline as defined in Section 16. Landscape Maintenance.

.9 Mulch is in place as required.

.10 Unmulched areas are cultivated to leave a loose, friable, water-permeable surface.

6.2 Products

This section was established to illustrate the methods of measurement and grading for nursery stock as accepted in the Nursery Trade and Landscaping Industry; Landscape Architects and Landscape Contractors thereby improving the quality of Nursery products.

6.2.1 The Ontario Landscaping Guideline shall employ the 6th edition, 1996, of the Canadian Standards for Nursery Stock developed by Canadian Nursery Trades Association in conjunction with Landscape Ontario.

.1 The CNLA 6th edition, 1996, of the Canadian Standards for Nursery Stock developed by Canadian Nursery Trades Association in conjunction with Landscape Ontario, contains the following sections for reference when developing specifications for any work to be performed:

1.0 Container Grown Stock
2.0 Lining Out Stock
3.0 Evergreens and Deciduous Conifers
4.0 Broadleaf Evergreens
5.0 Deciduous Trees
6.0 Deciduous Shrubs
7.0 Roses
8.0 Vines
9.0 Ground Covers
10.0 Bamboo, Ornamental Grasses and Yuccas
11.0 Fruit Trees
12.0 Understock
13.0 Small Fruits
14.0 Christmas Trees

15.0 Perennials
16.0 Bulbs, Corms and Tubers

.2 The application of these Guidelines are conditional under the premise that nursery stock is not a manufactured article that can be produced or manufactured to a rigid set of parameters. Each plant is grown using a set of guidelines, but individual habitat and growth are greatly influenced by the climatic and environmental conditions specific to the growing locale.

.3 The use of the ANSI Z60.1-1996 American Standard for Nursery Stock has also been influential in the measurements and grading of certain facets of the Nursery Stock industry where there has not been a precedent established.

.4 All nursery stock shall be viable, free from pests, diseases and viruses, and undamaged.

.5 Root balls must be free from pernicious perennial weeds.

.6 Between digging and delivery, roots must not be exposed to drying winds, sun or frost.

.7 Measurements:

.1 All measurements are in the metric units. The unit centimeter (cm) shall define heights and spread. The unit millimeter (mm) shall be used to define all caliper measurements.

.2 Where necessary, conversion table 6-1 shall be used to establish equivalency between metric and imperial sizes.

6.2.2 Plants

.1 While it is recognized that the provisions of tender documents and contracts take precedence over these guidelines, it is recommended that non-specimen plants be specified according to the Canadian Nursery and Landscape Association's Canadian Standards for Nursery Stock.

.1 All nursery stock must have an adequate fibrous root system that has been developed by proper cultivating practices, particularly transplanting or root pruning. Pertinent facts, such as to when larger nursery stock was transplanted or root pruned, should be available to the buyer when possible.

.2 Rootball sizes should always be of sufficient width and depth to encompass enough of the fibrous and absorptive root system to enable full recovery of the plant.

.3 Rootballs must be solid, be tied tightly with burlap and rope and remain intact until transplanted.

.4 Rootballs larger than those recommended in Tables 6-2 and 6-3 are required when the plants have not been transplanted or root pruned for four or more years or when plants are dug out of season.

.2 The Canadian Nursery and Landscape Association Canadian Standards for Nursery Stock, Sixth Edition, 1996 includes:

.1 common container sizes
.2 digging parameters
.3 rootball diameters, depths, weights
.4 recommended container sizes by plant type
.5 height relationship to caliper by type.

.3 Rootball Guidelines

.1 Rootballs over 60 cm are to be secured with either daisy baskets or wire baskets or drum tied with twine or rope. Tying material and burlap shall not be wrapped around the trunk or collar of the tree.

.2 Rootballs less than 60 cm below this size are to be secured with either poly twine or treated sisal with a maximum of 10 cm between wraps and have a lateral line around the centre of the ball at right angles to the regular ties. Tying material and burlap shall not be wrapped around the trunk or collar of the tree.

.3 Tables 6-2 and 6-3 show minimum sizes for root balls for coniferous and deciduous trees.

.4 New products for securing rootballs arrive to the market each year, such as wire mesh. All methods of treating rootballs must follow the guidelines provided, even if not specifically mentioned.

.4 Collecting native plants from the natural environment for projects is not acceptable. A seed or vegetative propagation of nursery stock should be used.

6.2.3 Planting Accessories

.1 Burlap used for rootballs shall be untreated, free from toxic contaminants, and of sufficient strength to hold the rootball in a compact, stable mass that does not move relative to the main stem(s) of the tree or shrub.

.2 Tree ties used to secure guy wires and stakes to the tree shall be of a material that will not damage the bark. Tree tie material shall be at least 25 mm wide and shall remain soft and pliable under all weather conditions. Tree ties shall be such that the tree is permitted a reasonable degree of movement under normal forces such as wind, without detrimental effects. Tree ties may be proprietary devices or may be adapted products such as rubber belts or tubing, provided that they meet the above requirements. Wire or wire encased in hose should not be used.

.3 Wire baskets should preferably be non-galvanized and shall be of a shape that will result in a stable planting condition. Wire baskets shall be properly sized for the rootball, such that the top wire is at least 10 cm below the top of the rootball for smaller baskets and 15 cm to 20 cm below the top of the rootball for baskets of 90 cm diameter or larger.

6.2.4 Deciduous Trees

.1 Trees are categorized into the following form types, in accordance with the Canadian Standard for Nursery Stock:

.1 Standard Shade Trees: Large growing shade trees which may be suitable for streets, shelters, screens, boulevards, parks, residential or industrial use. These trees have a single trunk or stem, with branching usually starting 1.0 M to 2.5 M above ground level.

.2 Dwarf, Formal and Grafted Trees: This group includes many small trees grown as standards, (topworked or grafted). This plant group may also include topiary formed trees.

.3 Other Forms of Trees:

.1 Small Spreading Trees: These are usually small trees which may have a stem 30 cm to 80 cm in height and a well balanced head.

.2 Columnar and Fastigiate Types: These are tall narrow trees with one main stem, often branched from near ground level.

.3 Multi-stemmed types: Tall growing trees with two or more main stems.

.2 Standard Shade Trees: Standard Shade Trees shall have straight sturdy trunks and well branched and balanced heads, form and shape for the species. The branching characteristic for the species shall be enhanced by suitable nursery pruning.

.1 Branching structure of the head will vary according to species, height, age, and climatic/cultural conditions. A dominant, central leader should be developed that is characteristic of the species. The dominant leader will not necessarily be evident or expected early in a tree's development and may not be typical of its natural growth habit. Diffuse or indeterminate branching is acceptable provided that it is characteristic for the species. The ISA Pruning Guidelines shall ensure that the branching does not create imbalance, crossing or rubbing branches, included bark or other structural flaws, which could affect the tree's long term wellbeing.

.3 Specifying Standard Shade Trees:

.1 Specifications for Standard trees should state the height at which branching starts. Height of branching should bear a relationship to the size and the species' normal range of forms of the tree, so that the crown of the tree will be in good proportion with the trunk size as the tree matures.

.2 Standard trees should be specified by height in 25-cm increments from 100-200 cm, in 50-cm increments from 200-500 cm. Standard trees higher than 2.5 M shall be specified by caliper.

.3 Caliper measurements must be the determining measurement when the caliper exceeds 40 mm.

.4 Calipers shall be measured 15 cm above ground level for trees up to 10-cm caliper. For trees of 10 cm caliper and greater, caliper shall be measured 30 cm above ground level. Trees larger than 30mm caliper shall be measured at 1.3m above ground level.

.5 See Table 6-4. Container Grown Deciduous Trees

.4 Specifying Dwarf and Formal Trees:

.1 Specifications should include the size of crown and overall height and the height of stem in appropriate metric increments. The caliper of the tree is used when the caliper exceeds 40 mm.

.2 Specifications should include all special requirements such as the form of topiary or espaliered branching.

.5 Specifying Other Forms of Trees:

.1 Small Spreading Trees should have a single stem (30 cm to 80 cm high), proportionate crown and are usually specified by height only. May be specified by caliper if the caliper is greater than 4 cm.

.2 Columnar and Fastigiate Trees should have a single stem. In some tree types branching may begin close to the ground. Specify height of branching. Specify by caliper (or by height if caliper is less than 40 mm).

.3 Specifications for multi-stem Trees should state the number of stems required and the size of the largest stem. No stem may be counted if it is more than two sizes smaller in diameter than the specified stem diameter.

.6 It is recognized that most trees do not attain their characteristic form when they are young and small. Trees should not usually be designated as "Specimen" until they have grown to larger sizes. Most standard form shade trees should not be designated "Specimen" until they are at least 80mm caliper.

6.2.5 Container Grown Plants

.1 The requirements of the Canadian Standards for Nursery Stock shall apply except where modified by the requirements of the Landscape Architect or otherwise specified.

.2 Plants shall have a well-established root system, reaching the sides of the container to maintain a firm ball when removed from the container, but shall not be root bound.

.3 Plants in containers shall not be grown in the same class container for longer than two growing seasons. However, depending on species, some plants could be grown for longer than two (2) years, provided that the root system does not become root bound, does not develop girdling roots or other characteristics detrimental to normal plant development.

.4 At the time of potting, all containers shall be filled to within 2.5 cm of the top of the container. Decomposition and settling may reduce the depth of growing medium while the plant is in the container, however no growing medium should be removed from the container.

.5 The CNLA has adopted the revised container classes as shown in table 6-5.

6.2.6 Additional Recommendations

.1 All specimen plants should be designated as such in the plant list. The term "Specimen" is usually applied to large trees and shrubs, and may be used to indicate exceptionally heavy, well-shaped plants. Plants designated as such or plants having a unique desirable character should be pre-selected or the required special characteristics (such as unique branching habit, deviations from standard minimum caliper, height, branching height, rootball size, foliage density) should be clearly specified.

.2 Specifying Plants:

.1 All plants shall be true to botanical name and of the size or grade indicated thereon. See Appendix "E", Botanical Nomenclature.

.2 When specifying by container class, only the CNLA Standard Container classes should be specified. Plant sizes and container class intermediate between those shown in the Standard or the CNLA Standard should not be specified.

.3 Where both container class and plant size are specified according to the CNLA Guidelines for Container Grown Plants, both plant size and container class shall be regarded as minimum sizes.

.4 Balled and burlapped field dug plants may be substituted from container grown plants provided that root ball sizes and plant sizes meet the requirements of the Canadian Standard for Nursery Stock, and provided that the proportion and density requirements of this guideline are met. Container grown stock that meets the specified size and the requirements of this Guideline may be substituted for balled and burlapped field dug plants.

6.2.7 Approval of Plants:

.1 Plants shall be made available for review at source of supply. Plant reviews requiring assembly should be arranged by the Architect with the supplier.

.2 Approval of plants at source will not impair the right of the owner, or owner's representative, to review plants upon arrival on the site or during the course of construction and reject plants that have been damaged or are not representative of the sample shown.

.3 Restocking charges may be incurred if plants approved at source of supply are subsequently rejected at project site without reason of damage or being unrepresentative of approved samples.

.4 Substitutions: All plants shall be supplied as specified on the Plant List. Substitution will be allowed only when:

.1 A search by the landscape architect within the appropriate area of search as shown in the contract documents proves that the substitution is justified in terms of availability of plants or sizes, and

.2 An acceptable substitute of equal value is made, and

.3 Written notification is given a minimum of 10 working days unless otherwise specified prior to the start of planting. The supplier or landscape contractor shall post confirmation of changes to the Landscape Architect or Landscape Designer in writing.

6.3 Execution

6.3.1 Digging of Plants

.1 Coniferous material should not be dug bare root.

.2 Plants specified or approved as "'BR" (Bare Root) shall be dug and moved while dormant and in accordance with Canadian Nursery and Landscape Association Canadian Standards for Nursery Stock.

.3 Plants specified or approved as "B&B" (Ball & Burlap) shall be dug and planted in accordance with Canadian Nursery and Landscape Association Canadian Standards for Nursery Stock.

.4 Plants specified or approved as "Machine Dug into Wire Basket" shall be dug and planted in accordance with Canadian Nursery and Landscape Association Canadian Standards for Nursery Stock

6.3.2 Preparing Roots.

.1 Before removing plants from containers for planting, the plants shall be well watered.

.2 Roots have a tendency to grow in a circular pattern within plastic pots. When this is apparent outside roots should be gently loosened or vertically cut with a sharp knife in one or two places.

6.3.3 Preparation for planting:

.1 Prepared growing medium areas for trees shall be between 450 mm and 600 mm deep for as large an area as is practical around each tree location.

.2 The transition of the tree planting area to shallower growing medium shall have a shallow angle.

.3 Excavation of the sub-grade below the root balls of trees shall be only as necessary to permit the bottom of the rootball to sit on undisturbed material or compacted fill such that the top of the rootball remains at the proper finished grade. Disturbed sub-grade or fill below the rootball shall be compacted to prevent settlement of the tree after planting. Excess excavated material shall be removed from the site.

.4 Poor drainage or percolation should be reported to the reviewer or authority. Planting pits or areas shall be tested by filling with water. If planting pits or areas do not drain adequately, measures such as penetrating the impervious layers, raising the planting grade, tree wells or adding drain lines should be employed.

.5 Planting pits or areas excavated in fine soils or by mechanical means shall have all bottoms and sides scarified to ensure that they do not have glazed surfaces. Where the growing medium in a planting pit or area is different in texture, structure or organic content from the surrounding soil, the sides and bottom shall be scarified and the two materials thoroughly mixed to avoid an abrupt interface. Growing medium shall be free from interfaces or textural differences that could impede root development.

6.3.4 Planting

.1 Planting shall not be performed during weather conditions that may adversely affect material. See Planting Calendar 6-6 for general planting times.

.2 Installer shall be a specialist in installing and planting landscape products with experience performing landscape work.

.3 Plants shall be planted so that after settlement the level of the adjacent growing medium surface matches the level of the original growing medium surface in the nursery. The soil mark on the stem or container soil level is an indication of this, and it shall be maintained on the finished level, allowing for settling of the growing medium after planting. The total depth of the root ball shall be planted in growing medium.

.4 Plants shall be set plumb in the planting beds or in the centre of the pits, except where the plant's character requires variation from this.

.5 Root balls shall be placed on the undisturbed sub-grade to prevent settling.

.6 If no other factors come into play, the plant should be oriented in the same direction that it was grown in the nursery. Face the lowest branch away from the greatest traffic (pedestrian and vehicular); and position the plant for best viewing.

.7 Growing medium shall be placed preferably by hand in layers around the roots or ball. Each layer shall be carefully tamped so as to avoid injuring the roots or ball, or disturbing the position of the plant. The hole should be backfilled and gently tamped so that no air pockets are left around the ball.

.8 When growing medium is up to about two-thirds of the rootball height, all ties shall be cut and the top one- third of burlap on B&B, plants shall be cut off or folded back carefully, so as not to disturb the rootball integrity. No burlap shall show above grade.

.9 Growing medium should be moist in tree pits or beds at this stage. After the water has been absorbed, the backfilling shall be completed and tamped lightly. Any settling shall be brought up to the intended grade with growing medium.

.10 The trunk flare should be partially visible after the tree has been planted.

.11 All imperishable containers and tying materials shall be removed. Perishable containers such as fibre tubs should be removed where possible, but trees dug BR and planted in tubs for summer planting (if not fully established at time of planting) can be planted with the fibre tub if the rim is removed below grade and large holes cut out on the sides.

.12 All string, rope, burlap and other restricting elements shall be cut and removed out to the perimeter of the rootball. All wire basket handles shall be cut off flush with the top ring or folded back down into the planting hole. Wire baskets should not be removed. Any visible portion should be folded down away from the rootball and buried. If the wire basket is oversized such that the top wire is higher than the levels stated in 6.2.3.3, the basket shall be cut back to meet the conditions of 6.2.3.3. No wires shall protrude into the top 100 mm of soil.

.13 Top lacing shall not be left in place at the time of planting.

.14 A 100 mm raised saucer should be constructed over the rootball to enhance water infiltration into the rootball.

.15 All planting hole depths should only be dug deep enough to accommodate the root system or root mass at the desired depth relative to the surrounding grade. Plant tree with the root collar at the same level as the surrounding ground.

.16 The planting hole width should be at least 30 cm wider than the perimeter of the rootball or root system.

.17 See planting details 6-9 Conifer trees, 6-7 Bare root, 6-8 deciduous, 6-10 Tree Spade. (see end of chapter)

6.3.5 Heavy Poorly Drained Soils

.1 Planting holes should only be dug deep enough to accommodate the root system or root mass at the desired depth relative to the surrounding ground. The tree should be planted with the root collar positioned 75 to 100 mm above the surrounding ground level as settlement may occur.

.2 When planting where drainage correction is impractical or impossible, the root collar should be planted higher in relationship to the surrounding soil surface by 75-100 mm.

.3 Planting Hole Depth: the width of the actual hole should be at least 30 cm wider around the perimeter of the root ball or root system.

6.3.6 Bare Root Planting - While dormant only.

.1 Damaged or broken roots should be cut back to healthy remaining tissue. Roots should be spread evenly in the planting pit.

.2 Growing medium shall be placed around the roots, gently shaking the tree so all the soil particles sift into the root system to ensure close contact with all roots and to prevent air pockets. Ensure adequate watering occurs immediately after planting.

6.3.7 Watering: Watering shall be carried out when required and with sufficient quantities relative to specific plant needs to prevent plants and the underlying growing medium from drying out. Plants shall be watered at the time of planting.

6.3.8 Pruning: Pruning at the time of planting, shall be limited to the minimum necessary to remove dead, diseased, broken or injured branches.

.1 Any corrective pruning (double leader) shall be done in such a manner as to preserve the natural character of the plants.

.2 Only clean, sharp tools shall be used. Tools should be sterilized between cuts of different plants.

.3 All cuts shall be clean and cut to the branch collar, leaving no stubs.

6.3.9 Mulching: All trees installed in lawn areas should have a one metre (1 M) diameter mulched ring that is maintained for a minimum of two years.

.1 Mulch is to be an appropriate type for the tree planted.

.2 A 75-mm to 100-mm thick layer of wood chip mulch placed around the base of the tree.

.3 Avoid placing wood chip mulch directly in contact with the trunk.

6.3.10 Stabilizing Trees

.1 Immediately following planting, trees shall be stabilized (when required or specified) using appropriate methods such that the crown of each tree is permitted free movement but normal forces such as wind, snow loading or forces applied by human hands will not disturb the buttress root system or cause the rootball to shift in the growing medium. Securing methods include staking, guying, soil anchors, deadmen, and attachments to fixed elements.

.2 A tree may not need to be stabilized if the subsoil and growing medium are stable and can hold the rootball in place and if the rootball is solid, contained in a wire basket, and shaped such that it can resist shifting.

.3 All tree stabilization methods shall be such that they do not damage the tree.

.4 Attachment to the tree shall be no higher than necessary to stabilize the rootball while permitting free movement of the tree's crown.

.5 Ties shall be secured in position in accordance with manufacturer recommendations. Ties shall form a loose loop around the stake and loop in a figure “8” around the trunk of the tree. Guys shall be sufficiently tight to transfer support from the stake to the tree and to permit some movement for the development of proper trunk taper.

.6 Stakes and anchoring devices shall be set deep enough that they will not move in the soil when subjected to wind and other normal forces. Stakes should be driven a minimum of 300 mm into undisturbed soil.

.7 Stakes or anchors for guy wires shall be set below or flush with the soil surface so that they do not present a hazard, and guy wires shall be used only where they do not present a hazard. Guy wires shall be marked with flagging tape for visibility.

.8 Stakes shall not be driven through or penetrate the rootball of the plant.

.9 The following methods are recommended for staking and guying:

.1 Deciduous trees up to 12-cm caliper and coniferous trees up to 3-M height: two stakes per tree.

.2 Deciduous trees larger than 12-cm caliper and coniferous trees larger than 3-M height: three guy wires spaced equally around each tree.

.10 Trees installed on roof decks or in planters may require special stabilization methods.

.11 Except where stabilization of plants is directed to remain in place for longer periods due to special considerations, tree ties, stakes, guys etc. shall be removed one year after installation. In some cases (e.g., street trees), stakes might be left in place to protect the trees, but ties shall be removed.

Table 6-1 Metric/Imperial Equivalents

Plants sized by Height or Spread		Plants sized by Caliper	
Metric (cm)	**Imperial (inches)**	**Metric (mm)**	**Imperial (inches)**
15	6	3.175	0.125
20	8	6.35	0.25
25	10	12.7	0.5
30	12	19	0.75
40	16	25.4	1
50	20	30	1.25
60	24	40	1.5
80	32	45	1.75
90	36	50	2
100	39	60	2.5
125	49	70	2.75
150	60	80	3
175	69	90	3.5
200	79	100	4
250	98	130	5
300	118	140	5.5
450	177	150	6

Table 6-2 Minimum Rootball Diameters For Field Grown Deciduous Trees

Approximate Height Range	**Caliper**	**Ball Diameter**	**Approximate Ball Depth**	**Approximate Ball Weight**
cm	mm	cm	cm	kg
250 to 300 cm	40 mm	60 cm	40 cm	150 kg
300 to 425 cm	50 mm	70 cm	40 cm	200 kg
350 to 500 cm	60 mm	70 cm	40 cm	200 kg
425 to 550 cm	70 mm	80 cm	60 cm	300 kg
450 to 575 cm	80 mm	90 cm	50 cm	300 kg
475 to 600 cm	90 mm	90 cm	50 cm	400 kg
500 to 625 cm	100 cm	100 cm	50 cm	600 kg
550 to 700 cm	120 cm	120 cm	80 cm	1200 kg
600 to 775 cm	150 cm	150 cm	80 cm	1500 kg
650 to 825 cm	175 cm	175 cm	80 cm	1800 kg
700 to 825 cm	200 cm	200 cm	80 cm	2000 kg
For every 25mm of caliper over 200 cm, rootball diameter shall increase by 25 cm.				
Minimum rootball for multi stemmed trees shall be one size larger than the sizes specified for single stemmed trees of equivalent caliper.				

Table 6-3: Minimum Rootball Diameters for Coniferous Trees

Height or Spread Whichever is greater (cm)	**Diameters (cm)**	**Diameters (cm)**	**Diameters (cm)**
	Dwarf and Medium	Tall and Columnar	Tall and Broad
30	20		
40	25		
50	30	25	30
60	35	30	35
80	40	35	40
100	45	40	45
125	50	45	50
150	60	50	60
175	70	60	70
200		70	80
250		75	90
300		80	122
350			127

Table 6-4 Container Grown Deciduous Trees

Height Range Cm	**Approximate Caliper mm**	**Container Top Diameter cm**	**Container Trade Designation**
50-80	8	15-19	#1
80-125	10	19-23	#2
100-150	15	23-26	#3
150-250	20-30	25-31	#5
200-300	30-35	31-36	#7
250-350	35-40	38-40	#10
300-400	40-45	38-44	#15
350-450	45-50	43-45	#20
400-500	50-60	50-60	#25

Table 6-5 Container Grown Stock Guidelines

		Inside Top Diameter	Inside Bottom Diameter	
Container Class	**Height Min-Max (cm)**	**Min-Max (cm)**	**Min-Max (cm)**	**Former Designation**
# 1	15-18	15-19	12-13	1 gal.
#2	19-23	19-23	16-20	2 gal.
#3	22-26	22-26	21-23	3 gal.
#5	28-32	24-31	22-26	5 gal.
#7	28-32	31-36	28-31	7 gal.
#10	37-39	38-40	38-40	10 gal.
#15	38-46	38-44	34-37	15 gal.
#20	50-52	43-45	43-45	20 gal.

Table 6-6. Planting Calendar

PLANT TYPES	ZONE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BALLED STOCK													
Coniferous	1-2												
	3												
	4-5												
	6-7												
Deciduous	1-2												
	3												
	4-5												
	6-7												
CONTAINER GROWN													
All	3-7												
BARE ROOT													
All	3-7												
TREE SPADED													
All	3-7												

CHAPTER 7. Lawns and Grass

This Chapter and Chapter 8, Turfgrass Sod, shall be read and interpreted in association with each other and all other applicable sections of the Landscape Ontario Guideline such as the Chapters on Maintenance.

7.1 General

7.1.1 Establishment of grass can occur over a wide range of conditions from highway to residential lawns. The following three grades and corresponding characteristics are recommended for a particular project or area.

Table 7-1 Grass Classes

	Grade 1 Lawn	Grade 2 Grass	Grade 3 Rough Grass
Uses	High profile building sites, areas around public entrances to commercial buildings, small urban and suburban sites. This is the minimum guideline for residential and commercial areas.	Large suburban sites, public areas around large facilities with park-like conditions, industrial sites.	Rural sites, verges of airport runways, farms, highway rights-of-way, and temporary grass cover.
Maintenance Level	Level 1 or Level 2. See Chapter 16. Landscape Maintenance.	Level 2 or 3. See Chapter 16. Landscape Maintenance.	Level 3 or "Other". See Chapter 16. Landscape Maintenance.
Growing Medium	To the requirements of Chapter 5, Depth of growing medium as shown in Table 5-4.	Existing soil (provided that it meets the requirements of Chapter 5, Table 5-4) cleaned to a minimum depth of 100 mm, of rocks and debris over 25 mm in any dimension.	Existing soil cleaned by mechanical means of surface debris over 50 mm in any dimension.
Gradient Guideline	As shown in Table 4-2.	As shown in Table 4-2. Minor grade irregularities acceptable if ponding does not occur.	Roughly graded for ease of maintenance and positive surface drainage.
Drainage	Collected storm water, and subsurface drainage dispersed by storm sewer, existing watercourse.	Collected and dispersed by storm sewer, existing watercourse.	Collected and dispersed via common means or held in an area intended for storm water retention ponds.
Seed	Certified Canada Grade No. 1.	Canada Common No. 1.	Canada Common No.1or No. 2 or as specified to suit soil, maintenance and climate conditions.
Sod See Chapter 8.	Sod: No. 1 Premium Grade.	Sod: No. 1	As Specified.

7.1.2 Primary pertinent guidelines and legislation:

.1 The Seed Act of Canada
.2 Fertilizer Act of Canada
.3 Also see Appendix B for other applicable acts and Legislation

7.1.3 Handling and Storage:

All grass seed, hydraulic mulch, fertilizers and other related materials, where required, shall be stored in a dry, weatherproof area and shall be protected from damage by heat, moisture, rodents or other elements until the time of seeding or use. Labels or other identification shall not be removed or defaced.

7.1.4 Finished Grade Preparation:

.1 The finished grade shall be smooth to the extent required for the class of seeding or sodding to be carried out. The medium shall be firm against footprints, loose textured, and free of all stones, roots, branches, rhizomatous weeds and foreign soil matter that are larger than the diameter required for removal for the class of seeding or sodding to be carried out.

.2 Areas that are excessively compacted shall have their surfaces loosened by means of scarification, discing or harrowing, to a minimum depth of 150 mm.

.3 Approval of site preparation should be obtained before commencement of seeding or sodding operations.

.4 See Chapter 1. General, Administration Recommendations 1.2

7.1.5 Recommended Conditions for Acceptance:

.1 Acceptance of grass areas by the Authority and Owner for further maintenance should be done only when the following conditions exist:

.1 Growing medium quality, fertility levels, depths and surface conditions are as set out in this Guideline.

.2 Grasses are the required species, free of species other than those specified.

.3 Grass areas are relatively free of weeds, containing no more than five (5) broadleaf weeds or twenty- five (25) annual weeds or weedy grasses per 100 M^2.

.4 Sod is sufficiently established that its roots are growing into the underlying growing medium.

.5 Sodded areas have been mown at least once, to a height of 60 mm.

.6 Seeded areas have been mown at least twice, to a height of 60 mm with the last mowing occurring within 48 hours of the field review for Acceptance.

.7 Grasses shall be established in sufficient density that no surface soil will be visible when they are mown to a height of 37 mm.

.8 Maintenance procedures set out in 7.3.2 have been carried out.

7.2 Products

7.2.1 Grass Seed

.1 Grass seed shall meet the requirements of the Seed Act for: Canada Certified No. 1, Canada Common No. 1, Canada Common No. 2.

.2 Seed mixtures shall be suited to the climate, soil conditions and type, orientation, sun exposure, terrain, establishment and maintenance conditions under which they are to be grown.

.3 Seed shall have a minimum germination rate of 85% and minimum purity of 97%, except where otherwise required by the specification of the seed mixture.

.4 Seed shall be packed and delivered in original containers clearly showing:
- .1 Seed grade
- .2 Lot number
- .3 Name of supplier
- .4 Germination percent
- .5 Purity analysis of seed mixture: Percentage of pure seed, variety and weed
- .6 Year of production
- .7 Net weight (mass)
- .8 Date and location of bagging

.5 The mixture shall be mixed and supplied by a recognized certified seed supplier.

.6 The Owner may test seed for purity and germination percentage.

.7 Endophyte enhanced grasses contain an internal fungus (Neotyphodium spp.) which lives in a symbiotic relationship of mutual benefit with the turfgrass. This provides a property which repels surface feeding insects such as chinch bug and sod webworms. Such varieties should be incorporated where possible.

.8 See Table 7-2, Grass Characteristics

7.2.2 Turfgrass Sod

Turfgrass sod shall meet the requirements of Chapter 8; Landscape Ontario Guideline for Turfgrass Sod.

7.2.3 Hydraulic Mulch

.1 The materials shall consist of a mixture of fiber, seed, fertilizer and water mixed and applied in the specified proportion.

.2 Hydraulic mulch, when used shall consist of fibre or other material designed for hydraulic seeding and dyed for the ease of monitoring application.

.3 Fiber should be green coloured fibrous, wood cellulose mulch not containing any growth or germination inhibitors and shall be manufactured so that it will form a uniformly suspended homogeneous slurry when added to the fertilizer, seed and water in a tank and agitated.

.4 When applied, the hydraulic mulch shall be capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil. The mulch shall be dry, be free of weeds and all other foreign material, and shall be supplied in packages bearing the manufacturer label clearly indicating the weight and product name.

.5 The mulch may contain a colloidal polyacrylamide (or equivalent) tackifier, that shall be adhered to the mulch to prevent separation during shipment and to avoid chemical agglomeration during mixing in the hydraulic mulching equipment.

7.2.4 Water

Water used in hydraulic seeding and irrigation should be potable and shall be free of any impurities that may have an injurious effect on the success of seeding or germination, or may be harmful or detrimental to the environment.

7.3 Execution

7.3.1 Seeding

.1 Scheduling:

.1 Seeding shall be carried out when seasonal conditions are likely to ensure successful germination and a continued growth of all species of seed in the grass mix establishment. All seeding shall be done during calm weather and on soil that is free of frost, snow and standing water.

.2 Seeding can be performed during the periods of mid-April to Early June, mid July to end of September or as a dormant seeding. The period from mid August to mid September is preferred as soil moisture and temperature conditions are optimum for germination.

.2 Methods:

.1 Seed shall be applied by Method A (Mechanical Dry Seeding) or Method B (Hydraulic Seeding) unless otherwise specified. Hand seeding is not generally recommended, and shall be carried out only when site conditions preclude the above two methods.

.3 Rates of Application:

.1 Rates of application of fertilizers, seed mixtures, mulch and other components shall be based on an analysis of the season, climate, terrain, soil, and establishment and maintenance conditions affecting the project.

.4 Method A: Mechanical Dry Seeding:

.1 The required fertilizer shall be uniformly applied at the rate required and worked well into the topsoil by discing, raking, or harrowing to a minimum depth of 50 mm. Any fertilizer needed should be based on soil test results. If soil testing is not performed a starter fertilizer similar to 16-25-12 maybe used, if specified.

.2 Seed shall be sowed evenly and/or incorporated into the soil by means of an approved mechanical dry seeder at the rate required or as specified.

.3 Seed shall be applied in two portions and applied in two directions at right angles to each other, except where conditions dictate one directional seeding.

.4 Prior to application all grass seed and fertilizer shall be measured accurately.

.5 Seeded areas (particularly for Class 2 Lawns and smaller areas) should be lightly raked to be incorporate into the top 3-6 mm of the soil and then rolled after seeding to ensure good contact between seed and growing medium.

.6 An approved mulch may be applied (particularly for Class 2 and 3 Grass areas and larger areas) with seed or following seeding. No area shall be seeded more than can be mulched on the same day. The mulch shall be applied uniformly over the entire area.

.5 Method B: Hydraulic Seeding:

.1 The quantities of each of the specified materials to be charged into the hydraulic seeder / mulcher tank shall be accurately measured either by mass or by mass-calibrated volume measurements.

.2 The materials shall be added to the tank while it is being filled with water and in the following sequence: seed, fertilizer, and where applicable, mulch.

.3 The materials shall be thoroughly mixed into a homogeneous water slurry in the various combinations described herein, and shall be distributed uniformly over the surface area with the hydraulic seeder/mulcher.

.4 All hydraulic seeding or mulching equipment shall have the tank volume certified by an identification plate or sticker that shall be affixed in plain view on the equipment and shall not be removed or altered.

.5 The tank should be thoroughly cleaned prior to and after, any and all seeding applications.

.6 The hydraulic seeder / mulcher shall be capable of sufficient agitation to mix the materials into, and maintain a homogeneous slurry in a homogeneous state until it is applied. The discharge pumps and gun nozzles shall be capable of applying the materials uniformly in a continuous non-fluctuating discharge in the specified quantities over the designated areas.

.7 After charging, no water or other material shall be added to the mixture in the hydraulic mulcher.

.8 Water slurry and other components shall not be left in the tank for more than four hours. Slurry left in the tank over the maximum time shall not be used for seeding and shall be disposed of off-site.

.9 Wildflower seed, if specified, should be applied following grass hydraulic seeding.

.10 Hydraulic seeding shall be done with care to ensure that the fertilizer in solution does not come in contact with the foliage of any tree, shrub or other susceptible vegetation. Seed or mulch shall not be sprayed on objects not expected to grow grass.

.11 Any overspray or damage that occurs during hydraulic seeding shall be promptly reported and the situation rectified immediately.

.12 All existing site equipment, roadways, landscaping and structures shall be protected from damage.

.6 Temporary fencing, barriers, barricades or signage shall be provided and maintained required to protect newly seeded/sodded areas from damage including but limited to erosion, pedestrian and vehicular traffic or wild life.

7.3.2 Grass Maintenance before Acceptance

.1 Maintenance for seeded and sodded areas shall begin immediately after sod has been installed or seeding has been completed, and shall continue until the date set for signing off or acceptance of, the turning the areas over to the Owner for further maintenance or as specified in the contract documentation.

.2 Maintenance shall include all measures necessary to establish and maintain grass in a vigorous growing condition, including, but not limited to the following:

.1 Mowing shall be carried out at regular intervals as required, to maintain grass at a maximum height of 60 mm. Not more than 1/3 of the blade shall be cut at any one mowing. Edges of sodded and seeded areas shall be neatly trimmed. Heavy clippings shall he removed immediately after mowing and trimming.

.2 Watering shall be carried out when required and with sufficient quantities to prevent grass and the underlying soil from drying out.

.3 Weed control shall be carried out when the density of weeds reaches 25 broadleaf weeds per 100 m^2.

.4 Weed control, whether manual or chemical, shall reduce the density of weeds to zero.

.5 Any sodded or seeded areas that show deterioration or bare spots shall be repaired immediately. All sodded areas showing shrinkage due to lack of watering shall be top-dressed and seeded with a seed mix that matches the original seed mix, when proper growing conditions permit.

.6 All seeded and sodded areas shall be adequately protected with warning signs, temporary wire or other necessary means. Fencing shall be maintained in good condition to provide a continuous barrier until acceptance. Except as otherwise required by the contract or as otherwise agreed, fencing shall be removed from the site upon Acceptance.

7.3.3 Cleanup: All materials and other debris resulting from seeding or sodding operations shall be removed from the job site.

TABLE 7-2 TURFGRASS CHARACTERISTICS

	Kentucky Bluegrass	Perennial Ryegrass	Creeping and Fine Fescues	Tall Fescue	Creeping Bentgrass
Characteristic	*(Poa pratensis)*	*(Lolium perenne)*	*(Festuca spp.)*	*(Festuca arundinacea)*	*(Agrostis palustris)*
Days to Germinate	10 to 30	3 to 10	7 to 14	7 to 14	10 to 21
Wear Tolerance	Good	Excellent	Fair	Good	Good
Drought Tolerance	Good	Very Good	Good	Excellent	Poor
Water Usage	High	Medium	Medium	High	Medium
Shade Tolerance	Fair to Good	Fair to Good	Very Good	Good	Fair
Cold Tolerance	Very Good	Poor	Good	Fine	Excellent
Seeding Rate ($kg/100m^2$)	1 to 2	2 to 4	1 to 3	2 to 4	0.5 to 1
Endophytic Variety Availability	No	Yes	Yes	Yes	No
Texture	Medium to Fine	Medium	Fine	Medium to Coarse	Fine
Uses	Athletic Fields, Home Lawns, Parks Golf Courses	Athletic Fields, Golf Courses Overseeding, Home Lawns	Golf Courses	Areas of little maintenance	Golf Courses Lawn Bowling Croquet
General	High quality turfgrass, dark green colour Prefers well drained soil and full sun.	Bunch type turf, rapid growth. Medium to dark green in colour. Does not tolerate poorly drained soils. Not winter hardy in all of Ontario.	Tolerates low maintenance conditions.	Tolerant of salt, grows in a wide range of conditions. Best seeded as a Monoculture.	High quality turfgrass. Intensive maintenance program required

CHAPTER 8. Turfgrass Sod

The Landscape Ontario Guideline sets out to document the guidelines of quality for turfgrass nursery sod in order to facilitate the specification type, define and installation for each use. The Nursery Sod Growers Association of Ontario (NSGA) is an organization dedicated to the enhancement of the turfgrass sod industry. Hence the NSGA specifications for Sod will help to form the basis for the Ontario Landscape Guideline. The choices in turf establishment in are chiefly sodding, seeding and hydroseeding.

8.1 General

8.1.1 This Guideline outlines the quality requirements for each grade and classification with regard to the various types of turfgrass sod. This Chapter of the Guideline is intended to be used in conjunction with other Chapters of this Guideline. Some of these include: General Requirements, Lawns and Grass, Maintenance and Grading.

8.1.2 Pertinent Guidelines and Legislation

.1 Canada Seed Act
.2 Weed Control Act
.3 Topsoil Preservation Act
.4 See Appendix “B” for other applicable legislation.
.5 Nursery Sod Growers Association of Ontario Standard.

8.1.3 Turfgrass Quality Grades: This guideline divides turfgrass sod into the following quality grades:

.1 Grade Number 1
.2 Commercial Grade
.3 See Table 8-1

8.1.4 Specifying and Identifying Turfgrass: Turfgrass nursery sod should be specified by reference to the quality grades in this Guideline, and should be fully specified with regard to the following characteristics:

.1 Mix of Grass Types: The mix of grass species in the sod shall be the producer’s mix and shall meet the requirements of this Guideline for the quality grade appropriate to the location unless otherwise specified.

.2 Specialty or custom mixes may include mixes other than the producer’s mix, or single species sod such as Kentucky bluegrass sod.

.3 Special Growing medium requirements: Unless otherwise specified, the growing medium for turf shall be the producer’s own growing medium. Other growing media may be specified, including the specific gradation and type of sand.

.4 Sod is cut to various sizes, depending on the harvesting equipment of the grower. However, to maintain uniformity within the industry, the imperial square foot measurement is the unit of measurement for the ordering and pricing of sod.

8.1.5 Turfgrass, contributes to the protection of our environment, enhancement of our quality of life, and also offers the following benefits:

.1 Soil Erosion Control - Sodding offers immediate soil stabilization of the site resulting in reducing the loss of soil by wind or water erosion. Occasionally, turf must be established on very adverse site conditions such as impermeable clays, stony and poor drainage. Proper sodding produces a much higher potential for successful stabilization of the area.

.2 Water Conservation: Sodded turf sites require irrigation for a shorter period of time after planting than sites which are seeded. Turfgrass sod has an excellent capability of trapping and retaining rain-water in place for ground water recharge and thereby reduces run-off.

.3 Reduced Herbicide Use: An established turf quality sod, should not require an initial herbicide application for weed control.

8.1.6 Certification: The supplier shall provide, upon request by the contractor, a label or statement certifying the quality grade, location of sod source and species of grass in the sod, and that the sod meets the specifications or requirements of this Guideline for the stated grade.

8.1.7 Handling and Storage:

.1 Sod shall be protected during transportation (i.e. tarpaulin) for load security and reduction of wind exposure to prevent drying out and shall arrive at the site in a fresh and healthy condition.

.2 Sod delivered to the job site shall be stored in such a manner to minimize drying out or overheating of product.

.3 Sod shall be installed within 24 hours after delivery to the site, and within 36 hours after harvesting.

.4 Small, irregular or broken pieces of sod shall not be accepted.

.5 Allow sod to dry sufficiently from wet weather to prevent tearing during handling.

.6 Sod shall not be dropped or dumped from vehicles.

8.1.8 Grade Preparation:

.1 See Chapter 7, Lawns and Grass 7.1.4, and Chapter 4, Grading and Drainage.

8.1.9 Recommended Conditions for acceptance: See section 7 Lawns and Grass, 7.1.5

.1 Sod shall be sufficiently established that its roots are growing into the underlying growing medium.

.2 Sodded areas shall have been mown at least once, to a height of 38 mm.

8.1.10 Maintenance

.1 Water sodded areas in sufficient quantities and at required frequency to maintain subsoil immediately under sod continuously moist for depth of 75 to 100 mm.

.2 Turfgrass for the first time when it reaches a height of 40 to 50 mm. No more than 1/3 of grass blade height shall be removed at any one mowing.

.3 Areas which show deterioration or bare spots shall replaced with sod immediately.

.4 Sodded areas shall be protected with warning signs during rooting and the initial maintenance period.

8.2 Products

8.2.1 All turfgrass sod shall be suited to the locality, site conditions, and intended function of each project or area. Sod to be grown in material qualifying as topsoil. Mostly impervious clay will not be accepted as topsoil.

8.2.2 Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site, free of subsoil, clay, or impurities, plants, weeds and roots; pH value of minimum 6.5 and maximum of 7.5

8.2.3 Grass mixture in Sod: Supplier's sod shall be grown from certified seed of improved turf cultivars registered for sale in Canada, and appropriate to the intended use.

.1 Species suited for Ontario include:

.1 Turf-type Perennial ryegrass
.2 Turf-type Kentucky Bluegrass
.3 Turf-type Red fescue (including Chewing's and creeping Fescues)

.2 Supplier's sod shall be composed of any two or more of the above species mixed in combination such that no single cultivar constitutes more than 90% of the grass in the turf.

.3 Specialty or custom sod shall be as specified or as certified by the supplier, and maybe composed of a single variety or combinations of varieties of improved turf cultivars registered for sale in Canada, suited to the intended use.

8.2.4 Specialty sod mixes may include:

.1 Colonial Bentgrass
.2 Creeping Bentgrass
.3 Turf-type Tall Fescue
.4 Hard Fescue
.5 Creeping bentgrass with Poa annua
.6 Poa reptans
.7 Poa supina
.8 See Table 8-3

8.2.5 Size of sections: Turfgrass sod shall be cut by able methods by machines designed for that purpose, to the supplier's length and width, plus or minus 12 mm in width and plus or minus five percent (5%) in length. Broken pieces and torn or uneven ends are not acceptable.

8.2.6 Thickness of Cut: Turfgrass sod shall be cut at a uniform soil thickness (excluding top growth and thatch) of 15 mm plus or minus 5 mm.

8.2.7 Strength of Sod: Minimum age of 12 months, with root development that will support its own weight without tearing, when suspended vertically by holding up the upper two corners.

.1 Sod shall be strong enough that a normal sized section can be grasped at one end, picked up and handled without damage.

.2 Sod shall have strong fibrous root system, free of stones, burned or bare spots.

8.2.8 Moisture Content: Turfgrass sod shall not be harvested or transplanted when its moisture content is too low or high, resulting in potential damage to the sod.

8.2.9 Grass height: the height of the grass in the sod at the time of harvesting shall be between 40 mm and 60 mm.

8.2.10 Thatch: turfgrass sod shall be reasonably free from thatch. Up to 10 mm of thatch (uncompressed) is acceptable.

8.2.11 Diseases, Fungi, Nematodes, Insects: Turfgrass sod shall be reasonably free from diseases, fungi, nematodes and soil-born insects, to the extent that with proper installation methods and initial maintenance as described in Sections 7 and 8, new turf will not deteriorate due to such causes.

8.2.12 Weeds: All turfgrass sod shall be absolutely free from plants designated as noxious weeds by Agriculture Canada or by provincial authorities.

.1 Nursery turfgrass sod shall be free of broadleaf weeds and undesirable grasses to the extent required for each quality grade.

.2 Field turfgrass sod shall contain not more than 10 weeds per 10 m^2.

.3 Weeds: Defined in OMFRA publication 505.

8.3 EXECUTION

8.3.1 Timing

.1 Turfgrass sod shall be installed within 24 hours of delivery and within 36 hours of harvesting. Sod may be rejected if there is any evidence of deterioration.

.2 Sod laying shall be coordinated to with topsoil operations.

.3 Sod laying shall be coordinated with the installation of the irrigation system and contractor.

8.3.2 Preparation

.1 Chapter 3 Site Preparation and Chapter 4 Grading are applicable to this Chapter.

.2 All grading shall eliminate rough, low, or soft areas and ensure positive drainage.

.3 The growing medium under all sodded areas shall be spread evenly over the approved subgrade to the specified depth or as outlined in this Guideline.

.4 Subsoil:

.1 Subsoil shall be prepared to eliminate uneven areas and low lying spots.

.2 All lines, levels, profiles and contours shall be maintained according to the plan or specification.

.3 All vegetative matter and foreign non-organic material shall be removed during any spreading operation.

.4 Subsoil should be scarified to a depth of 100 mm where topsoil is to be placed.

.5 Topsoil:

.1 Topsoil shall be spread to the specified depth over the area to be sodded.

.2 Topsoil shall be placed during dry weather and on unfrozen subgrade.

.3 All vegetative matter and foreign non-organic material shall be removed during any spreading operation.

.4 Approval of the topsoil grade and depth prior to sodding from the Landscape Architect or Owner shall be obtained in writing.

.6 The required fertilizer shall be applied to and well worked into the topsoil by discing, raking or harrowing, at the rates specified. This shall be done in advance to laying the sod.

.7 Growing medium in the prepared surface shall be moistened immediately prior to laying sod.

8.3.3 Sodding

.1 Sod laying shall be performed during the active growing season. Sodding during dry periods, at freezing temperatures or over frozen soil is unacceptable.

.2 Sod shall be laid in smooth and even rows, closely knit, tight together in such a manner with no open joints visible, joints staggered a minimum of 25 cm, and no pieces are stretched or overlapped.

.3 Sod shall be laid flush with adjoining grass areas, paving and the top surface of curbs unless shown otherwise on the drawings.

.4 Protection of sodded areas against erosion shall be employed. Erosion control netting shall be installed where required. Erosion control mesh or netting shall be placed and secured with stakes or staples set firmly into the ground to a minimum depth of 150 mm. Spacing of stakes or staples shall be adequate to ensure complete anchorage of the sod to the ground or as specified by the manufacturer.

.5 Sod shall be laid at right angles to slopes or the flow of water. On slope areas, sodding shall be started at the bottom of the slope. On slopes steeper than 2:1 every row shall be pegged with wooden lath pegs, of sufficient length to ensure satisfactory anchorage of the sod, at intervals of not more than 0.5 metres. Pegs shall be driven flush with sod.

.6 Sod shall be cut where necessary only with a sharp knife or edging tool.

.7 Newly sodded areas shall be protected from heavy foot traffic during laying. Planks shall be placed if necessary to prevent damage.

.8 The sodded area shall be rolled, tamped, or planked providing sufficient pressure, to ensure a close contact between sod and soil. Heavy rolling to correct irregularities in grade shall not be permitted.

.9 The sod area shall be watered immediately with sufficient amounts to saturate the sod and penetrate through the sod into the top 100 mm of topsoil.

.10 Before pedestrian traffic is permitted on the turf, and after the turf is well rooted into the growing medium, all pegs or stakes shall be removed or driven at least 50 mm below the surface.

Table 8-1. Specifications for Turfgrass Sod for Ontario

Quality Guidelines for Turfgrass Nursery Sod
Turfgrass nursery sod is grass that has been seeded and cultivated in nursery sod fields as a turfgrass sod.

TYPE	TOLERANCES	MOWING HEIGHT	THICKNESS	USES
Number One Grade	Sod of this quality may contain 1 broadleaf weed per 40 square metres and up to 1% native* grasses. Sod should be of sufficient shoot density that no surface soil will be visible from a standing position when mowed to a height of 4 centimetres.	The mowing height range should be 3 to 7 centimetres with the exception of creeping bentgrass sod where mowing height is determined by the end use.	The thickness of the soil portion of the sod should not exceed 1.5 centimetres.**	For locations where an attractive high quality turf is required, such as residential/commercial/office lawns, golf courses and sports fields.
Commercial Grade	Sod of this quality may contain up to 5 broadleaf weeds per 40 square metres and up to 20% native* grasses. Sod should be of sufficient shoot density that no surface soil will be visible from a standing position when mowed to a height of 4 centimetres.	The mowing height is determined by the end use.	The thickness of the soil portion of the sod should not exceed 1.5 centimetres.**	Suitable for erosion control, roadsides, boulevards and minimum maintenance areas.

**Any grass species other than those seeded shall be deemed native.*

***Thickness of the soil portion of the sod may vary with field and environmental conditions at time of harvest. Note that the soil portion is generally composed of at least 50% volume of grass roots.*

Table 8-2. Types of Turfgrass Nursery Sod

CLASSIFICATION	% Weight of Kentucky bluegrass cultivars	% Weight of creeping red, chewings or hard fescue cultivars.	USE
Kentucky Bluegrass Sod	100	0	Highly recommended by N.S.G.A., this all-purpose sod is a first choice for Ontario climates for use in sunny to slightly shady locations. Its excellent colour and texture make it an attractive, high quality turf especially for residential lawns. Also used for parks, cemeteries, institutional grounds, boulevards, golf courses, sports fields, office and commercial lawns.
Kentucky Bluegrass/Fine Fescue Sod	90 - 95	5 - 10	An all purpose sod with moderate shade adaptation. Suitable for residential lawns, parks, cemeteries, institutional grounds, boulevards, golf courses, sports fields, office and commercial lawns.
Fine Fescue/Kentucky Bluegrass Sod	60 - 70	30 - 40	A less attractive lower maintenance sod having higher tolerance to shade and drought stresses. Suitable for any turf area requiring shade tolerance and/or minimal maintenance.

Table 8-3. Specialty Turfgrass Sod

Nursery sod grown from seed of various species of turfgrass such as:

Descriptive Name	Character	Uses	Mixes
Creeping Bentgrass	Vigorous, very dense fine textured, low growing	Putting greens, golf courses, bowling greens	Usually mono stand of a single cultivar
Turf-Type Perennial Ryegrass	Medium textured, moderately fast growing, good wear tolerance, lacks cold hardiness	Lawns, sports fields, golf courses	Usually mixed with Kentucky Bluegrass
Fine-Leafed Fescues*	Very fine textured, shade adapted, drought tolerant	Low maintenance and shady areas	Usually mixed with Kentucky Bluegrass
Turf-Type Tall Fescue	Coarse texture, drought and wear tolerant, may not have cold hardiness	Sports fields, low maintenance areas, usually mowed at higher heights	
Poa supina	Very Fine textured	Shade and wear tolerant species	Fescues, Bentgrasses

**Includes creeping red fescue, chewings fescue, hard fescue, and sheep fescue.*

Chapter 9. Mulching

9.1 General

9.1.1 Mulch is an aesthetic ground cover applied to planted areas at the time of planting. (see table 9-1 Mulch is also applied as a part of an ongoing maintenance program and conservation management system. Mulch is not intended to replace vegetation as an exclusive ground cover, nor is it to be utilized as a growing medium in the landscape.

The objectives of mulching are:

.1 Insulating soil from extreme temperature changes by maintaining uniform soil temperatures.

. .2 To protect the soil from structural damage that results from winter freezing

.3 Conserving soil moisture by reducing losses via evaporation.

.4 Keeps soil moist, therefore making nutrients more available to plant.

.5 To reduce compaction of soil.

.6 Prevent crusting of soil surface, thus improving absorption and percolation of water into the soil.

.7 To discourage the germination, growth of weeds and make removal.

.8 To reduce and minimize soil erosion.

.9 Decaying mulch may also provide a source of organic matter for the soil aiding in improving soil structure and tilth.

.10 Aesthetically improve or augment the landscape by providing a cover of uniform colour, interesting textural components to the surface and give a neater and more finished appearance.

9.1.2 Material shall be reasonably free of weed seed, foreign materials, or other injurious materials that would prohibit seed germination.

9.2 Products

9.2.1 Mulches can be divided into the two basic categories of organic and inorganic (see table 9-2). Organic materials are composed of plant or animal residues and decompose over time. Inorganic mulches are natural or man-made materials that do not readily decompose. Inorganic mulches may be gravel, crushed stone or some manufactured product. Most of these materials are not as beneficial to plants as the organic mulches because they do not improve the structure or nutrient content of the soil.

9.2.2 Organic Mulches

.1 Bark Mulch: Bark mulch shall be 25 mm (1") bark chips and fines, or a combination of the two, free of chunks and sticks, dark brown in colour, and free of all soil, stones, salts or other harmful chemicals, roots or other extraneous matter. Coarse bark mulch shall meet the same guidelines as bark, but shall consist of larger chips.

.2 Composted or Potting Bark: Bark that has been composted to the point where it is of a uniform texture and is dark brown in colour. It must be free of all soil, stones, roots or other extraneous matter.

.3 Compost: Composted materials may by produced from various plant sources that have been tested to assure that they do not contain any toxic residues, and contain a minimum amount of viable weed seeds.

9.2.3 Inorganic Mulches

.1 Rock: Rock mulch materials vary in character, colour and size. The rocks should be selected with a view to their suitability for the size of the area, the design and the type of plant material. It is important to avoid the use of finely ground rock such as crushed limestone as it is likely to compact and form an impervious barrier to both water and air.

.2 Landscape Fabric: Fabric may be woven or spun bonded, and shall be a product specifically designed for weed control. Geotextiles with a high percentage of closed space have been found to be most effective.

.3 Black plastic is not a suitable substitute for landscape fabric as it does not permit air and water to pass to the growing medium.

9.3 Execution

During wet periods when the soil surface is very moist, mulch may encourage a fungal disease damping-off. Do not mulch if the soil surface is saturated; allow the surface to dry. Do not mulch wet low-lying areas where ponding may occur. If mulching is necessary due to environmental concerns, a light dry material that will float should be used. Heavy mulch materials will mat and increase and maintain the wetness of the site.

9.3.1 Organic Mulch

.1 Applying Bark Mulch, Composted Bark or Other Composted Bark or Other Materials: After finish grading is complete and immediately after each area requiring mulch is planted, place mulch in an even layer. Recommended depth of mulch is as specified after settling.

.2 Maintenance mulching to replace organic matter lost through the normal oxidation process is recommended for planters and planting areas. The frequency of mulch applications should be checked seasonally.

.3 Organic matter such as shredded bark and leaves should be moist when applied, as extremely dry mulching materials could absorb moisture from the soil.

9.3.2 Inorganic Mulch

.1 Rock Mulch: Rocks should be dispersed evenly over soil surface between shrubs or plants. Depth of the mulch will vary according to the diameter of the individual rocks. Care should be taken to avoid contacting or burying the plants' lower branches under the mulch. Rock mulch should be placed on an approved landscape fabric as specified, see section 9.3.3.

.2 Landscape Fabric: It may be appropriate to apply a pre-emergent herbicide before installing the fabric. After finish grading is complete but before planting, lay fabric over area. Cut “X” shaped openings in material to accept individual plants. Upon completion of planting, apply mulch in an even layer, leaving no part of the landscape fabric exposed. The mulch should either be as specified or a coarse material such as bark chips or rocks, both which discourage germination of weed seeds on the soil surface layer.

9.3.3 Maintenance of Mulch

.1 Mulch usually settles to a stable configuration however, traffic, weather or other causes may displace mulch at some locations. Mulch should be periodically restored to its specified depth, location and constancy by the addition of similar mulch and subsequent raking, particularly to eliminate the exposure of any underlying landscape fabric (if used).

.2 Where necessary, mulch may be topped up to its intended depth. Adding subsequent layers of mulch to create a depth greater than that recommended or specified should be avoided.

9.3.4 Mulching Trees in Lawn Areas: All trees installed in lawn areas should have a one metre (1 m.) diameter mulched ring that is maintained for a minimum of two years. Mulch is to be an appropriate type for the tree planted.

.1 Mulching Trees in Landscaped Areas: Mulch should not be placed within 10 cm of the base of the trunk of trees.

.2 Mulching Shrub is Landscaped Areas: Mulch should not be placed within 5 cm of the base of the trunk of shrubs.

.3 Mulching Perennials in Landscaped Areas: Mulch should not be placed within 5 cm of the stem of perennials.

9.3.5 Soil fertility may be temporarily decreased due to the binding of nutrients by microorganisms, especially if supplemental fertilizers are not added.

TABLE 9-1: Some Considerations When Choosing A Mulch

TYPE	APPEARANCE	ADVANTAGES	DISADVANTAGES
Bark Mulch (Medium Sized Bark)	Reddish brown, medium texture material	Widely available effective mulch	Can be blown or accidentally swept out of planted area
Coarse Bark Mulches	Dark reddish brown, coarse texture locations	Longevity in beds	Slow to decompose, will not contribute to the soil structure for many years
Potting and Fine Sized Bark Mulches	Reddish brown, shreds or fine textured	Breaks down quickly to become part of the soil structure	Effective lifetime of mulch is shortened as it is already partly decomposed, easily wind swept until matted
Compost	Dark brown, fine texture	Breaks down quickly to become part of the soil structure, good soil amendment	Effective lifetime of mulch is shortened as it is already partly decomposed
Organic Mulches	Various	Recycled products	Some may require some composting before use
Rock Mulches	Assorted colours and sizes	Protects soil from frost heave and compaction; provides clean uniform effect	Does not contribute to the organic content of the soil; long term maintenance is difficult unless used in conjunction with landscape fabric. Difficult to amend soil with organic matter over time
Synthetic Fabrics	Should not be visible when installed correctly	Prevents,-weed germination while letting water pass readily into the soil	Cannot be used in plantings that include stoloniferous plants or bulbs
Recycled Synthetic Materials (i.e. Shredded Tires)	Assorted colours	Recycled product	Does not add organic matter

Table 9.2 Types Of Mulch And Their Properties

Material	Classification Types	Longevity	Add Nitrogen Source	Comments
Black Plastic Film	I	M	N	One layer cover, requires anchors, tears easily
Crushed Rock	I	VL	N	Many colours, avoid limestone
Geotextile Weed Barrier	I	L	N	Anchors required, best covered with mulch
Gravel	I	VL	N	Many colours and sizes available
Landscape Fabric	I	L	N	Should be covered with a mulching material
Lava Rock	I	VL	N	Should be used with Landscape fabric
Pea Gravel	I	VL	N	Attractive, small textured size adds interest to garden
Pebbles	I	VL	N	Many colours and sizes available
Rock Mulch	I	VL	N	Many colours and sizes available
Stone/Chips	I	VL	N	Usually used with plastic mulch and landscape fabric
Volcanic Rock	I	VL	N	Small sizes easily moved by water
Bark Chunks	O	L	R	Expensive, Looks Good, Medium and Coarse best for mulch
Coarse Bark Mulch	O	L	R	Used for planting beds and tree wells
Cocoa Shells	O	S	N	Adds potassium, Nice aroma, looks good
Compost	O	S	N	Well Cured
Eastern Cedar	O	L	R	Used for planting beds and tree wells
Peat Moss	O	S	R	Expensive, coarse grade for mulch
Pine and Bark Nuggets	O	L	R	Used for planting beds and tree wells
Pine Bark	O	L	R	Slow to decompose, very attractive
Pine Needles	O	M	R	Fairly durable, does not mat down, very good for acid loving plants
Red Cedar Mulch	O	M	R	Used for planting beds and tree wells
Shredded Bark	O	M	R	Good for paths, picnic areas, causes nitrogen deficiencies
Shredded Pine Mulch	O	M	R	Used for planting beds and tree wells
Bark Mulch	O	L	R	Used for planting beds and tree wells
Straw	O	S	R	Supplies potassium, weed seeds
Utility Bark Mulch	O	L	R	Hardwoods such as Oak, Maple, Cheery, Spruce
Composted Leaves	OR	S	N	Better as Soil Amendment
Composted Yard Waste	OR	S	N	Weeds Seeds, odours
Ground or Shredded Tires	OR	VL	N	Playground Use and Sports Fields
Manure (Well Rotted)	OR	S	N	Weeds Seeds, odours
Newspaper	OR	S	R	Good when covered with Pine needles
Waste Paper	OR	S	N	Must shred, apply wet and keep moist

N= NOT REQUIRED
R= REQUIRED
I=INORGANIC
O=ORGANIC
OR=ORGANIC RECYCLED
S=SLOW
M=MEDIUM
L=LONG
VL=VERY LONG

CHAPTER 10. Interlocking Concrete Pavers

10.1 General

10.1.1 This chapter provides basic guidelines for the manual installation of concrete interlock pavers based on guidelines provided by the CSA. These guidelines assume installation will be on a compacted aggregate base under the bedding sand and pavers. Other bases can be used, such as cement or asphalt-treated aggregate, concrete or asphalt.

10.1.2 Pavements subject to heavy vehicular traffic should be designed in consultation with a qualified civil engineer, in accordance with established AASHTO flexible pavement design procedures.

10.1.3 Related Guidelines and References

.1 Canadian Standards Association (CSA):
- .1 A231.2, Precast Concrete Pavers.
- .2 A23.2A, Sieve Analysis of Fine and Coarse Aggregates.

.2 © 1999 ICPI Tech Spec No. 9 Interlocking Concrete Pavement Institute—Revised August 2003 3. CSA A23.1-FA1, Concrete Materials and Methods of Concrete Construction. 4. CSA A179, Mortar and Grout for Unit Masonry.

.3 Interlocking Concrete Pavement Institute (ICPI)

10.2 Product Selection

10.2.1 The Landscape Architect or Consultant and Owner shall agree upon a colour and design selected from a manufacturer's list of available products.

10.2.2 The Owner will be provided with four (4) representative full-size samples of each paver type, thickness, color, finish that indicate the range of color variation and texture expected in the finished installation. Accepted samples become the accepted guide for the work.

10.2.3 The design shall indicate perimeter conditions, relationship to adjoining materials and assemblies, layout, colour arrangement, pattern installation and details.

10.2.4 The Contractor will provide:

.1 a manufacturer's certification of concrete pavers as having met applicable CSA guidelines.

.2 Manufacturer's catalogue containing product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

10.3 Delivery, Storage and Handling of Product

10.3.1 The Contractor shall comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

10.3.2 Delivery and paving schedule will be coordinated to minimize interference with normal use of buildings adjacent to paving.

10.3.3 Concrete pavers will be delivered to the site in steel-banded, plastic-banded or plastic-wrapped packaging capable of transfer by forklift or clamp lift.

10.3.4 Pavers will be unloaded at job site in such a manner that no damage occurs to the product. Materials should be protected such that they are kept free from mud, dirt, and other foreign materials.

10.3.5 Bedding sand and joint sand should be securely covered with waterproof covering if required to prevent exposure to rainfall or removal by wind.

10.4 Bedding and Joint Sand

10.4.1 The Contractor will provide bedding and joint sand (table 10-2)that is clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.

10.4.2 Limestone screenings, or stone dust shall not be used for the bedding layer. Sand for the bedding sand material that does not conform to the grading requirements of CSA A23.1 (FA1) shall not be used.

10.4.3 Bedding sand conforming to the grading requirements of CSA A23 (FA!) may be used for the jointing material. Mason sand, or sand conforming to CSA A179 shall not be used for the bedding layer.

10.4.4 Where concrete pavers are subject to vehicular traffic, utilize sands that are as hard as practically available.

10.4.5 Bedding sands shall be sieved according to CSA A23.2A

10.4.6 Bedding sand material requirements should conform to the grading requirements of CSA A23.1-(FA1). Refer to Table 10-1. In addition, the amount passing the .075 mm sieve should be as close to zero as practically possible.

Table 10-1

Grading Requirements for Bedding Sand CSA A23.1 (FA1)

Sieve Size	Percent Passing
10 mm	100
5 mm	95 to 100
2.5 mm	80 to 100
1.25 mm	50 to 90
.630 mm	25 to 65
.315 mm	10 to 35
.160 mm	2 to 10

Table 10-2

Grading for Joint Sand ASTM C 144

Sieve Size Natural Sand	Percent Passing
5	100
2.5	90 to 100
1.25	85 to 100
.630	65 to 95
.315	15 to 80
.160	0 to 35

10.5 Edge Restraints

10.5.1 Edge restraints should be installed around the perimeter of all interlocking concrete paving unit areas, as specified by the Owner or Consultant. Edge restraints are available in a variety of materials including:

- plastic
- concrete
- aluminium
- steel
- pre cast concrete
- cut stone

10.6 Execution

10.6.1 Interlocking paving stones will be installed by qualified contractors, including, but not limited to:

.1 Contractors able to provide job references from projects of a similar size and complexity.

10.6.2 Pavers and sand should not be installed under the following conditions:

.1 during heavy rain or snowfall.
.2 over frozen base materials.
.3 over frozen sand or saturated sand

10.6.3 Mock-Ups. Where required by the Owner or the Consultant, a 2 m x 2 mock-up paver area will be constructed. This area will be used to determine surcharge of the bedding sand layer, joint sizes, line(s), laying pattern(s), color(s) and texture of the job.

.1 This area will be used as the guideline by which the work will be judged.

.2 Subject to acceptance by owner, the mock-up may be retained as part of finished work.

.3 If the mock-up is not retained, it will be removed and properly disposed of by the Contractor.

10.6.4 The Contractor shall verify that subgrade preparation, compacted density and elevations conform to specified requirements:

.1 Compaction of the soil subgrade is recommended to at least 98% Proctor density per ASTM D 698 for pedestrian areas and residential driveways. Compaction to at least 98% modified Proctor density per ASTM D 1557 is recommended for areas subject to heavy vehicular traffic. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils.

10.6.5 Mechanical tampers are recommended for compaction of soil subgrade and aggregate base in areas not accessible to large compaction equipment. Such areas can include those around lamps, utility structures, building edges, curbs, tree wells and other protrusions.

10.6.6 The Contractor shall verify that geotextiles, if applicable, have been placed according to drawings and specifications.

10.6.7 Prior to screeding the bedding sand, the recommended base surface tolerance should be ± 3/8 in. (10 mm) over a 10 ft. (3 m) straight edge.

10.6.8 Spread bedding sand evenly over the base course and screed to a nominal 1 in. (25 mm) thickness, not exceeding 11/2 in. (40 mm) thickness. Spread bedding sand evenly over the base course and screed rails, using the rails and/or edge restraints to produce a nominal 1 in. (25 mm) thickness, allowing for specified variation in the base surface.

.1 Do not disturb screeded sand.
.2 Screeded area shall not substantially exceed that which is covered by pavers in one day.
.3 Do not use bedding sand to fill depressions in the base surface.

10.6.9 The elevations and surface tolerance of the base determine the final surface elevations of concrete pavers. The paver installation contractor shall not correct deficiencies in the base surface with additional bedding sand or by other means. Therefore, the surface elevations of the base should be checked and accepted by the General Contractor or designated party, with written certification to the paving subcontractor, prior to placing bedding sand and concrete pavers.

10.6.10 Lay pavers in pattern(s) shown on drawings. Place units hand tight without using hammers. Make horizontal adjustments to placement of laid pavers with rubber hammers as required. Provide joints between pavers between [1/16 in. and 3/16 in. (2 and 5 mm)] wide. No more than 5% of the joints shall exceed ¼ in. (6 mm) wide to achieve straight bond lines.

10.6.11 Joint (bond) lines shall not deviate more than ± ½ in. (15 mm) over 50 ft. (15 m) from string lines.

10.6.12 Fill gaps at the edges of the paved area with cut pavers or edge units. Cut pavers to be placed along the edge with a double blade paver splitter or masonry saw. For vehicular applications, cut pavers should not be less than 1/3 of the original size of the paver. For pedestrian areas and driveways, the cut pieces should be no less than 10 mm wide.

10.6.13 Use a low-amplitude plate compactor capable of at least minimum of 5,000 lbf (22 kN) at a frequency of 75 to 100 Hhz to vibrate the pavers into the sand. Remove any cracked or damaged pavers and replace with new units.

10.6.14 Simultaneously spread, sweep and compact dry joint sand into joints continuously until full. This will require at least 4 to 6 passes with a plate compactor. Do not compact within 6 ft (2 m) of unrestrained edges of paving units.

10.6.15 All work within 6 ft. (2 m) of the laying face must shall be left fully compacted with sand-filled joints at the end of each day or compacted upon acceptance of the work. Cover the laying face or any incomplete areas with plastic sheets overnight if not closed with cut and compacted pavers with joint sand to prevent exposed bedding sand from becoming saturated from rainfall.

10.6.16 Remove excess sand from surface when installation is complete, except when excess joint sand should be allowed to remain on surface to protect pavers from damage from other trades. The Contractor will be responsible for removing excess sand at the completion of construction or as directed by the Consultant.

10.6.17 Surface shall be broom clean after removal of excess joint sand.

10.6.18 Edge restraints should be installed as per the drawings and manufacturer's recommendations, at the indicated elevations.

10.7 Field Quality Control

10.7.1 Surface tolerances on flat slopes should be measured with a rigid straightedge. Tolerances on complex contoured slopes should be measured with a flexible straightedge capable of conforming to the complex curves on the pavement surface.

10.7.2 The final surface tolerance from grade elevations shall not deviate more than ± 3/8 in. (10 mm) under a 10 ft (3 m) straightedge.

10.7.3 Check final surface elevations for conformance to drawings. For installations on a compacted aggregate base and soil subgrade, the top surface of the pavers may be 1/8 to ¼ in. (3 to 6 mm) above the final elevations after compaction. This helps compensate for possible minor settling normal to pavements.

10.7.4 The surface elevation of pavers shall be 1/8 in. to ¼ in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.

10.7.5 Lippage: There shall be no more than 1/8 in. (3 mm) difference in height between adjacent pavers.

10.8 Cleaning, Sealing, and Joint Sand Stabilization

10.8.1 If specified, special cleaners, sealers or joint sand stabilization materials shall be applied in accordance with manufacturer's recommendations.

APPENDIX B

APPLICABLE LEGISLATIONS:

FEDERAL LEGISLATION

The Canada Agriculture Products Standards Act
The Canada Lands Surveyors Act
The Canada Labour Code
The Canada Transport Act
Canada Water Act
Canada Wildlife Act
Canadian Environmental Assessment Act
Canadian Environmental Protection Act
Clean Air Act
Employment Insurance Act
Environmental Contaminants Act
Fertilizers Act
Fisheries Act
Food and Drug Act
Forestry Act
Hazardous Materials Act
Migratory Birds Convention Act
Motor Vehicle Safety Act
Motor Vehicle Tire Safety Act
Motor Vehicle Transport Act
Pest Control Products Act
Plant Breeders' Right Act
Plant Protection Act
Plant Quarantine Act
Quarantine Act
Seeds Act
Transport Act
Transportation of Dangerous Goods Act
Unemployment Insurance Act

PROVINCIAL LEGISLATION

Table of Public Statutes

Abandoned Orchards Act

Aggregate Resources Act

Agricultural and Horticultural Organizations Act

Agricultural Research Institute of Ontario Act

Agricultural Tile Drainage Installation Act

Agriculture and Food Institute of Ontario Act

Apprenticeship and Certification Act

Apprenticeship and Tradesmen's Qualification Act
(See Trades Qualification and Apprenticeship Act)

Architects Act

Bees Act

Boundaries Act

Building Code Act

Cemeteries Act

Condominium Act

Conservation Authorities Act

Conservation Land Act

Consolidated Hearings Act

Construction Lien Act

Consumer Protection Act

Crop Insurance Act (Ontario)

Dangerous Goods Transportation Act

Dog Owners' Liability Act

Drainage Act

Egress from Public Buildings Act

Employers and Employees Act

Employment Agencies Act

Employment Equity Act

Employment Standards Act

Endangered Species Act

Environmental Assessment Act

Environmental Bill of Rights

Environmental Protection Act

Farm Implements Act

Fire Protection and Prevention Act

Fish and Wildlife Conservation Act

Floral Emblem Act

Forest Fires Prevention Act

Forest Tree Pest Control Act

Forestry Act

Highway Traffic Act

Human Rights Code

Labour Relations Act

Lakes and Rivers Improvement Act

Lightning Rods Act

Limitations Act

Line Fences Act

Local Improvement Act

Ministry of Agriculture and Food Act
(See now Ministry of Agriculture, Food and Rural Affairs Act)

Ministry of Agriculture, Food and Rural Affairs Act
(formerly Ministry of Agriculture and Food Act)

Ministry of Colleges and Universities Act
(See now Ministry of Training, Colleges and Universities Act)

Ministry of Energy Act

Ministry of Health Ac

Ministry of Labour Act

Ministry of the Environment Act

Ministry of Training, Colleges and Universities Act

Ministry of Transportation Act

Municipal Act

Municipal Water and Sewage Transfer Act

Niagara Escarpment Planning and Development Act

Oak Ridges Moraine Protection Act

Occupational Health and Safety Act

Ontario Association of Landscape Architects Act

Ontario Heritage Act

Ontario Highway Transport Board Act

Ontario Water Resources Act

Ontario Works Act

Ontario Youth Employment Act
Parkway Belt Planning and Development Act
Pesticides Act
Planning Act
Plant Diseases Act
Professional Engineers Act
Professional Foresters Act
Professional Geoscientists Act
Provincial Parks Act
Public Lands Act
Public Parks Act
Public Utilities Act
Snow Roads and Fences Act
Statute Labour Act
Surveyors Act
Technical Standards and Safety Act
Tile Drainage Act
Topsoil Preservation Act
Trades Qualification and Apprenticeship Act
Trees Act
Truck Transportation Act
Waste Management Act
Weed Control Act
Wilderness Areas Act
Woodlands Improvement Act
Workers' Compensation Act
Workers' Compensation Insurance Act
Workplace Safety and Insurance Act
3 R's Regulations (101/94-105/94)

MUNICIPAL LEGISLATION

The Municipal regulations, ordinances and by-laws vary according to locale. Therefore these are not listed but should be reviewed and abided to by all parties involved in any scope of work pertaining to this and other guidelines.

CHAPTER 11. Dimension Stone

11.1 General

11.1.1 There are many types of stone that are used in the landscape industry for a wide variety of purposes, including water feature construction, shoreline protection, retaining wall construction and as decorative elements. This section deals with the very general principles off stone use only, as each project has it own specific and unique requirements. These specific requirements and construction methods are to be clearly outlined in the specification parameters of the construction contracts.

11.1.2 Related Guidelines and References

.1 Canadian Standards Association
.2 National Building Code of Canada
.3 Ontario Masonry Block Association
.4 Masonry Council of Canada
.5 Ministry of Northern Development and Mines, Ontario Dimension Stone Producers and Processors Directory

11.1.3 The Landscape Architect or Consultant and owner shall agree upon the type and colour of stone to be used. When required, the owner will be provided with a sample of stone that is representative of the type and colour of stone to be used for the project.

11.1.4 Stone should be supplied from a single quarry source with sufficient quantities to provide consistent quality of the specified materials.

11.2 Products

11.2.1 Manufactured Stone: Are stone fragments that are bonded together either with cement or epoxies to create materials resembling stone in appearance.

11.2.2 Natural or Quarried Rock may include but is not limited to:

.1 Granite
.2 Basalt
.3 Limestone
.4 Travertine
.5 Sandstone
.6 Marble
.7 Slate

(A classification and grading note: each different family of stone has its own different grading system, please check with the local quarry or association for the system used in the area.)

11.2.3 Forms of stone: In the industry, stone is often marketed in a number of different forms, usually referring to individual elements:

.1 Rubble: in its purist sense refers to fieldstone, however, it also is used to non-cut stone, which might result from blasting in the quarry.

.2 Ashlar: refers to squared stone. (Usually cut by sawing or chiseling, depending upon the composition of the stone) This stone is available in numerous finishes.

.3 Dimension stone: refers to cut stone, wholly fabricated at the mill, ready for installation.

.4 Flagstone: refers to flat slabs, either sawed, or broken.

.5 Riverstone: are rounded rocks typically found in rivers or streambeds.

.6 Cobblestone: are paving units (usually granite) chiseled or tumbled to roughly rectilinear shapes.

.7 Field Stone: is usually derived from surface deposits.

11.2.4 Glossary:
Footings: wall foundations
Wythes: vertical stacks of stones
Courses: horizontal layers of stones
Stretcher Stones: long stones set parallel to face of wall
Tie Stones: long stones set across courses (width) in wall
Weep holes: through wall drainage holes
Coping: capping of layer stones

11.3 Delivery, Storage and Handling of Product

11.3.1 The Contractor shall be responsible to ensure that the supplier delivers masonry materials to project in undamaged condition.

11.3.2 Wherever necessary, materials will be stored and handled to prevent their deterioration or soiling or damage.

11.3.3 Stone and cementitious materials will be stored on non-staining wood skids or pallets, covered with a non-staining, waterproof cover in a dry location.

11.3.4 All materials shall be placed and stacked on skids or pallets as to evenly distribute the weight so as to prevent breakage or cracking of stones.

11.3.5 Whenever necessary, a protective wooden or equivalent covering shall be placed to protect the stone work and shall be maintained until final inspection the stonework.

11.3.6 The Contractor shall comply with referenced guidelines and other requirements indicated applicable to each type of material required.

11.4 Execution

11.4.1 The contractor shall ensure that when they are cutting and shaping stone, all employees, shall use protective eyewear, hearing protection and other Personal Protective Equipment as required under the WSIB and OHSA.

11.4.2 All stonework shall be carried out by or directly supervised by a skilled stone mason.

11.4.3 Natural flagstone walks and patios

.1 Excavate individually to depth of 5 cm below thickest part of stone
.2 Compact underlying soil
.3 Place stone
.4 Fill Gaps

11.4.4 Patios & Mortared Walks

.1 Excavate to accommodate aggregate base 5 - 10 cm concrete slab 7-15 cm, 5-cm bed of mortar, and the depth of stones
.2 Compact underlying soil & construct concrete forms
.3 Add & compact the aggregate base (preferably 5-cm gravel, then 5-cm sand)
.4 Pour concrete slab & allow it to set & dry
.5 Lay out stones in desired pattern
.6 Build edging if specifications
.7 Apply 5-cm bed of mortar
.8 Proceed to lay stones
.9 Fill spaces between stones with mortar and dress the joints
.10 Clean mortar from exposed surfaces
.11 Keep moist as mortar dries over several days

11.4.5 Aggregate Pathways

.1 Outline (stake) path & establish grade
.2 Excavate to 15-20 cm depth
.3 Tamp underlying soil; install drainage lines and weed barriers if desired
.4 Install edging
.5 Add 7-10 cm coarse aggregate & compact
.6 Add 5-cm coarse builders sand, wet & compact
.7 Add 5 cm of desired aggregate, slightly mounded center
.8 Compact and roll smooth

11.4.6 Laying Stone Wall

.1 If mortared, must use concrete foundation
.2 Use largest stones at base
.3 Local ordinances may require permits and/or inspection

11.4.7 Building a Dry Stone Wall

.1 Concrete footer preferred, but may also use minimum of 15 cm gravel, compacted 95% SPD.
.2 Begin with wider base than top
.3 Slope sides so that stones lean to center of wall
.4 Slope at 1-2” horizontal per vertical foot

CHAPTER 12. Aggregate Bases

12.1. Legislation and Guidelines

12.1.1 Ministry of Transportation of Ontario
12.1.2 OPSS (Ontario Provincial Standard Specifications)
12.1.3 CSA
12.1.4 Aggregate Resources Act

12.2 Product

12.2.1 All aggregate shall be clean, free from organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm and stable base.

12.2.2 The amount of reclaimed or recycled material shall not exceed 50% of the total volume of the aggregate used unless otherwise specified.

12.2.3 Oversized material shall not be incorporated into the base course. See Table 12-1.

12.2.4 Each layer shall be free from pockets of coarse or fine material.

12.2.5 Production of aggregate must meet MTO OPSS 1010 for Granular A, B, C.

12.2.6 Coarse sand shall meet the Ministry of Transportation of Ontario, OPSS 1004.

12.3 Execution

12.3.1 Aggregate shall not be spread and compacted when the atmospheric temperature is less than two (2) degrees Celsius.

12.3.2 No material of any kind shall project above the grade established by the Architect or Engineer at the time of placement of aggregate sub-base or base materials.

12.3.3 Sub-base course shall be free from any rutting or deformations before the placement of the next course.

12.3.4 The layers or windrows of aggregate sub-base or base shall be shaped to a thickness that after watering (if required) and compacting, such that the completed sub base or base shall conforming to the specified grade and cross sectional thickness' within the specified tolerances.

12.3.5 Where the required thickness is 150 mm or less, the aggregate sub-base or base should be spread and compacted in one layer.

12.3.6 Where the required thickness is more than 150 mm, the aggregate sub-base or base shall be spread and compacted in 2 or more layers of approximately equal thickness, so that the maximum compacted thickness of any one layer shall not exceed 150 mm.

12.3.7 The relative compaction of each layer of compacted base material shall not be less than 95%.

12.3.8 The top 15-cm layer of the sub-grade shall be compacted to not less than 100% of the maximum density.

12.3.9 The surface of the finished aggregate base at any point shall not vary more than 6 mm above or below the grader established by the Architect/Engineer or as specified.

12.3.10 Should the sub-base or base course prove to be unstable, the Architect or Engineer shall require the Contractor to stabilize the sub-base or base aggregate by either one or a combination of the following methods:

.1 By the addition of binder or filler. The binder or filler shall be added and thoroughly distributed throughout the aggregate until a homogeneous moisture is obtained.

.2 By the addition of an approved crushed aggregate.

.3 By the addition of emulsified asphalt to the compaction water in the proportions designated by the Engineer.

.4 Any other method proposed by the Contractor and approved by the Engineer.

12.3.11 The final graded level of the aggregate shall not vary more or less than 6 mm from the specified grade or slope when measured in any direction with a 3.3 m straight edge, unless otherwise specified.

12.3.12 The limestone screening course shall be spread and compacted to the depth or thickness' as indicated or specified on the drawings.

12.3.13 Limestone screenings should measure less than 6 mm in all diameters and be 100% crushed

12.3.14 The final graded level of the screenings shall not vary more or less than 3 mm from the specified grade or slope when measured in any direction with a 3.3 m straight edge, unless otherwise specified.

TABLE 12-1

AGGREGATE GRADING REQUIREMENTS ****

Numbers are the Percentage passing by mass through the screen sizes as shown.

MTO SIEVE DESIGNATION	Clear Stone	Granular "A"	Granular "A"	Granular "B" T-1*** Modified	Granular "B" T-2	Granular "C"	Granular "M"
150 mm				100	100	100	100
26.5 mm	100	100	100	47-100	47-100	5-100	
19 mm	90-100	85-100	87-100*				100
13.2 mm		65-90	75-95*				73-97
9.5 mm	0-55	50-73	60-83*				53-82
6.7 mm							
4.75 mm	0-10	35-55	40-60*	25-50	20-55	25-30	33-57
2.36 mm							
1.18 mm		15-40	15-40	10-35	10-40	10-35	13-62
600 um							
300 um		5-22	5-22	5-20	5-22	5-20	3-24
150 um							
75 um		2-8	2-10**	3-8	0-10	3-8	1.5-8.5

* Where the aggregate is obtained from an iron blast furnace slag source.
** Where the aggregate is obtained from a quarry of slag source
*** When Granular "B" is used for granular backfill for pipe subdrains, 100% of the material shall pass the 37.5 mm sieve.

**** Ministry of Transportation of Ontario Lab Test No. LS 602

CHAPTER 13. Landscaping over Rooftops and Structures

Rooftop gardens and landscaping over structure such as parking garages are an opportunity to create green spaces in Ontario. This practice is common in Europe and is becoming more accepted in Ontario.

13.1 General

13.1.1 Environmental Conditions: Landscaped areas on roof slabs and in contained planters are subject to more severe drying conditions, the elements and potential drainage problems than at ground level. To confront these issues growing medium depth and type, drainage system, membrane layers, plant selection, amount of direct and reflected sunlight, watering/irrigation, water storage and maintenance all require special attention.

13.1.2 Reference Publications and Legislation:

.1 Rooftop gardens are considered to be an extension of the roof and are therefore subject to the Municipal By-laws, local zoning, Ontario Building Code and the National Building Code.

.2 If the garden is accessible to the occupants or public then public-issues for handicap access, rail spacing, parapet heights, lights, exits and safety must be addressed.

.3 CMHC Roof Decks Design Guidelines.

.4 ASTM (American Society for Testing Materials) guidelines.

.5 Fire Codes: CAN/ULC-S107 - Standard Methods of Fire Tests of Roof Coverings; National Standard of Canada.

.1 ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.

.6 Geosynthetic ASTM's : D-4632/4595/3786/4833/4533/4355/4751/4491/5621

.1 CCMC - Technical Guide for PVC Sheet Waterproofing (Exposed to Light Pedestrian Traffic); National Research Council, Canada Construction Materials Centre (CCMC).

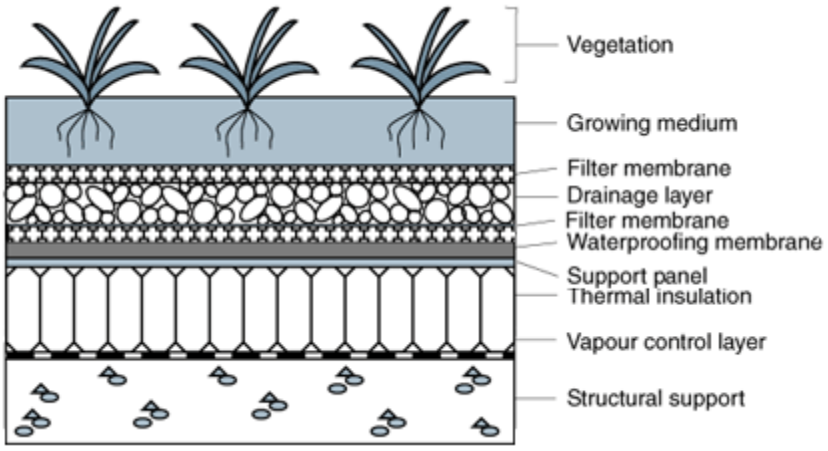
.2 CGSB 37-GP-54 M - Roofing and Waterproofing Membrane, Sheet Applied, Flexible, Polyvinyl Chloride; Canadian General Standards Board.

.3 CGSB 37-GP-55M - Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane; Canadian General Standards Board.

.7 National Building Code of Canada Compliance: Comply with National Building Code of Canada 1995, Part 9, Clause 9.26.2.1(1)(h)

.8 See Appendix "B" for other applicable legislation.

Principle Component Layers of a Rooftop Garden



13.1.3 Scheduling: Hoisting and moving of soil, plants and drainage material onto or through buildings structures should be carefully coordinated with tenants and other trades on-site. All required permits and if applicable, building permits, shall be obtained.

13.1.4 Load Capacity: Weight is the primary limiting factor for most roof garden or structural designs. Therefore the design of landscaped areas over structures shall be such that loading is not in excess of the design loading for the structure. Hoisting and moving drainage material on structures shall be managed so as to avoid excessive loading. Both the intended landscape design loading and loading during construction shall be reviewed, approved and documented by a structural engineer.

13.1.5 Growing Medium Depths and Volumes: The minimum recommended depths for growing medium over structures is shown in Table 13 - 1. Designs should take into account the effect of on soil moisture-holding capacity small depths and volumes. Small, narrow or shallow planters will dry out very quickly and require extra care in plant selection, irrigation design, monitoring and maintenance.

Table 13-1: Minimum Growing Medium Depths after Settlement For On-Slab Applications, Including Roof Decks and Interiors

Irrigated lawn areas	150 mm (6")
Non-irrigated lawn areas	225 mm (9")
Planting areas:	
• ground cover areas	225 mm (9")
Shrub areas:	
• small shrubs	300-500 mm (12-20")
• large shrubs	500-900 mm (20-36")
Tree pits	
• small to medium trees	450-900 mm (18-36")
• large trees	900-1200 mm (36-48")

From: CMHC Roof Decks Design Guidelines

13.1.6 Growing Medium Properties: The growing medium consists of a specialized soil mix. The growing medium layer must be able to retain moisture and must provide firm anchorage for plant roots, supply the plants with essential nutrients and allow gaseous exchange.

.1 Growing medium for roof slabs and contained planters shall be designed to avoid plugging or caking at the filter cloth, and should therefore be low in content of fines (silts and clays). This layer should not become easily compacted, which could lead to acidification of the soil and ultimate degeneration of the plants.

.2 Growing medium properties shown in Table 5-1. for "High Traffic Maintenance Levels" may be applicable for use on roof slabs and in contained planters, amended for planting areas by increasing the content of organic matter to 14-20%. The organic matter may be present in a homogenous mixture with the mineral components or may be contained within the top 20 cm of growing medium.

.3 European List: The physical and chemical properties of the growing medium satisfy relevant FLL guidelines for the chosen material. (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau E. V., Ausgabe 1995: Research Association for Landscape Development and Landscape Construction) Table 13-2

Table 13-2

	Extensive Soil		Intensive Soil		Drain Material
	one layer	multi-layered	soil mixture	bulk material mixture	
PHYSICAL PROPERTIES					
Water retention (compressed condition)	min. 25%	min. 35%	min. 50%		min. 15% (without water damming)
Water permeability (compressed condition)	min. 60 mm/min	min. 0,6 mm/min	min. 0.3 mm/min		min. 180 mm/min
Air Content (Fully Saturated)	min. 25%		min. 15%	min. 20%	
Weight (density) (fully saturated)	0.8-1.4 g/cm^3	1.0-2.2 g/cm^3	1.4-2.2 g/cm^3	1.0-1.8 g/cm^3	0.8-1.8 g/cm^3 dependent on the material
CHEMICAL PROPERTIES					
pH-value	6.5 – 9.5	6.5 – 8.0	6.5 – 7.5		6.5 – 8.0
Salt content of water extract (recommended, if possible)	max. 1 g/liter				
Initial organic matter	3-8%		3.6%	6-12%	
Nitrogen (N) slightly soluble	max. 60 mg/liter		max. 60 mg/liter		
Phosphorous (P_2O_5)	max. 150 mg/liter		max. 200 mg/liter		
Potassium (K_2O)	min. 150 mg/liter		min. 150 mg/liter		
Magnesium (Mg)	max. 120 mg/liter		max. 120 mg/liter		

13.1.7 Protection of Waterproofing: All slab areas, walls and other surfaces to receive growing medium shall have an impermeable surface / waterproof membrane with a protective cover (protection board).

13.1.8 Drainage: All soil areas on-slab shall be adequately drained by the following methods: layers are designed to store water for plant use and regulate water runoff. Selection of material based on structural load capacity of roof or structure, vegetative selection, water permeability, storage capacity.

13.1.9 Drainage layer, consisting of, a manufactured product specifically designed for slab drainage or minimum 100 mm depth (4") of round drain rock.

.1 The drainage layer shall be installed immediately over the protective cover and separated from the growing medium with a filter fabric/geosynthetic textiles.

.2 Filter fabric /geosynthetic textiles shall be designed or selected to meet the strength, durability and permeability requirements of each application.

.3 Recommended minimum average roll test values for filter fabrics/geosynthetic textiles for on-slab installations are:
Table 13-3

Puncture	ASTM-D-4833	0.240 KN
Mullen Burst Strength	ASTM-D-3786:	greater than 1275kPa
Apparent Opening Size	ASTM-D-475 1:	212 um
Permittivity	ASTM-D-449 1:	2.1 sec,-'
Flow Rate	ASTM-D-4491:	6300 I/min./M2

.4 The filter fabric/geosynthetic textiles shall be selected and designed to withstand wear and tear during construction without deterioration of its strength and or filtering properties. Where substantial traffic is envisioned over the filter fabric/geosynthetic textiles during construction a heavier, more durable fabric with high permittivity and flow rate should be selected.

.5 Deck drains and planter drains where required to collect excess water. Bi-level drains should be used where appropriate to accept water at both the surface paving and the waterproofed membrane level. Drains shall be adequately protected to prevent soil particles and roots from entering the drain.

.6 All drains should be accessible for inspection and cleaning via a capped cleanout riser to finish grade. All slabs shall have a sufficient slope to ensure runoff to drain.

.7 Deck drains may not be required immediately beneath the growing medium, provided that the excess water collected in the drainage layer beneath the growing medium is directed to flow out of the soil area to deck drains located outside the soil area.

.8 Manufactured drainage panels with filter fabric specifically designed for on-slab drainage shall be installed such that a continuous drain course is established.

13.1.10 Design Conditions: Structural considerations such as: wind load drag on trees, stress reflected heat, rapid winter freezing, snow load, medium and plant weight are important factors.

.1 Designs over slab may require earth forms and finish grades that could result in excessive loading on the structural slab if the full depth consisted of growing medium.

.2 Lightweight materials may be incorporated as voiding to reduce loading.

.3 Voiding materials shall be of sufficient compressive strength to resist deformation and settlement due to the weights of growing medium, traffic, plants, water and other forces.

.4 Voiding materials shall resist decomposition and shall not absorb more than 4% water by volume at any time.

.5 Materials commonly used for voiding are solid blocks or clean formed "seedling trays" of expanded polystyrene (EPS) which has a uniform cellular structure and is free from voids resulting from un-expanded components.

.6 Where voiding materials are specified or approved for use, they shall be arranged and installed such that the movement of water through the growing medium, filter fabric, voiding and drainage course to the drains is not impeded.

13.1.11 Watering: Due to rapid drainage in the growing medium, absence of a water table, finite amount of soil, and exposure to the climatic conditions, soil areas on-slab will require more frequent watering than at ground level.

.1 A water supply should be conveniently located near all planting areas. An automatic irrigation system with drip emitter should be installed to serve all planted areas on slab, to ensure consistent watering and prevent plant losses due to drying.

13.1.12 Monitoring and Maintenance: Landscape over structures requires a higher level of monitoring and maintenance than other landscape areas. Maintenance practices as stated in Section 16, Landscape Maintenance Level 1 is often appropriate for landscapes over structures.

CHAPTER 14. Irrigation

14.1 General

14.1.1 Successful irrigation system design and construction consists of providing an assembled and installed sprinkler system which will operate in an efficient and satisfactory manner, encouraging good water management, uniformly irrigating all designated areas and proving satisfactory to the owner.

14.1.2 New systems

.1 Obtain or prepare a scaled design of the proposed irrigation system.

.2 Supply and install the components required to provide a properly operating, irrigation system to efficiently irrigate the applicable landscape.

14.1.3 Existing Systems

.1 Locations of points of joining between the removal work, shut-off valves and existing system shall be recorded on the as-built drawing.

.2 All sprinkler heads, valves and equipment within the limits of the work shall be salvaged where possible.

.3 Piping shall not be abandoned in place.

14.1.4 Quality Assurance

.1 A qualified irrigation designer shall design the system for the efficient and uniform distribution of water.

.2 All irrigation work shall be done by a suitably experienced and qualified irrigation contractor, having trained, competent and proficient personnel.

.3 The contractor shall ensure compliance with all relevant codes municipal rules and regulations relating to any portion of the work, in the design and during the installation phase.

.4 The contractor shall obtain all the required permits and licenses applicable for the work to be performed.

.5 The landscape architect, irrigation designer or representative shall perform at least three site reviews during the system installation, during initial layout, at 50 per cent completion and at final acceptance, to check for adherence to the design specifications.

.6 The contractor shall thoroughly test the completed system to verify that the system operates according to the design criteria.

.7 A final site review shall be conducted within a reasonable time period following the installation and completion of the system. The review shall check the performance of the system for conformance with local requirements and design intent.

14.1.5 Guarantee or Warranty

.1 It shall be the Contractor's responsibility to insure and guarantee complete balanced coverage of the areas shown on the drawings to be irrigated, without excessive overthrow. Plant and turf areas should be watered separately where possible to meet their specific water requirements.

.2 The Contractor shall also guarantee the satisfactory operation of the entire system and the workmanship and restoration of the work area.

.3 The entire system shall be guaranteed to be complete and efficient in every detail for a minimum period of one year from the date of its acceptance and will include initial start-up and end-of-season shutdown of the system.

14.1.6 Submittals

.1 A suitably scaled as built drawing shall be provided.

.2 All components of the irrigation system shall be shown as installed. The dimensional locations of the following should be indicated:

.1 all valves
.2 main and distribution lines
.3 plugged tees
.4 routing of control wires
.5 controller and its circuit breaker
.6 main water connection
.7 blow out connection
.8 pump and its connections
.9 back flow prevention assembly
.10 flow and rain sensors
.11 electrical conduits
.12 sleeves
.13 and any other similar features

.3 The Owner shall be provided with clear instructions and printed material pertaining to the operation, scheduling and maintenance for the system.

14.1.7 Site Conditions

.1 Verify and mark the location of all site elements, utilities, existing mechanical, paving and other similar conditions which may affect the installation or operation of the irrigation system. Removal of buried debris, which impedes the proper installation of the irrigation system as designed, will be the responsibility of the Owner.

.2 The contractor shall report to the Owner or the consultant, any deviations or adjustments between drawings, specifications and the site. Any changes are to be made, in accordance with the appropriate provision once a change has been approved. (See Alternate Materials)

.3 Protect from damage as necessary all existing structures, buildings, equipment, materials, utility installations, work in progress and the work of other trades.

.4 Ensure that sequencing of work is coordinated with other trades.

14.1.8 Alternate materials

.1 No substitutions will be permitted which the Owner has not approved in writing. Sufficient descriptive literature or samples must be furnished for any materials submitted as "equal" substitutes.

.2 Alternate materials must be, and remain compatible with the original materials, in performance and other characteristics so as not to compromise the intent of the design.

.3 Alternate materials shall be installed according to manufacturer's recommendations.

14.2 Design

14.2.1 The system design must consider:

.1 water conservation
.2 durability
.3 efficiency and uniform distribution of the water
.4 safety issues
.5 aesthetic issues
.6 site-specific requirements:
  .1 soil type
  .2 slope
  .3 root depth
  .4 plant materials
  .5 microclimates
  .6 weather conditions
  .7 water source
  .8 plants watered separately from turf
  .9 sun and shade areas watered separately
  .10 time of day to operate irrigation system
  .11 site usage (i.e. commercial vs. sports area vs. residential use)

14.2.2 To ensure that the irrigation system will meet the above criteria, the irrigation designer shall:

.1 Obtain direct knowledge of site conditions to generate a design.

.2 Meet all applicable local codes including plumbing and electrical.

.3 Specify manufacturer, model, type, and size of all components to eliminate uncertainty at construction and facilitate management of the system.

.4 The selection of pipe, electrical wire and other materials shall be based on environmental conditions and irrigation system design principles

14.2.3 Follow the recommendations of the flow rate guidelines:

.1 The maximum allowable pressure loss through the meter shall be less than 10% of the static pressure at the meter.

.2 The maximum flow rate through the meter shall not exceed 75% of the maximum safe flow rate through the meter.

.3 Select pipe sizes so that the velocity of water moving through the irrigation pipe does not exceed the industry guideline of 1.52 metres per second.

.4 Selected components will strive to keep the sprinkler precipitation rate below the infiltration rate of the soil.

.5 The pressure variation within each zone from the first to the last head must not exceed fifteen (15%) percent.

14.2.4 Sprinklers

.1 All sprinklers must be suitably adjustable and located in order to keep the water within the target area and minimize overthrow.

.2 Sports fields and public parks sprinklers shall be equipped with rubber covers in turf areas.

.3 All heads of a particular type and function in the system and each station shall be of the same manufacturer and shall be marked with the manufacturer ’s name and identification, in such a location that they can be identified without being removed from the system.

14.2.5 Pipe

.1 Selection of the strength and flexibility of the pipe material and its installation criteria must be considered for site-specific requirements.

.2 Polyethylene piping under continuous pressure or larger than 3.175 cm shall be double clamped.

14.2.6 Zoning (Stations)

.1 All sprinklers grouped into a zone shall have matched precipitation rates.

.2 Areas of the landscape that have different water requirements should be identified and a determination made whether separate zoning is required.

14.2.7 Controllers

.1 Controllers must be C.S.A. approved and allow for optimum operation of the designed system.

.2 Rain shut-off devices are required for all systems.

.3 Rain sensors or other water management devices are recommended.

14.2.8 Winterizing

.1 All irrigation systems located in freezing climates must be drained to avoid damage. This may be accomplished by:

.1 Grading all piping to designated low points, with drain valves installed in valve boxes having a gravel drainage sump.

.2 The installation of the required adaptor to the irrigation mainline such that an air compressor maybe utilized. Air compressors to be 125 cfm for residential systems, 185 to 250 cfm for commercial systems and over 300 cfm for golf course applications, or as required.

14.2.9 Backflow Prevention

.1 When the water supply is from a potable water service, an approved backflow prevention device must be installed at the source, in accordance with the local plumbing code.

14.2.10 Lightning and Surge Protection

.1 For large open field sites where the controllers are mounted outdoors, the contractor shall install lightning surge arrestors and ground rods to the manufacturer 's and local electrical codes specifications on the satellite controllers.

14.3 Materials

14.3.1 General

.1 All materials used in the system shall be new, without flaws or defects of any type and shall be the best of their class and type.

.2 All material shall have a minimum guarantee of one year against material defects or defective workmanship.

.3 All materials and equipment shall be installed in an organized manner following the manufacturers recommendations.

.4 All pipes shall be handled in accordance with the manufacturer 's recommendations on loading, unloading and storage.

.5 See Pipe Guidelines, Schedule 14-S1.

14.3.2 Controllers

.1 All controllers shall be C.S.A. or Ontario Hydro approved for use in the mounting location selected.

.2 Controller shall be grounded as per the uniform building codes and the controller installation detail.

.3 The minimum features the unit should offer are:

.1 The controller shall have independently programmable run time for each station. It shall have a minimum of three start times per day schedule. The controller programming shall be capable of a 7-day weekly, interval day or odd/even day schedule.

.2 Rainy weather shutdown mode as well as an automatic device to be fitted to prevent watering during or just after a rain fall.

.3 The irrigation system controller shall be a microprocessor based/micro electronics solid state type, capable of fully automatic or manual operation of the system or controlled by a central computer.

.4 Controller station operation shall be sequential, or as per the most efficient watering method for each station.

.5 The controller shall have a factory preset backup program for standby operation in the event of program loss and a rechargeable battery backup to maintain program during power loss.

.6 The controller shall have a seasonal global adjustment in a minimum of 10% increments + or – to allow for the schedule to be reset without altering the original program yet adapting to seasonal weather requirements.

. 4 A site map and schedule, providing information about the sequencing of the system, shall be posted inside the control cabinet.

14.3.3 Outdoor Control Enclosure

.1 All automatic sprinkler controllers installed on the outside of a building shall be mounted within a CSA approved vandal resistant enclosure.

.2 The outdoor automatic controller enclosure shall be of appropriate size to adequately house the specified controller and all required central control equipment.

14.3.4 Wire

.1 All wire shall be sized and specified as shown in the design and as per irrigation design guidelines.

.2 All power wires, wiring and its associated components shall conform to local codes.

.3 White wire shall only and always be used as the common wire; and other coloured wires for the power wire.

.4 All connectors shall be C.S.A. approved for watertight application and installed according to the manufacturer recommendations.

14.3.5 Tracer Wire

.1 On large piping systems, where directed, tracer wire shall be covered by a detectable underground utility marking tape with a minimum overall thickness of 4.85 millimetres and blue in colour.

14.3.6 Backflow Prevention Devices

.1 All devices used must be C.S.A. approved for the application and must meet or exceed the local plumbing requirements and the manufacturer 's recommendations.

14.3.7 Pipe- Polyethylene

.1 All pipe shall be in new condition, extruded from virgin materials and free from visible cracks, dents, hole or foreign materials and permanently marked with the manufacturers name, material, size, and pressure rating, nominal pipe size, schedule or class, pressure rating and date of extrusion.

.2 All pipe must be a series rated for a pressure equal to or greater than the maximum water pressure to be encountered in the irrigation system.

.3 All polyethylene pipe connections shall use stainless steel clamps.

14.3.8 Pipe- Poly Vinyl Chloride (PVC)

.1 All pipe shall be in new condition, extruded from virgin materials and free from visible cracks, dents, hole or foreign materials and permanently marked with the manufacturers name, material, size, and pressure rating of a minimum 160 psi, nominal pipe size, schedule or class, pressure rating and date of extrusion.

.2 All plastic pipe fittings to be installed should be schedule 40 molded fittings manufactured from the same material as the pipe and shall be suitable for solvent weld, slip joint ring tight seal, or screwed connections.

14.3.9 Fittings

.1 All fittings shall be injection molded of an approved P.V.C. compound featuring high tensile and impact strength and chemical resistance.

.2 Where threads are required in plastic fittings, these shall also be injection molded and suitable for solvent welding or threaded connections.

.3 Fittings for Polyethylene pipe may be compression style or insert fittings with strength at least equal to the pipe used, complete with stainless steel clamps. Fittings used shall be of a type recommended by the pipe manufacturer.

.4 All threaded connections shall be Teflon taped.

.5 Nipples shall be Schedule 80 with molded threads.

.6 All P.V.C. slip fittings shall be minimally Schedule 40 P.V.C.

14.3.10 Thrust Blocks

.1 Thrust blocking shall be used on all irrigation mainlines 7.5 cm diameter and larger or as per accepted irrigation industry guidelines.

.2 All changes in pipe direction must be thrust blocked according to manufacturer 's recommendations.

14.3.11 Valve Boxes

.1 All valve boxes shall be in new condition of the size and type as shown in the design or an approved equal.

.2 All manual and automatic valves shall be enclosed in proper irrigation high impact plastic valve boxes of a size as required to permit for service purposes.

.3 All valve access boxes shall be installed on a suitable base of gravel for proper foundation and proper drainage of the box. Unless otherwise specified, all valve access boxes shall be provided with proper length and size extensions, to bring the valve boxes level with the finished grade.

.4 Valve boxes should be aligned at right angles to adjacent hardscaping whenever possible. Where several valve boxes are located in the same area, arrangement should be in a uniform and orderly fashion, with a minimum 25-cm allowance between valves and boxes.

14.3.12 Sleeving

.1 Sleeving material shall be series minimum 1220-160 P.V,C. -160 psi plastic pipe unless otherwise specified.

.2 Sleeving shall be twice the size of the pipe being protected.

.3 Providing the sleeves are buried with selected fill to the minimum depths described in Table 14-1.

.4 Separate sleeves must be provided for all electrical wiring.

14.3.13 Pumps

.1 Wiring of the pump and all related electrical switch gear shall comply with the local electrical codes, including the installation of a disconnect within 1.5 metres of the pump control box.

.2 The electrical disconnect shall be mounted in such a fashion as to permit operation without reaching over the pump motor.

14.4 Installation

14.4.1 General

.1 Prior to beginning installation, the contractor shall contact all appropriate utility companies to locate all underground utilities. The contractor shall not begin installation until all such utilities are located and clearly marked.

.2 Prior to installation, the exact location of all components shall be coordinated with planting locations to avoid conflict and damage during the course of the work.

.3 All sprinkler locations are to be staked and grades checked for all components. Adjustments to the design should be as necessary to suit the existing site conditions and grade before proceeding with the work.

.4 Where changes from the design are required the as-built shall reflect such changes.

14.4.2 Pipe

.1 Each pipe shall be inspected prior to installation with the removal of any dimpled or damaged sections.

.2 Pipe shall be laid in a straight line between fittings. Where required, tracer wire shall be placed on top of all distribution mains and pipe under constant pressure.

.3 All lines shall have a minimum clearance of 10 cm from each other and 25 cm from lines of other trades.

.4 Irrigation piping shall not occupy same trench with piping or conduits of any other utility or service.

.5 Parallel lines are not to be installed directly over one another.

.6 When two pipes are to be placed in the same trench provide not less than 12 cm space between pipes.

.7 All solvent welding is to be done in compliance with the manufacturer's recommendation solvents and methods as recommended except where threaded connections are utilized. The solvent weld joints should be made according to Schedule 14-S2.

.8 Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturers, along with the installation of concrete thrust blocks where the pipe changes direction.

14.4.3 Valves and Valve Boxes

.1 All valves shall be installed parallel to grade with flow control handles facing upwards and centered in the box.

.2 All valve boxes shall be installed with adequate clearance above the pipe and be supported on a type of gravel material base to support the weight of expected traffic so as not to contact the pipe with settlement or upon being depressed.

.3 Minimum valve box size recommendations are:

10 inch round	One 37 mm or Two 25 mm valves
Normal rectangular	Two 37 mm or Three 25 mm valves
Jumbo rectangular	Three 37 mm or Four 25 mm valves

14.4.4 Sprinklers

.1 All pop-up sprinklers with an inlet of one inch (1") (25mm) or larger, shall be connected to the pipe by an adjustable swing pipe/joint assembly that is sized to meet the flow requirements of the sprinkler and relative to grade as per the manufacturer's recommendations.

.2 All sprinkler heads and turf valves shall be set perpendicular to finished grades and not higher than any adjoining hard surface from which there must be at least a 5 cm separation to allow for edging unless otherwise designated on the drawings or as specified.

14.4.5 Wire

.1 All wiring shall be installed to meet local electrical codes.

.2 Sizing of wire shall be in accordance with manufacturer's recommendations.

.3 All wiring shall be protected by being bundled and taped at 3 metre intervals and installed beneath the irrigation piping or in an appropriately sized conduit.

.4 All wire splices shall be contained in a valve box.

.5 Extra wire shall be neatly coiled and left in each valve box such that the splice may be lifted 30cm above grade.

.6 White wire shall only be used as the common wire and other colours used shall be consistent from valve to controller.

.7 All visible low voltage wire shall be enclosed in electrical conduit.

.8 Direct burial wire may be trenched or placed in a common trench beneath irrigation pipes, or laid, but not pulled with a vibratory plough, and should have a minimum soil cover of 25 cm. Provisions shall be made for expansion and contraction of all direct burial wire, including protection from foreign objects.

.9 All electrical wire connections to remote control electrical valves and splices in the field shall be soldered or completed with a wire connector that are specifically designated for low voltage in ground irrigation use.

14.4.6 Controller

.1 All 110 volt wiring to the controllers shall be enclosed in P.V.C. electrical conduit or completed with BX cable.

.2 The controller shall be firmly mounted with all wiring done in the controller or an approved junction box as per the manufacturer specifications.

.3 The unit must be grounded in compliance with the manufacturer 's recommendations and the local electrical code.

.4 Stations shall be wired in a logical sequence and an irrigation schedule shall be placed in the control box with each station clearly identified in relation to site.

14.4.7 Sleeving

.1 All sleeving in soil shall be installed and backfilled with the same considerations for protection of the material as if it were water pipe. Compaction shall be to the same guideline as the adjoining undisturbed soil and the sleeves shall project at least 25 cm on either side of the hard surface being crossed.

.2 Sleeving being installed across roads, walks or driveways for future use, shall have the necessary pipe installed at the same time with each end elbowing to at least 90 cm above grade

.3 When it is not possible to install sleeving, the water pipe shall be either Schedule 40 PVC, SDR 11 High Density Polyethylene (HDPE) or Series 160 Polyethylene.

14.5 Excavation and Backfilling

14.5.1 General

.1 The following coverage to finished grade is required over the piping. Depths over piping may be greater in colder climates.

Table 14- 1

	MINIMUM COVERAGE DEPTHS OVER PIPING (cm)
Lateral pipes less than 4 cm diameter	30
Lateral pipes 4-7.5 cm diameter	45
Lateral Pipes over 7.5 cm diameter	60
Pipe for Mains and Supply Lines	60
Control Wires or Tubing	45
Under Asphalt Roads	90

.2 Trenches for all pipes should be straight with a level, uniform grade with firm base and wide enough to provide free working space around the work and to provide abundant space for backfilling and tamping.

.3 Backfill the trenches shall be performed in 15 cm layers with tamping to ensure that the compaction of the trench is equal to that of the surrounding undisturbed areas.

.4 Backfill material shall be free of rocks and/or other unsuitable materials, which could damage the pipe or create unusual settlement problems

.5 Trenches shall be at least 30 cm away from paving stone or other hard surfaces to avoid undermining such surface or its edge retention.

.6 Trenches located under areas where paving or concrete will be installed shall be backfilled with sand and compacted in layers to 95% compaction. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil.

.7 All trenches shall be left flush with the adjoining grade.

.8 All trenches that are opened during the working day shall be closed and backfilled the same day.

.9 Vehicle wheels shall not be used for compacting soil.

14.5.2 Pulling

.1 Where soil conditions allow the pipe depths of cover described in table 14-1 are met, the piping may be installed by use of a vibratory plough.

.2 The feed blade must be equipped with a minimum bullet diameter 1.5 times the outside diameter of the pipe to be installed. The interior of the pipes shall be kept free from dirt and debris.

.3 Contractor shall be responsible for the restoration of the site to its original condition, including responsibility for damage to existing trees, shrubs, and structures, along with settlement of trenches within the warranty period.

14.6 Site Maintenance and Protection

14.6.1 The job site shall be kept in a neat, clean, and orderly condition at all times during the installation process.

14.6.2 All refuse, debris and excess materials shall be regularly removed from the site and properly disposed of.

14.6.3 Trenching, laying pipe and backfilling shall be continuous so that the amount of open trench is minimized.

14.6.4 Any open trench or other excavations shall be barricaded. The Contractor shall securely cover or barricade all opening into the section of the system he is working on and components of the system as it is being installed.

14.6.5 The Contractor shall adequately protect adjacent property as provided by law and shall provide and maintain all passage-ways, guard fences, lights and other facilities for protection.

14.7 Testing and Maintenance

14.7.1 Inspection

.1 Upon completion of the irrigation system installation, all components shall be adjusted so as to optimize the operation of the system and allow for final inspection and testing.

.2 Inspection will be carried out with the consultant or owner's representative present to ensure that the work has been completed according to specifications, and meets the intent of the installation guidelines.

14.7.2 Testing

.1 Upon completion of the irrigation system and after sufficient time has been allowed for solvent weld joints to cure, the entire system shall be tested for proper operation. All air will be flushed from the system and all components will be checked for proper operation.

.2 The test will require that the system be operated sequentially with the controller, in the presence of the owners' representative.

.3 The purpose of the test is to ensure that the system adequately covers the landscape to be irrigated and meets the design criteria.

.4 Where required, main line pipes may be tested with air pressurized to twice normal operating pressures and observed over a period not less than 3 hours to determine that pressure losses have not exceeded 5 percent of initial pressure setting.

14.7.3 Deficiencies

Any deficiencies noted during any inspection and testing will be rectified promptly and signed off by the owner's representative.

14.7.4 Maintaining the Irrigation System

.1 A periodic maintenance contract for spring start up, winterization, recommended irrigation schedule, inspection and reporting performance conditions to the end-user (or owner) of the irrigation system, should be established.

.2 Periodically review the system components to verify that the components meet the original design criteria for efficient operation and uniform distribution of water. See Schedule 14-S3.

.3 Ensure that the replacement hardware used for system repairs matches the existing hardware, and is in accordance with the design.

.4 As plant material matures, additional sprinklers or other hardware maybe required to compensate for blocked spray patterns or changes in the irrigation needs of the landscape. Rescheduling may also be required to meeting the changing landscape's water requirements.

.5 As a base minimum guideline, an irrigation schedule should reflect a twice-daily cycle scheduled for every second day. Setting spray head zones for 7 minutes and rotary zones for 25 minutes per cycle to allow for .15 inches of precipitation during each application assuming proper design guidelines have been adhered to.

.6 A dedicated irrigation system water meter should be installed to monitor total water consumption of the irrigation system.

SCHEDULE 14-S1

Guidelines

The following are ASTM (American Society for Testing and Materials) guidelines that are applicable:

ASTM D-1784 or D-2241 to meet the requirements of cell classification 12454B for pipe and fittings.

ASTM D2239 (ANSI B72.1): Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR)

ASTM D1785 (ANSI B 72.7): Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

ASTM D2241 (ANSI 72.2): Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)

ASTM D2466: Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

ASTM D2564-36A (ANSI B72.16): Standard Specifications for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

ASTM D2855 (ANSI K65.55): Standard Recommended Practice for Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

SCHEDULE 14-S2

Solvent Weld

.1 With a clean dry cloth thoroughly clean the mating pipe and fitting.

.2 Using an approved applicator apply a uniform coat of solvent primer to the outside of the pipe.

.3 In a similar manner apply solvent primer to the inside of the fitting.

.4 While the primer coat is still wet and tacky to the touch, apply a light coat of cement to the outside of the pipe and the fitting interior.

.5 Insert the pipe to the full depth of the fitting socket.

.6 Give the pipe or fitting a quarter turn to evenly distribute the solvent.

.7 Hold in position for 10 seconds.

.8 Use a clean rag and wipe off any excess solvent.

.9 Allow at least 15 minutes for curing of all welded joints before moving or handling and at least 24 hours before water is allowed in the pipe.

.10 Care should be taken so as not to use an excessive amount of solvent, which may cause an internal obstruction to form.

.11 In colder to extreme heat temperature conditions, the speed of the solvent welding process will vary and the primer application (steps .2 and .3 above) should be examined to ensure that it is still wet when cement coat is applied.

SCHEDULE 14-S3

Maintenance

.1 Maintenance procedures should include but are not limited to the following:

.2 Check that:

.1 the backflow prevention device is working correctly.

.2 the water supply and pressure are as outlined in the design.

.3 the pressure regulators are adjusted for the specified operating pressure.

.4 the operation of the controller is as designed. Confirm the correct date, time and replacement of the back-up battery. Reschedule frequently according to changes in seasonal weather patterns.

.5 that all sensors used in the irrigation system are working properly and are within their calibration specifications.

.6 that heads are properly adjusted – nozzle size, arc, radius, level and altitude with respect to slope.

.3 Adjustment of:

.1 valves for proper flow and operation.

.2 valve flow regulators for desired closing speed.

.3 Examination of all filters and cleaning of all filtration elements as required.

.4 Repair or replacement of any broken hardware and pipe.

.5 Restoration of the system back to its design specifications, if necessary.

.6 Notification of the owner of any changes from the original design.

.7 All repairs shall be tested.

CHAPTER 15. Landscape Lighting

15.1 General

15.1.1 Landscape lighting consists of the installation of a lighting system to efficiently light areas as detailed in the specification documents. Unless specified otherwise, the construction of the lighting system shall include the furnishing, installing, testing of all lighting equipment, hardware and the restoration of the site to its original condition.

15.1.2 Landscape lighting is used for, but not limited to:

.1 Walkways
.2 Roadways
.3 Equipment yards
.4 Parking lots
.5 Outdoor security
.6 Decorative effects including, but not limited to:
  .1 architectural
  .2 flag and monument lighting
  .3 illumination of trees, bushes, etc.

15.1.3 Electrical work and installation shall be in accordance with to the prevailing codes.

15.1.4 Equipment specifications and installations procedures shall be followed according to prevailing codes and manufacturer's recommendations.

15.1.5 The contractor shall be aware of all utilities servicing the property, and provide written notification pertaining to location of property lines and utilities on the property.

15.1.6 Prior to the commencement of any work, it will be the responsibility of the contractor to notify the appropriate utility companies to make arrangements for cable and utility locations.

15.1.7 The contractor shall maintain sufficient protection from all work-related damage at the Client's and adjacent property.

15.1.8 The contractor shall report to the Client any deviations between drawings, specifications and the site.

15.1.9 Upon completion of the work, the contractor shall prepare an updated as-built drawing that should be proportionally and diagrammatically correct of the system indicating the locations of:

.1 Controller
.2 Fixtures
.3 Junction Box
.4 Transformers and Remote Ballast Boxes
.5 Wire Run
.6 Sleeves under hard surfaces

15.2 Legislation and Regulations

15.2.1 All local and municipal rules and regulations relating to any portion of work shall be incorporated into the specifications and the provisions shall be carried out by the contractor. Information contained in the specifications shall not be construed to conflict with any of the above mentioned regulations or requirements of this guideline. Where a conflict may arise, the regulations of the governing code shall be adhered to. Nevertheless, should these specifications and/or drawings specify materials, workmanship or construction of a better quality; these shall take precedence over the requirements of this guideline.

15.2.2 C.E.C. in this guideline refers to the Canadian Electrical Code Book. All rules noted refer to rules in the C.E.C. Book and the E.S.A. (Electrical Safety Authority)

15.2.3 Any permit for the installation or construction of any of the work which is required by any of the legally constituted authorities having jurisdiction, shall be obtained by the contractor. Where inspection of the lighting system work or portions thereof, is required to be performed, the Contractor shall notify the Owner of the time when such is required.

15.2.4 All 120 Volt connections and electrical panel hooks ups shall be performed by, or under the direct supervision of, a licensed electrician.

15.3 Materials

15.3.1 All fixtures installed in the Landscape Lighting System shall meet CSA guidelines and must be suitable for outdoor installation.

15.3.2 All materials shall be new, without defects and shall be the finest grade of their category.

15.3.3 Sufficient descriptive literature and/or samples must be furnished to the owner, for approval, for any materials submitted as ‘equal’ substitutes.

15.3.4 Types of lamps used, but not limited to:

.1 Fluorescent
.2 High Pressure Sodium
.3 Incandescent
.4 Low Pressure Sodium
.5 Halogen
.6 Mercury Vapour
.7 Metal Halide
.8 Neon

15.3.5 Guarantee

.1 The entire lighting system, unless otherwise noted, shall be guaranteed to be complete as per specifications in every detail for a period of one (1) year from the date of its acceptance.

.2 All landscape lighting systems shall be maintained by the installing company for a period of one (1) year after the date of installation. Guarantees apply to lighting systems only; lamps are not guaranteed by the contractor.

15.4 Execution

15.4.1 Above Ground

.1 All wire, hardware and fixtures are to be located so as to allow for 'normal' unobstructed plant growth with attention paid to the following:

.1 Hardware or fixtures should not be mounted in such a way that wire needs to be routed through any tree branch or trunk unions.
.2 Branches or trunks should not be encircled with wire or any other hardware
.3 A minimum of 25 cm should be maintained between all new and existing installations of tree hardware.

.2 All wire to be protected by PVC conduit or water resistant flexible conduit to a minimum of 250cm (8 ft.) above grade.

.3 The landscape lighting system must be protected by an approved fuse or breaker in accordance with Rules 14-100 through 14-304 inclusive of the CEC.

.4 All connections shall be made in approved junction boxes.

.5 Wire Type:

.1 Low voltage: 12 gauge, 2 wire, UV rated Coating

.2 Line Voltage: 12 gauge, N.M.W.U. or S.J.T.W.

.3 All wiring used in the installation shall be CSA approved. It is recommended that 12 gauge wire be used in all landscape lighting installations.

.6 Wire Fastening:

.1 Fastening hardware shall be composed of corrosion resistant materials.

.2 Conduits shall be secured to any tree with appropriate approved clips and hardware.

.3 Wire is to be fastened only with galvanized wire staples which have stand-off nubs.

.4 Staples shall not be driven into the tree past the stand-off nubs so as not to pinch the wire. The wire should be left loose so as to allow for tree sway, tree growth, wire expansion and contraction.

.5 A 25 cm slack or service loop should be left at each end junction or fixture for the allowance of:

.1 wire contraction
.2 servicing
.3 re-location.

.7 Transformers:

.1 All transformers used in low voltage lighting installation shall be CSA approved in addition to meeting local hydro codes and approval.

.2 All transformers must be installed in accordance with Section 16 of the CEC.

.3 All transformers must be properly fused in accordance with Rules 16-100 through 16-106 and Rules 16-200 through 16-208 inclusive of the CEC.

.4 All transformers must be installed in accordance with the manufacturer's recommendations and in such a fashion as to be clear of debris, water, snow, etc.

.5 All mounting fixtures, junction boxes and ballasts shall be mounted with a 'stand off' type galvanized lag bolt, (minimum diameter 9 mm) leaving a minimum of 25 mm between limb and fixture.

15.4.2 Tree Wiring

.1 Tree Work Plant Selection:

.1 Trees selected for lighting installation shall be in healthy, vigorous, growing condition, free of structural deficiencies, disease and decay. Trees shall be inspected by an ISA Certified Arborist when the above criteria are in question.

.2 A yearly inspection and maintenance of all tree installations is recommended.

.3 As determined at time of inspection, such procedures as follows will be necessary:

.1 Screw type fastening hardware shall be loosened to accommodate tree growth

.2 Removal of existing wire-mounting staples and installation of new staples as required to accommodate tree growth.

.3 Relocate or re-secure grade mounted fixtures so as to accommodate for plant (including root) growth.

.4 All electrical installations in trees should conform with the Occupational Health and Safety Act which requires a minimum clearance of 3m from any existing electrical utility or energized conductor.

.5 Installation personnel, when climbing over 3 m above ground level, must use climbing equipment or a fall arrest system and techniques which conform with the Occupational Health and Safety Act and which are C.S.A. approved.

.6 Personnel involved in the design and installation of tree mounted lighting systems shall be well skilled in arboriculture as it applies to tree identification, growth habits and tree care.

.7 All installations with fixtures mounted in trees must have a service contract with the Client to monitor and maintain tree growth adjustments. All landscape lighting transformers must be UL1838 listed and approved.

.2 All conduits shall run parallel to the existing main roots anywhere inside of the 'Drip line' of tree.

.3 Burial depths shall be as per code where possible.

.4 Grade mounted fixtures and mounting stakes shall be located so as to allow for normal plant growth. Special attention shall be paid to protecting the roots and 'buttress flair' root structure during installation.

.5 Holes for bolt installation shall be pre-drilled to bolt shank diameter.

.6 Limbs for fixture installation shall be of sufficient size (minimum 50 mm diameter) and strength to support fixture and hardware installation.

15.4.3 Below Grade Wiring

.1 All below grade wiring shall be installed in accordance with Rule 12-012 and table 53 of the CEC.

.2 Sleeves:

.1 Recommendations should be of rigid pipe similar to PVC or ABS.

.2 When installing conduit under sidewalks, roadways, etc., it shall be installed in a sleeve at least 10 cm in diameter.

.3 Sleeves shall be of an approved type and must be installed at the same depth as the remainder of the conduit system.

.4 Electrical Sleeves must be dedicated for electrical lines only. All sleeving must be sealed and clearly marked as to location.

.3 Unclassified Excavation

Excavation shall be unclassified and shall include all materials encountered. All materials or matter that cannot be excavated by normal excavation means shall be brought to the attention of the client.

.4 Excavating and Backfill

.1 Trenches for electrical conduit and wiring shall be of sufficient width to permit proper handling and installation of the pipe and fittings.

.2 Trenches containing conduit for line voltage wiring must have a minimum cover of at least 37 cm wherever possible and vehicle areas 50 cm in depth. (refer to rule 12-012 and table 53 of the C.E.C.)

.3 Trenches containing conduit for low voltage wiring must have a minimum cover of at least 25 cm wherever possible.

.4 The backfill shall be thoroughly compacted up to original grade level 90% of the modified Proctor density.

.5 Pulling:

.1 Sizing of the required pull boxes shall be determined using Rule 12-3042 of the C.E.C.

.2 Where soil conditions allow the pipe depths of cover described above to be met, the electrical conduit may be directly installed without trenching by the use of a vibratory plough.

.3 The interior of the conduit shall be kept free from dirt and debris.

.4 The contractor is responsible for restoring the site to its original condition, including accountability for damage to existing trees, shrubs and structures, along with settlement of trenches within the warranty period.

.6 Underground Conduit:

.1 All PVC conduit shall be installed in accordance with Rules 12-1200 through 12-1220 inclusive of the CEC.

.2 All PVC pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer.

.3 All PVC conduit shall only be cut with approved PVC cutters with all burrs removed prior to installation.

.4 All PVC conduit joints shall be solvent weld joints. Only the solvent recommended by the manufacturer shall be used.

.5 Poly Pipe can be used as the recommended protection for low voltage lighting wire protection.

.7 Pull Boxes and Junction Boxes

.1 Pull boxes and/or junction boxes that are used as part of the conduit system, shall be of an approved type suitable for outdoor installation.

.2 Boxes shall remain accessible at all times. (Refer to Rule 12-3018 of the C.E.C.)

15.4.4 A regular maintenance check is required to monitor tree growth, wire tension, landscape changes and their effect on the effectiveness and design of the lighting system.

CHAPTER 16. Landscape Maintenance

16.1 General

16.1.1 The purpose of ongoing landscape maintenance is to:

.1 maintain all aspects of the landscape, including soft landscaping areas and elements that have completed one year of growth since installation, such that the plants are healthy and thriving

.2 the site is clean

.3 the site is aesthetically pleasing

.4 all site features and elements, hard surfaces, all irrigation and lighting systems, are functional and operational as designed and kept in a condition that enhances the design and intended use of the site.

16.1.2 Maintenance operations should, where possible, follow ecologically sound practices such as:

.1 Integrated Pest Management (IPM)
.2 Plant Health Care (PHC)
.3 Composting
.4 Application of organic mulches

16.1.3 Related Information, Guidelines and Legislation

.1 Guidelines and legislation related to this Chapter are listed as reference publications in the Landscape Ontario Guideline and in Appendix “A”.

.2 The latest edition of each publication shall be used in conjunction with this Guideline:

.1 ANSI A300 (Part 1)-2001 for Tree Care Operations, Pruning
.2 ANSI A300 –1995- for Tree Care Operations, Standard Practices
.3 ANSI Z133.1-1994-for Tree Care Operations, Safety Requirements
.4 International Society of Arboriculture, Ontario Supplement to Guide for Plant Appraisal 8th Edition
.5 OMAFRA Publication 505 Ontario Weeds
.6 OMAFRA Publication Recommendations for Turfgrass Management
.7 OMAFRA Publication Diseases and Insects of Turfgrass in Ontario
.8 OMAFRA Best Management Practices, Integrated Pest Management
.9 OMAFRA Publication 75, Guide to Weed Control.

.3 Legislation

.1 The Pest Control Products Act
.2 The Food and Drug Act
.3 The Plant Protection Act
.4 The Weed Control Act
.5 The Canadian Fertilizer Act
.6 Ontario Pesticide Act and Regulation 914.
.7 The Ontario Ministry of the Environment
.8 Ontario Provincial Specification Standards

16.1.4 Maintenance Concept

.1 The maintenance concept for each site is based upon its intended use, design, and present condition. For mature sites, the concept will be to maintain the existing elements by keeping plants healthy and preventing deterioration due to weather, damage and normal usage. For some sites, maintenance should incorporate the idea of succession planting, such as allowing native plants to take over rough grassed areas, or as understory growth as maturing stands of trees are thinned out or mature.

.2 Maintenance for newly established sites should focus on producing healthy plant growth toward desired mature forms and increase in size.

.3 Where plants are over-established and in decline, a planting program for the gradual replacement of such may be appropriate.

.4 The maintenance programs developed for each site should support the maintenance concept and landscape design intent.

16.1.5 Appearance Guidelines

.1 The Specifier or the Owner in association with the Contractor, should set out the desired Appearance Guideline for each area or feature of the site. These Guidelines, if developed in enough detail, may form the basis of an agreement. Alternatively, they may lead directly to a maintenance program based on operations and frequency.

16.1.6 Maintenance Levels

.1 The Maintenance Levels (Table 16-1) relate the general Appearance Guideline for each area to the scope and frequency of maintenance operations. The levels described here are the basis of maintenance operations and frequencies recommended in 16.3 of this Guideline.

16.1.7 Site Examination

.1 Maintenance Programs and contracts should be based on a thorough knowledge of the site, its characteristics and elements. The evaluation of the site should include (but is not limited to):

.1 Climate
.2 Design Intent
.3 Drainage
.4 Exposure to wind, rain, sun
.5 Growing Medium, Chapter 5
.6 Hard surfaces and features
.7 Irrigation
.8 Plant types and growth requirements
.9 Reflected light and heat from structures
.10 Soil types, depth, fertility and structure
.11 Utilities
.12 Wind Effects from structures

.2 Maintenance Inspection Form (Table 16-2) should be used to ensure that all aspects of the maintenance work are considered.

.3 In evaluating the site, existing detrimental conditions (such as disease, poor drainage, or conditions that may lead to abnormal deterioration) should be documented. Some existing features may be difficult, costly or impracticable to maintain at the stated level (e.g. Maintenance Level 1, lawn under a dense conifer tree). The contract should recognize such conditions and include modification guidelines or remedial work procedures.

16.1.8 Maintenance Program

.1 Following the initial site examination and determination of the maintenance concept and levels, a maintenance program should be developed that is specifically tailored to each site (or if required, to each area within the site).

.2 The maintenance program may be developed by the maintenance contractor as a proposal to the Owner, or may be developed by the Owner on the basis of a tender call. In either case, it should clearly document the expected appearance for each element of the landscape, and should document the frequency and details of each maintenance operation.

.3 Maintenance Program Summary Sheet (Sample, Table 16-3) should be used as a reference to the detailed maintenance program.

16.1.9 Contracts

.1 A contract is a document that clearly states the expectations, responsibilities and rights of the parties involved in the project.

.2 The Landscape Ontario Guideline is not intended to be a contract document.

.3 A contract for maintenance of a specific site should include (but is not limited to):

.1 Scope of Work which clearly defines all work to be performed and includes specifications, frequencies and methodology of work to be performed.

.2 A complete listing of maintenance, timing and frequency of each operation (or workable guideline for appearance to be maintained). In some cases, a description of the materials (i.e. quantities and sizes of plants, type of fertilizer, brands of equipment, etc.) and equipment to be used can help to describe a particular level of maintenance. The scope of work should include a description of any special procedures to be included in the work.

.3 Specifications, proposal calls, tender documents, and contracts should be written by a person who has a thorough knowledge of the site, elements present and of maintenance operations.

.4 Payment Procedures may include: lump sum, unit prices, monthly fee or other methods, a schedule of progress payments, final payments and hold backs.

.5 Procedures for reporting and documenting site visits, work done, extra work, materials used shall be included.

.6 Insurance requirements

.7 Scheduling

.8 Guarantees on work or services.

.9 Remedial or upgrading work if applicable

.10 Testing requirements

.11 Arbitration Procedures

.4 Also see 2.2.8, Contract Section.

.5 A maintenance contract maybe developed by using the following procedures:

.1 Initial Site Examination;

.1 Determine the maintenance concept and appearance guideline or level required
.2 Establish the maintenance level required: High, Medium, Low or other specified
.3 Ascertain special or adverse site conditions, corrective measures required
.4 Site evaluation of plant health
.5 Analysis of soil conditions and type
.6 Completion of inspection reports

.2 Development of a Maintenance Program
- .1 Outline of required and expected Appearance Guidelines and/or Procedures and Frequencies
- .2 Completion of the Maintenance Program Summary Sheet

.3 Preparation of Specification and Tender Documents
- .1 Outline specifics of maintenance to be performed
- .2 Review documents and pricing structure

.4 Contract
- .1 Review with legal representative, if required
- .2 Review with client

.6 Where this guideline is incorporated into a maintenance contract and the guideline conflicts with provisions of the contract, the provisions of the contract shall govern.

6.1.10 Documentation and Reporting

.1 Each time maintenance personnel are on the site; they should record in a logbook the operations carried out and materials used, and any conditions that require attention or monitoring.

.2 A summary of the information should be submitted as specified to the Owner, preferably on a Landscape Maintenance Report form (sample Table 16-4). Conditions requiring immediate attention shall be brought promptly to the Owner's attention.

.3 The contractor should review the site regularly and adjust maintenance operations to suit the observed conditions. A Site Maintenance Inspection Form (Table 16-2) should be used to record data for each site visit.

.4 Report in writing a minimum of 7 days prior to any intended major maintenance procedures.

.5 Report any necessary work identified on the contract to be done at extra cost when required.

.6 Include a cost and explanation for the proposed work.

6.1.11 Qualifications

.1 All landscape maintenance personnel shall be skilled, knowledgeable and competent in the tasks assigned to them.

.2 Supervisors for Landscape crews should be a horticulturist holding a recognized horticultural diploma or degree, or Canadian Certified Horticultural Technician (CCHT) certification, or have successfully completed a certificate of apprenticeship or qualification.

.3 Pesticide handling and application of chemicals as defined by pesticide requirements shall be done only by applicators holding current and applicable

class Exterminator Licenses or Technician Certificates under the Ontario Ministry of the Environment.

6.1.12 Quality of Work

.1 All maintenance work shall be performed by qualified (See above, Qualification) maintenance personnel to the guidelines recognized as acceptable by Landscape Ontario or other applicable trade association(s).

6.1.13 Protection

.1 All existing and new plants, site services, hard landscaping elements, structures, finishes and all other features shall be protected against damage during the work. Damage shall be reported immediately, and shall be promptly and completely repaired.

.2 Appropriate measures shall be taken to ensure that no spillage of fuels, toxic construction materials, or other toxic wastes occurs. Where use of such materials is necessary, the contractor should ensure that adequate containment facilities and cleanup equipment are readily available and utilized. If required the contractor shall contact and inform the proper authorities as required by Federal, Provincial and Municipal regulations and by-laws.

.3 Toxic or waste materials shall not be dumped into any watercourses.

.4 Toxic materials, fertilizers, or fuels shall not be stored adjacent to watercourses in a location where spillage could result in leakage into watercourses or the water table.

.5 All toxic wastes and other material shall be disposed of in a manner in accordance with Municipal, Provincial and Federal regulations.

6.1.14 Safety

.1 Maintenance work shall be done in a manner that complies with all applicable laws, bylaws, regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss.

.2 All safeguards for safety and protection, as required by the Worker's Safety Insurance Board, CSA and the ULC, shall be put in place and maintained while maintenance work is in progress.

.3 Barricades, safety guards, and warning devices shall be erected and maintained whenever necessary for the protection of persons and property.

16.1.15 Chemicals

.1 Handling and applications of all chemicals, including, but not limited to pesticides including herbicides, fungicides and insecticides, shall be done in accordance with Provincial, Federal and Municipal legislation.

.2 Handling and disposal of chemicals shall comply with all applicable legislation and regulations, including, but not limited to: the Federal Pest Control Products Act, Food and Drugs Act, Wildlife Act, the Weed Control Act and Waste Management Act.

.3 The posting of warning signs and proper advance notification to people in the area shall be done before any spraying is to be carried out, thereby staying in adherence and accordance with and compliance to provincial legislation, Regulation 914 of the Ontario Pesticides Act.

.4 The applicator must obtain suitable weather-proof signs in accordance with the regulation, and completely fill in all required spaces. The applicator must ensure that the signs are posted 24 hours before application and must remove the signs on the third day after the application.

16.1.16 Reporting Damage

.1 While it is recognized that the maintenance contractor is not responsible for reviewing the site for general hazards, should any dangerous or potentially dangerous situations be observed, then notification should be given at once, verbally, and where necessary in writing, to the Owner and to the appropriate public agencies or authorities responsible for the safety and repair of such property as public utilities or for the protection of the environment.

.2 Notification of damage to property site features of the environment should be included in the site report and logbook.

16.1.17 Water

.1 Water used for landscape maintenance shall be potable and free from organic or inorganic chemical contaminants which are detrimental to healthy plant growth and the environment.

.2 The contract for each site should include accurate information regarding the availability of water for maintenance purposes.

.3 This information should include:

.1 Who is to provide equipment such as hoses, sprinklers, etc.

.2 Who is responsible for watering

.3 Existence of, and details of irrigation system

.4 Location of hose bibs

.5 Water pressure and volume

.6 Any restrictions on the use of water

16.1.18 Non-Horticultural Elements

.1 Non-horticultural elements (hard landscaping elements) within the site such as paving, signage, site furnishings, irrigation, lighting, curbing, buildings and other structures, fences, play equipment, art works and fountains should be maintained to guidelines that are consistent with the selected maintenance level.

.2 Health and safety shall be considered in developing maintenance procedures, particularly in regard to potable water, play areas and equipment.

.3 Deterioration or unsafe conditions in any element of the site shall be reported immediately to the proper authority.

.4 Guidelines developed by appropriate trade professional organizations should be used in developing maintenance procedures for elements not covered in this Guideline.

16.2 Products, Materials, Equipment

16.2.1 Products and Materials

.1 Products and materials used in landscape maintenance shall meet the requirements of the Landscape Ontario Guideline, particularly the following sections;

.1 Chapter #5 top soil testing, on site soil, topsoil, sand peat moss, manures fertilizer mixtures

.2 Chapter # 7 Lawns and Grass

.3 Chapter #8 Landscape Ontario Guideline for Turfgrass Sod- classes of grass areas, sod, seed, hydraulic mulch.

.4 Chapter # 6 Plants and Planting- plants, planting accessories.

.5 Chapter # 9 Mulching- types

16.2.1 Equipment

.1 Equipment shall be suitable to the work at hand, and shall be maintained in a clean and safe working condition. Safety devices and guards shall be in place and functioning to the Worker's Safety Insurance Board (WSIB), CSA and ULC requirements.

.2 Equipment shall be kept clean to reflect a level of professionalism and prevent the spread of plant diseases.

.3 Equipment shall be such that the risk of spillage, inadvertent spraying or misdirection of oil, gasoline, pesticides or any other chemicals is minimized.

.4 Cutting and pruning equipment shall be kept clean, sharp and well adjusted.

.5 All personal protective equipment shall meet the appropriate CSA, ULC and WSIB guideline and regulations.

16.3 Execution

16.3.1 Growing Medium Testing

.1 Growing medium testing is the most accurate way to determine the exact fertilizing, liming or acidifying requirements, and also to monitor soils for changes that may affect plant health care.

.2 Growing medium testing should be done regularly for maintenance level 1. It is not always necessary in single-family residential landscapes, but is a useful diagnostic tool if problems are encountered. Soil testing may be useful in some maintenance levels 2 and 3 areas.

.3 On a well established turfgrass area, representative sampling every two or three years maybe adequate.

.4 A recognized OMAFRA accredited soil-testing laboratory using consistent methods shall perform all growing medium testing. All test results should be expressed in a consistent form, units and format.

16.3.2 Watering

.1 The watering program for an area should reflect soil conditions, climate, including microclimate, and types of plant material.

.2 Watering should supplement natural rainfall such that the soil moisture content is kept at 50% to 100% of field capacity.

.3 To supplement natural rainfall as required in 16.3.2.2, it is usually necessary to perform occasional deep watering of ornamental trees and shrubs, throughout the growing season.

.4 Ornamental shrub plantings should be frequently watered. A minimum of once per month throughout the growing season is recommended. New plantings should be monitored carefully and will generally require more frequent watering.

.5 Watering should be such that the soil is saturated to a depth of 400 mm to 500 mm for established plantings and to the depth of the root zone for new plantings.

.6 Ornamental and exposed evergreen plants, especially new plantings, in areas where cold, dry winters occur, should be watered deeply in late fall before freeze-up to reduce desiccation damage during winter.

.7 Ornamental turfgrass areas should also receive deep watering to supplement natural rainfall. Soil in turfgrass areas should be saturated to the full depth of the root zone, 150 mm to 200 mm at each watering. Frequent watering and light applications should be used only to encourage germination and rooting of newly seeded and turfed areas.

.8 Plants and grasses native to an area or selected for the area's cultural conditions usually do not require irrigation beyond the establishment maintenance period.

.9 Mature trees can generally withstand longer dry and hot periods than smaller plants, due to their established root system. When rainfall is insufficient to replenish these reserves, or when trees are surrounded by paving or other factors that prevent water penetration, trees should be given sufficient supplemental water.

16.3.3 Fertilizing

.1 The objective of proper fertilizing is to supply nutrients to a plant such that a healthy rate of growth and quality of plant is maintained by supplementing nutrients naturally available in the soil.

.2 The necessity for supplemental fertilizing increases with:

.1 the desired quality of a landscape
.2 the intensity of activity
.3 maintenance activity on or around a planted area
.4 the inability of a soil to retain nutrients, i.e. sandy soils
.5 the amount of precipitation or irrigation water applied to the planting
.6 other factors.

.3 Fertilizer is best applied just prior to the period when plant requirements are highest and the fertilizer should be applied in a form and at a rate to supply the immediate requirement and to provide a continual source of nutrients throughout the growing season with minimal leaching.

.4 Soil testing should be carried out when formulating a fertilizing program and should be performed regularly thereafter to monitor fertility levels and adjust fertilizer application rates.

.5 General nutrient levels are recommended in Chapter 5 of the Landscape Ontario Guideline. Variations from these general nutrient levels may be made on the basis of soil test results and a thorough knowledge of the existing site conditions. Additional requirements for fertilizing lawns are in 16.3 and 17.8 of this Guideline.

.6 Trees may have different soil fertility needs than the surrounding area. These needs should be determined by regular observation and, wherever necessary, using tissue testing.

.7 Fertilizer application methods for trees should be chosen to ensure consistent nutrient distribution throughout the root zone.

.8 Suggested fertilizer types and rates are stated for the different levels of maintenance in 16.3 of this Guideline. These types and rates should be adjusted to suit each situation.

16.4.4 Cultivating

.1 Cultivating is done primarily in ornamental and display planting beds to reduce weed growth, improve air and water penetration into the soil, moderate soil temperature and to improve the appearance of the planting area.

.2 The depth for cultivating is determined by the types of soil and plant material. Cultivating should be done without damaging the roots of desirable plants. Cultivation depth should be varied each time the action is performed in order to prevent the formation of a soil pan.

16.4.5 Mulching

.1 Mulching is done to reduce weed growth, improve water retention in soil, moderate soil temperature, and to improve the appearance of the planting area. See Landscape Ontario Guideline, Chapter 9, Mulch.

.2 Mulch can be used to retain soil warmth, but if applied too early in the spring, may slow soil warming.

.3 “Green” mulches such as compost, leaf mulch or well-rotted manure when sufficiently decayed, can be worked into the soil by a thorough cultivation. When this is done, these mulches become organic soil amendments that improve the structure, fertility and moisture holding capacity of the soil.

.4 Bark mulch should not be cultivated into the soil.

.5 Bark mulch should not be used to replace vegetation as a sole ground cover.

.6 Bark mulch can inhibit the growth of plants, particularly smaller plants such as groundcovers. Where optimum plant growth is desired, such as in Level 1 and 2 maintenance levels, more intensive maintenance measures such as cultivation and “green” mulches (see 16.3.5.3) should be used.

.7 Bark mulch should consist of chips and fines of pine bark, or as specified, and shall be reasonably free from sticks, splinters of wood, salts and contaminants that could be toxic to plants (see Mulching Chapter 9).

.8 Maintenance measures for bark mulch include litter removal, replacing displaced mulch and the addition of mulch, and “topping-up”, to the specified settled depth.

.9 The settled depth of bark mulch should not exceed 100 mm around larger plants and 50 mm for smaller plants. Should a layer of additional mulch will cause these depths to be exceeded, then some of, or all of the old mulch should be removed before placement of the new mulch.

.10 Impermeable plastic film is not recommended to be used as a weed control under mulches. Where a weed barrier is desired, permeable woven or non-woven fabric geotextiles designed for this purpose should be used.

16.4.6 Decorative Surface Treatments

.1 Decorative surface treatments using inorganic materials, such as rock, crushed stone, and marble chips, can provide a tidy finished appearance but do no fulfil

the functions of organic mulches. Inorganic materials can be detrimental to plant growth by increasing reflected heat and can reduce soil quality when worked into the soil.

16.4.7 Weed Control

.1 In this Guideline, a "weed" is defined as any plant growing where it is not wanted. This definition includes unwanted plants in planting beds, unplanted areas and paving, etc. This definition also includes grass varieties that detract from the desired appearance or function of lawn areas. Agriculture Canada defines some weed varieties as "noxious weeds" and has formulated regulations to control their spread. These regulations shall be followed during all maintenance work.

.2 Weed control consists of:

- .1 biological control
- .2 control of weeds by the use of herbicides
- .3 crop rotation
- .4 cultivation
- .5 encouraging the growth of desired plants that can compete with weeds
- .6 hoeing
- .7 mulches
- .8 preventing or reducing the entrance of weeds into the area
- .9 pulling by hand
- .10 reducing the growth rate of weeds
- .11 removing and properly disposing of weeds
- .12 management practices for weed control:
  - .1 aeration
  - .2 fertilizer
  - .3 mowing
  - .4 species selection
  - .5 thatching
  - .6 watering

.3 Weed control methods include (but are not limited to) handwork, machine operations and chemical applications. See also 16.1.16.2, Chemicals. Proper horticultural practices can reduce the need for chemical controls. The weed control guidelines shown assume some use of chemical controls. If local regulations limit such controls, these guidelines may not be achievable.

.4 Weed control must be very thorough in higher-level maintenance areas. The intensity of weed control is reduced in lower levels. In low-level maintenance areas, weed control may consist of simply cutting weeds back on a regular basis.

.5 Weed control operations shall be scheduled and carried out such that the spread of weeds by seed roots, runners, etc. is minimized.

.6 Weed control guidelines for the three maintenance levels are shown in Table 16-5 Weed Control Guidelines.

16.4.8 Pest and Disease Control

.1 The principles of IPM and PHC should be applied in controlling pests and diseases. The methods and principles used should be a combination of physical, cultural, biological and chemical methods, chosen for the most effective, safe and economical control of pests and diseases.

.2 Proper horticultural practices can reduce the need for more aggressive pest and disease control measures such as the use of chemicals.

.3 Facilities where the public has free access shall have minimal pesticide use except where irreversible damage would result from a pest and disease infestation. Controlled use of registered pesticides may be appropriate in areas of controlled or restricted public access.

.4 Where chemical controls are required, pesticides shall be chosen on the basis of highest effectiveness and selectivity, and least hazard to health and environment. Any chemical under review by Agriculture Canada, Health Canada or the Pest Management Regulatory Agency for a health or environmental reason shall not be used.

.5 Sites of chemical pesticide use shall be posted prior to, during and after each application, to the requirements of local authorities and Ontario Pesticide Act.

.6 Sites shall be regularly monitored for pest problems to ensure prompt treatment, minimal damage and amount of treatment used.

.7 The Ontario Ministry of the Environment shall regulate storage, handling, and application of pesticides.

.8 The pesticide label shall be consulted for special instructions prior to opening the container.

.9 All applicators shall be certified under the appropriate category of the Ontario Ministry of the Environment, and all firms shall be licensed by the Ontario Ministry of the Environment.

.10 Timing of pesticide applications shall include considerations of weather limitations and conflicts with the use of the site.

16.4.9 Litter Removal and Clean Up

.1 All vegetative and non-vegetative litter (e.g. paper, cans, refuse) should be regularly collected and properly disposed of. The frequency of litter removal is to be determined by the maintenance levels required and by the amount of litter accumulated on site. Cleanup should be a routine part of every site visit.

.2 Vegetative litter (e.g. fallen leaves, twigs, trimmings) should be removed in a selected procedure before it rots or accumulates sufficiently to detract from the use or appearance of the area or damages the landscape.

.3 Vegetative litter should be composted for re-use on site where possible, or disposed of in an approved manner.

.4 Contract documentation should state clearly whether litter removal is required only in planted areas or if paved (Parking areas) or other areas are to also have litter removal.

.5 During the course of maintenance, all excess and waste materials shall be continuously and promptly removed at the end of each site visit.

.6 Clean up after maintenance practices such as mowing, shall include sweeping or blowing of paved areas and sidewalks.

16.4.10 Tree Stabilization

.1 Established trees, generally one year after planting, should not normally require stakes or anchors; these should be inspected regularly and removed as soon as possible.

.2 Where stakes or anchors are necessary, they shall meet the requirements of Sections 6.3.10 and 6.2.3.

.3 Ties and guy wires, shall be regularly inspected, adjusted, repaired or replaced as necessary.

16.4.11 Pruning

.1 Pruning is the removal of plant parts to control the growth of plants and to enhance their appearance or function in the landscape.

.2 Pruning requires considerable knowledge of plants and should be done by a professional trained in arboriculture or horticulture.

.3 Pruning should be done at the appropriate time of year according to each plants characteristics and location.

.4 Clean, sharp tools shall be used for pruning.

.5 Pruning should be limited to only those cuts that are necessary to remove dead, damaged, diseased, crossing and rubbing branches, to direct growth and to correct structural weaknesses. Pruning should be done so as to preserve the natural character and structure of the plant.

.6 Cuts shall be clean, and in accordance with the guidelines set by the International Society of Arboriculture. See reference publications ANSI Z133.1-1994-Pruning, Trimming, Repairing, Maintaining, and Removing Tree, and Cutting Brush; ANSI A300 (Part 1)-2001 Pruning; ANSI A300-1995 Standard Pruning Practices.

16.4.12 Root Pruning

.1 Root pruning, including alteration or removal of surface roots is a specialized horticultural procedure and shall only be performed by a qualified arborist. (See Chapter 3.2.3.3)

16.4.13 Hazard Removal

.1 A certified arborist or other qualified professional shall promptly evaluate plant conditions and structure that could cause injury to people or damage to property. These conditions include dead, dying, or rotting branches or trees, leaning trees

and those that are newly exposed to wind (due to removal of adjacent trees) or which have suffered root damage.

.2 If required, the affected branch or tree shall be removed or other precautions taken to reduce the potential of damage or injury.

16.4.14 Bedding Plants (Seasonal Planting)

.1 The addition of an array of colour, accent and texture in the landscape is the primary objective of installing bedding plants. Bedding plants will therefore require intensive management by experienced gardeners in regard to layout, planting, weeding, trimming, regular watering, and pest and disease control to achieve the desired appearance.

.2 Layout of bedding plants should be such that each variety is shown to its best advantage in a enjoyable arrangement. Spacing will vary with the plant types and the appearance level, and should be such that as individual plants mature they fill the bed with flowers or foliage to the desired density.

.3 Bedding plants shall be fertilized with a fertilizer appropriate to the plant type and soil conditions.

.4 Moisture content shall be regularly monitored and bedding plants shall be watered whenever necessary to maintain plant health and prevent wilting.

.5 Pruning or trimming, including the removal of dead flower heads (“deadheading”) should be done regularly throughout the growing season; frequency of “deadheading’ shall be such that the desired appearance level is maintained consistently.

.6 Bedding plants shall be inspected for signs of pests and disease each time maintenance personnel are on site, and if any are observed, immediate measures shall be taken to remove or control the problem.

.7 Staking of bedding plants (where necessary) shall be done, as the plants develop to prevent them from falling.

.8 Changes of bedding plants should be made seasonally depending on budget and desired program for floral displays (i.e. spring and summer bulbs, annuals, chrysanthemums, ornamental kale and cabbage, winter foliage arrangements). If beds are not planted during any season, they shall be left cultivated and groomed to a smooth, friable soil surface.

16.4.15 Lawns and Grass Areas

.1 General: Since there are many variables in grass types, appearance levels, soil and moisture conditions and other factors of lawn maintenance, it is important that maintenance personnel and managers have the essential knowledge to judge each situation and make appropriate decisions.

.1 The following guidelines to equipment types, mowing heights and frequencies, and fertilizing, etc., may be adjusted as necessary to produce a healthy lawn of the desired appearance.

.2 Mowing Equipment: Provided that the equipment is sharp and well adjusted, rotary mowers are satisfactory for most maintenance levels. Maintenance Level 3 Low may require the use of gang mowers, flail mowers or other mowing equipment. Mowing heights for these methods are to be determined by the objective site conditions, and type of equipment.

.1 Table 16-6 Mowing Heights and Frequencies, shows the recommended mowing heights and frequencies to achieve the desired appearance levels unless specified otherwise. Some lawn types and site conditions may require variations from this guideline.

.2 Mowing may be performed and should be performed as necessary to keep from removing any more than one-third of the grass blade length at any one time.

.3 Rejuvenating: It is an acceptable practice to lower the cutting height in early spring to rejuvenate the grass. This is often done in combination with de-thatching.

.4 Clippings: Clippings should not generally be removed (unless specified otherwise), unless they interfere with the intended function.

.5 Trimming: Lawn edges should be trimmed with a steel blade edge or nylon line trimmer at the frequencies shown in Table 16-6, mowing heights and frequencies. For Level 3 low, trimming is not necessary in all cases, but trimming with each mowing contributes greatly to the desired “neat and orderly” appearance.

.6 Edging: Lawn edging consists of vertical cutting through the mat of grass to remove grass that is growing over walks, paved areas, curbs and tight to fences, buildings and other structures. Edging is done to re-establish the lines of the original landscape layout and to make routine trimming easier. Edging should be performed with a half-moon-cutting tool or a power edger.

Recommended frequencies for edging are:

.1 Level 1, one with each mowing
.2 Level 2, two every second mowing
.3 Level 3, three as required, during the growing season

.7 Fertilizing Lawns: Lawns should be fertilized regularly according to soil test results to keep nutrient levels within an acceptable range for each maintenance level. Refer to Chapter 5 - Topsoil and to Chapter 16.3 of this Guideline. Fertilizer types and ratio of application should be based on the OMAFRA recommendations as modified to suit the site and its current soil conditions. Minimum frequencies for application of fertilizer are shown in Table 16-7.

.1 It is generally better to apply fertilizer with more frequency at a lower rate.

.2 Timing of Fertilizer: Application depends on factors such as:

.1 Desired level of quality
.2 Length of growing season
.3 Soil type
.4 Turf conditions
.5 Turf species
.6 Turf use

.7 Type of fertilizer used
.8 Weather conditions
.9 Whether or not clippings are removed

.3 Avoid applying fertilizing during periods of heat, drought, stress or when conditions favour active disease development.

.4 Fertilizer applications should be scheduled so that they do not occur within 3 weeks of a lime application.

.5 Table 16-8 Nitrogen Requirements for Turf

Area	Amount of Nitrogen*
Greens, Tees, Lawn Bowling Greens	Not more than 400 kg N/ha divided over 6 to 8 applications. 250 kg N/ha is usually sufficient for established greens. Not more than 50 kg N/ha per application should be used.
Lawns Level 1 and 2, Athletic fields	Not more than 200 kg N/ha in 4 applications should be performed when the clippings are not removed. No more than 50 kg N/ha per application should be applied.
Level 3 Low	One application of 50 kg N/ha once per season.

*The amount of Nitrogen should be recommended by a turf specialist based on soil testing.

.6 Fertilizer shall be applied with mechanical spreading equipment that can be calibrated for an even and uniform application of fertilizer.

.8 Adjusting Soil Ph:

.1 Raising pH:

Table 16-9: OMAFRA Recommendations for Lime requirements to correct soil acidity based on soil ph and soil buffer ph.

Buffer ph	Target ph=6.5, lime if soil<6.1	Target soil =6, Lime if soil <5.6
	Ground Limestone required t/ha based on an Agricultural index of 75	Ground Limestone required t/ha based on an Agricultural index of 75
7	2	0
6.5	3	2
6	9	6
5.5	17	12
5	20	20

.2 Lowering Ph: Do not apply more than 2 kg elemental sulfur per 100m2 on established turfgrass.

Table 16-10: OMAFRA Recommendations for Soil acidification to ph 5.0 with sulphur

Initial pH	Soil type	Soil Type
	Sand (kg/100 m2)*	Loam (kg/100 m2)*
7	7.4	22.6
6.5	6	17.5
6	4	12
5.5	2	6

* kg of elemental sulphur per 100m2 for 2 successive years.

.9 Aerating: Aerating is performed when required to improve water penetration and soil structure, particularly where soils drain poorly or have become compacted. Aerating shall be done with a suitable corer that removes cores of soil depth of at least 75 mm. Heavy clay or compacted soils can be improved over the long term by removing the cores of soil and top dressing with sand or an appropriate fine-screened soil or composted material. In other situations the cores can be broken up and left on the soil surface.

.10 De-thatching: De-thatching involves a series of vertical cuts into a grass area using suitable equipment, to penetrate and remove excessively thick layers, in excess of 12 mm, of thatch on the soil surface. When required, this procedure should be done prior to over-seeding and/or topdressing.

.11 Topdressing and Re-Seeding: Topdressing should be done annually in Level 1 areas, and may be occasionally necessary in Level 2 areas. Topdressing is done by mowing the area to a height of +/- 40 mm, power raking thoroughly to removed loose and dead grass, stones and debris and spreading a fine sandy soil mix to a depth of 6-13mm, filling in low areas and bare spots. The topdressing soil mix should be a clean dry, fine screened topsoil mixed in a 1:1 ratio with clean sand.

.1 When reseeding is required the seed mix variety should match the existing grass varieties in the lawn, and be applied before topdressing. Refer to Chapter 7 Lawns and Grass and Chapter 8 Landscape Ontario Guideline for Turfgrass Sod.

.2 Thinning: Thinning may be caused by many factors, including:

.1 chemical or mechanical damage
.2 disease
.3 improper lawn seed selection

.4 inadequate fertilizing
.5 inadequate watering or over-watering
.6 incorrect cutting height
.7 insects
.8 poor drainage
.9 severe competition from other plants
.10 shade
.11 soil compaction

.3 Bare Patches: Bare patches are resultant of not solving the thinning issue.

.4 Timing of Repairs

.1 Level 1 Thinning and patches (Should they occur) should be repaired immediately
.2 Level 2 Repaired in early spring or fall
.3 Level 3 Repaired when required

.5 Methods of Repair of Bare Patches:

.1 power rake or heavily rake the area, loosening the soil to the depth of compaction
.2 apply appropriate seed
.3 dress with topsoil to a depth of 6-13mm
.4 re-sod

.6 Method of Repair Thinning Problems:

.1 Improve cultural practice; such as fertilizing and watering
.2 Overseed with appropriate seed mixture
.3 Aerate and topdress

16.4.16 Irrigation Systems

.1 Maintenance of underground irrigation systems is intended to keep the system in good working condition and to provide water to the area properly supplement natural rainfall for optimum growing conditions for lawn and plants. Refer to the Irrigation Chapter of this Guideline.

.2 Most irrigation systems are shut down and drained or blown out for the winter. When a system is restarted in the spring, it should be thoroughly checked for leaks, valve problems, proper irrigation head and nozzle operation, timer operation and spray coverage pattern.

.3 During the operating season, the system should be checked weekly, and promptly repaired or adjusted as necessary. Damage and repairs should be recorded. Adjustments should be made to sprinkler coverage and timing to ensure that all areas receive adequate water to supplement natural rainfall, without over-watering, or creating excess runoff. The timer shall be adjusted to suit seasonal water requirements.

.4 Irrigation systems (except those designed for year-round operation) shall be shut down at the main and completely drained of water in the Fall before freezing

occurs. Controls should be turned off and all pop-up heads should be left in the down position. Any auxiliary batteries should be removed for the winter season.

.5 Repairs to irrigation systems shall be done a soon as possible after damage or deterioration is observed, so that plants are not allowed to dry out and so that further damage to the landscape does not occur due to leakage. Repairs shall be done properly.

.6 Modification of existing irrigation systems (such as relocation of, or adding heads or zones) may sometimes be desirable. Such changes shall be carefully planned so that they are beneficial to the landscape and do not adversely affect the intent of the existing irrigation system. Changes to the system shall be reported and shall be accurately recorded on "as-built" drawings kept with the landscape maintenance records.

.7 All adjustments, modifications and/or repairs shall be completed in accordance with Chapter 5 of this guideline.

16.4.17 Recommended Maintenance Procedures and Frequencies for Maintenance Levels 1 to 3

.1 Procedures

.1 The procedures and frequencies summarized for maintenance Levels 1 to 3 in Table 16-1 are intended as guidelines for achieving the appearance guidelines set out in 16.1.5. The maintenance program developed for each site (or each portion of a site) should be based on these guidelines but should be adjusted as necessary to achieve the desired appearance guideline.

.2 Site maintenance typically extends beyond the property lines of a site to include such things as boulevards and street frontages. This should be addressed in the maintenance contract.

.2 Recommended Schedules

.1 Maintenance schedules showing the usual or preferred periods or season for carrying out procedures for each Maintenance level are included in Table 16-11.

Table 16-1 MAINTENANCE LEVELS

Maintenance Level	High	Medium	Low
Objectives:	-present a neat, orderly, impeccably clean and well groomed appearance -first class appearance	-generally neat and orderly in appearance with some tolerance for the effects of wear and tear	-to preserve existing conditions
Aesthetic Guideline:	-plants are healthy and vigorous -lawns uniformly green and regularly mowed and trimmed thoroughly within accepted height range -area has very few weeds -no accumulated debris -seasonal plantings kept lush and "showy" during their seasonal bloom -plants are kept manicured and in excellent health	-plants and lawn are healthy -lawns kept within accepted height ranges -weeds and debris acceptable within limits between regular visits -may or may not include seasonal plantings	-vegetation retains a healthy, normal appearance -weeds and debris removed only as requested
Locality:	-very high profile part of a larger site -residential -commercial -institutional entry of front areas -urban landscapes -rooftop gardens -high profile -areas where people in close proximity to the landscape	-may include residential, commercial, institutional sites, general park areas and open spaces -may also be publicly visible portions of industrial sites -areas for occasional recreational use and areas viewed from a medium to long distance	-parkland areas -natural regeneration areas -wildlife areas -preserves -areas seldom publicly used except for specific leisure activities such as hiking
Maintenance Practices:	-frequent, regular routine maintenance of a fairly high intensity -regular monitoring and adjustments to keep visual quality appealing -turf management practices such as aeration, de-thatching, edging and trimming etc. -tree and shrub care such as fertilizing, pest and disease control -irrigation monitoring	-routine maintenance of moderate to low intensity and frequency -emphasis is on controlling deterioration and adapting the site to activities -vegetation is managed to accommodate the activities	-primarily vegetation and weed control -debris and removal of hazardous conditions to the public

	-plantings such as annuals -many maintenance tasks require a horticulturist and/or skilled gardener for proper execution -consistent, frequent attention to many details that affect the health and appearance of the gardens -maintenance may include extensive work to upgrade conditions that would be acceptable in most other landscapes		

Table 16-2 Sample: Site Maintenance Inspection Form

Date:	Inspected by:
Time:	Client Name:
Weather:	Contract Number/Address:

		GOOD	REQUIRES ATTENTION	NOT APPLICABLE	COMMENTS/LOCATION
LAWNS	❖ General appearance	G	R	N	
	❖ Mowing height	G	R	N	
	❖ Water/moisture	G	R	N	
	❖ Edging/trimming	G	R	N	
	❖ Pest/disease control	G	R	N	
	❖ Weed control	G	R	N	
	❖ Fertilization	G	R	N	
BEDDING PLANTS (Annuals) & PLANTERS	❖ Plant condition	G	R	N	
	❖ Water/moisture	G	R	N	
	❖ Pest/disease control	G	R	N	
	❖ Cultivation	G	R	N	
	❖ Staking	G	R	N	
	❖ Dead heading	G	R	N	
	❖ Trimming	G	R	N G	
	❖ Fertilizing	R	N		
	❖ Weed control	G	R	N G	
	❖ Edging	R	N		
PERENNIALS & GRASSES	❖ Plant condition	G	R	N	
	❖ Water/moisture	G	R	N	
	❖ Pest/disease control	G	R	N	
	❖ Cultivation	G	R	N	
	❖ Staking	G	R	N	

	❖ Dead heading ❖ Trimming ❖ Fertilizing ❖ Weed control ❖ Edging	G R N G R N G R N G R N G R N	
SHRUBS & GROUNDCOVERS	❖ General condition ❖ Water/moisture ❖ Pest/disease control ❖ Pruning ❖ Shearing ❖ Trimming ❖ Weed control ❖ Cultivation ❖ Fertilizing ❖ Mulching	G R N G R N G R N G R N G R N G R N G R N G R N G R N G R N	
TREES	❖ General condition ❖ Water/moisture ❖ Pest/disease control ❖ Edging wells ❖ Pruning ❖ Repair ❖ Hazards ❖ Plant Support ❖ Stakes/wires/anchors ❖ Base damage/girdling ❖ Fertilization ❖ Mulch	G R N G R N G R N G R N G R N G R N G R N G R N G R N G R N G R N G R N	
IRRIGATION SYSTEM	❖ Heads/risers ❖ Pressure ❖ Coverage ❖ Controller settings ❖ Leaks	G R N G R N G R N G R N G R N	
DRAINS/DITCHES/WATER COURSE	❖ Debris ❖ Pollution	G R N G R N	
HARD SURFACES	❖ Surface conditions ❖ Weed control ❖ Curbs/stops/dividers ❖ Gum/stains	G R N G R N G R N G R N	
FURNISHINGS & FIXTURES	❖ Damage ❖ Dirty	G R N G R N	
LITTER/CLEAN UP		G R N	
OTHER		G R N	

Table 16-3 MAINTENANCE PROGRAM SUMMARY (sample)

Contract number:	Maintenance Level: H M L Other
Site Location:	Work to Start:
Owner's Rep.:	Work to End:

Elements	Operations	Special Requirements	Location, Quantity, Area,Frequency
LAWNS	Mow		
	Trim		
	Water		
	Fertilize		
	Edge		
	Weeds		
	Monitoring Pest and Diseases		
	Pest Control		
	Weed Control		
	De-Thatching		
	Leaf Removal		
	Topdressing		
	Over-Seeding		
	Aeration		
	Other		
TREES, SHRUBS	Pruning		
	Water		
	Fertilize		
	Monitoring Pest and Diseases		
	Pest Control		
	Other		
GROUNDCOVERS	Prune		
	Water		
	Fertilize		
	Monitoring Pest and Diseases		
	Pest Control		
	Weed Control		
	Other		

BEDDING PLANTS AND PLANTERS	Water		
	Fertilize		
	Seasonal Change		
	Monitoring Pest and Diseases		
	Pest Control		
	Weeding		
	Cultivating		
	Other		
IRRIGATION	Automatic		
	Manual		
	Adjustments		
	Repairs		
HARD LANDSCAPE FEATURES	Walks cleaned		
	Element Cleaning		
	Other		
OTHER FEATURES			
LIGHTING			
OTHER	Debris and Litter removed		
SPECIAL SCHEDULING REQUIREMENTS			

Table 16-4 LANDSCAPE MAINTENANCE REPORT (sample)

Contract no.:
Address:
Month:

Elements	Work Performed this month	Problems requiring attention	Suggestions for Improvement
BEDDING PLANTS & PLANTERS			
SHRUBS & TREES			
GROUNDCOVERS			
PERENNIALS & GRASSES			
LAWNS			
HARD LANDSCAPE AREAS			
IRRIGATION			
LIGHTING			
OTHER			

Table 16-5 WEED CONTROL GUIDELINES

Maintenance Level	Guideline
High	Weeds are not permitted to grow larger than 25 mm in width. All weeds shall be removed when observed. The ability to perform both mechanical and chemical weed control must be present during each visit. Weeds to be moved prior to flowering, potential seed distribution or substantial root growth.
Medium	Weeds are not permitted to grow larger than 50 mm in width. All weeds shall be removed or killed when observed or at the next regularly scheduled visit (within two weeks). The ability to perform both mechanical and chemical weed control must be present during every second visit. Weeds to be moved prior to flowering, potential seed distribution or substantial root growth. Weeding shall be performed when isolated* small weeds patches have a width of 150 mm. Mechanical or chemical weeding shall remove or kill 90% of weeds or the process shall be repeated within the next two site visits.
Low	Weeding shall be performed when isolated* weedy patches have achieved a width of 300 mm. Mechanical or chemical weeding shall remove or kill 75% of weeds or the process shall be repeated within one month. The spread of weeds and especially noxious weeds to adjacent areas shall be prevented. The height and spread of any existing weeds shall be controlled to prevent interference with any outdoor activities.
	* Note: “isolated” means a weed distribution no greater than two patches per 5 m^2.

Table 16-6 MOWING HEIGHTS AND FREQUENCIES

Maintenance Level	Mowing Heights	Frequency	Trimming	Clippings*
1 High	5.0-7.5 cm	4-7 days	Each mowing	Return
2 Medium	5.0-7.5 cm	7 –14 days	Every other mowing	Return
3 Low	6.0-10 cm	As required	As required	Return
Bentgrasses	3-9 mm	1-2 days	Each mowing	Remove
* Clippings contain nutrients that can be utilized by soil organisms and uptaken by root systems of plants. The removal of clippings may require the supplement of Nitrogen and Phosphorus to the soil.				

Table 16-7 Fertilizer* Application Frequencies

	Frequency of Applications	
Maintenance Level	Applications per Year**	Recommended Timing**
1: High	2-4 times	Early June; Late June to Early July; Late August to Early September; Late October to Early November
2: Medium	1-2 times	Early June; Late August to Early September
3: Low	0-1 time	Early June; or Late August to Early September

* The type of fertilizer i.e. 21-7-7 depends on the outcome of the soil test results and recommendations.

**Varies as the fertilizing program and philosophies of timing and type of fertilizer, i.e. slow release types.

Other variables such as:

the turf species
turf use
turf conditions
soil type
weather conditions
irrigation availability
type of fertilizer used
whether the clippings are removed or not

will also influence the frequency and timing of the applications.

CHAPTER 17. Establishment Maintenance

17.1 General

17.1.1 The purpose of establishment maintenance is to provide horticulturally sound care and practices to newly installed plant material for a specified period of time or for one full growing season, to ensure or increase the long-term success of the planting or work.

17.1.2 The primary purpose is the adaptation of newly planted or transplanted plants to a site in order to produce the desired effect from the planting or design intent. The result of establishment maintenance is to reduce the failure rate of planting and reduce unnecessary work associated with improper plant establishment, methods or procedures.

.1 Establishment maintenance procedures apply to all flora, including:

.1 seeded, hydroseeded, sodded and cultivated turfgrass
.2 re-vegetated grass and wildflowers
.3 existing and new trees, shrubs, perennials and groundcovers

17.1.3 Maintenance/Guarantee:
Establishment maintenance procedures should be exercised to all areas of planting that have not completed a full growing season or specified period, since final acceptance or installation. Maintenance during the one-year guarantee/warrantee period is essential to ensure the validity of any guarantee/warrantee (see General, 1.2.10).

17.1.4 Related Guidelines and Legislation:

.1 The Canadian Fertilizer Act

.2 All work should be done in agreement with all applicable local legislation federal, provincial and municipal, codes and by-laws, which may restrict or prohibit certain activities such as the application of pesticides.

.3 See Appendix “B” for other applicable Legislation.

17.1.5 Field Reviews: A logbook and reporting procedures should be established and maintained. In addition to the field review at the end of the guarantee/warrantee period, there should be an agreed to a specified number of field reviews throughout the growing season attended by the Contractor and the Owner as recommended in General recommendations 1.2.7.

17.1.6 Scheduling: Maintenance operations shall be carried out in a preset schedule suited to the prevailing climatic conditions, owner’s requirements and timetable.

17.2 PRODUCTS

17.2.1 Products and materials shall be as specified in other parts of this Guideline or as specified in the contract documentation.

17.2.2 Fertilizers shall meet the requirements of Chapter 5.2.7. Formulations and application rates shall be as required by analysis of the results of the soil or tissue testing.

17.3 EXECUTION

17.3.1 Plant Material Establishment

.1 Watering: During the establishment period, new plants shall be watered (according to conditions) at minimally every seven (7) to ten (10) days between May and August 30, and minimally every fourteen (14) to twenty-one (21) days between September 1 and November 15.

.1 Watering shall be such that the water penetrates the full depth of the growing medium.

.2 Soil moisture shall be monitored throughout the growing season, and the frequency of watering shall be increased when plant materials are reaching the permanent wilting point. Scheduled applications of water shall be skipped only when rainfall has penetrated the soil fully as required.

.2 Mulch: See Chapter 9, mulches shall be maintained in the originally designed areas, to the originally specified depths using similar materials or as specified.

.3 Weed Control: All areas shall have all weeds removed at least once per month during the growing season by hoeing, cultivation to a maximum depth of 100 mm, (varying the depth to prevent a soil pan) hand pulling or, if absolutely necessary by the use of herbicides. Ground covers and shallow rooted plant material should have the weeds manually removed.

.4 Pest and Disease Control: All planted areas shall be regularly inspected for pests and diseases and at least every week during the growing season. The principles and methods of Integrated Pest Management (IPM) and Plant Health Care (PHC) (See Chapter 18) should be applied in controlling pests and diseases.

.1 Treatment for pests or diseases shall be carried out at the proper biological stage or phase for maximum effectiveness. The methods used should employ a combination of physical, cultural, biological and chemical methods chosen for the safest and most effective control of pests and diseases.

.5 Tree Support: Stakes, guy wires and ties shall be maintained for one full growing season. Ties shall be checked minimally every three months to ensure that they are not rubbing against the bark, and shall be loosened, repaired or replaced as necessary. All stakes, guy wires and ties shall be removed after the first growing season.

.6 Pruning: All trees and shrubs shall be examined minimally every two months during the growing season and shall only be pruned to remove all dead, damaged, weak or diseased wood.

.1 Pruning to maintain the natural form of the tree or shrub shall be adhered to. Clipping or shaping of plant material shall be carried out only if specified in the maintenance contract.

.7 Fertilizing: Shrubs and trees shall be fertilized only as required to correct symptoms of nutrient deficiency, except where otherwise recommended on the basis of soil or tissue test results

17.3.2 Establishment Maintenance of Grass Areas

.1 Watering: Hoses and sprinklers, irrigation systems or other methods shall be used to apply water to Maintenance Level 1, High and Maintenance Level 2, Medium, grassed areas (See Section 7. Lawns & Grass) such that the grass is maintained in a turgid condition.

.1 The method of application shall be such that over saturation, runoff or erosion of the soil does not occur.

.2 Watering is not usually required areas designated Maintenance Level 3, Low, however it may be required to prevent plant loss or severe deterioration under drying conditions.

.3 Each application of water shall be at an application rate and duration such that the water content in the growing medium reaches field capacity to the full depth of the growing medium. The next application shall take place when the water content reaches 25% of field capacity.

.2 Weed, Insect and Disease Control: Grass areas shall be reviewed each time they are mowed for weeds, pests, and diseases. See Chapter 18

.1 Broad-leaved weeds shall be removed or killed in High and Medium Maintenance Level, lawns by a general application of a suitable herbicide, if conditions are suitable and if the weed population exceeds 10 broadleaf weeds or 50 annual weeds or weedy grasses per 40 m^2. The application should reduce the weed population to almost zero.

.3 Mowing and Trimming: Maintenance Levels of lawn or grass referred to herein be as defined in Chapter 7 Lawns & Grass.

.1 All areas: Excess grass clippings shall be removed following each cut.

.2 Maintenance Levels, High 1 and Medium 2 areas: Mow with a sharp rotary mower when the grass reaches a height of 75 mm. Mow to a height of 60 mm. Edging or trimming is required.

.3 Low Level 3 areas: Mow every 30 days or as otherwise specified. Edging or trimming is not required.

.4 Edging: Level 1 and 2 areas shall be edged with a half-moon or power edger as frequently as necessary to accurately establish and maintain the intended edge location, not less than once per year. Edging should be to lines established and maintained with straight string lines, or curves established by string or other marking methods suited to the design layout.

.5 Aeration: Aeration shall not be carried out in the first growing season. If necessary, in the second growing season, aeration shall be done in early May with a suitable mechanical corer. Coring shall be done to a depth of 100 mm, and the cores shall be broken up on the surface by matting and then proceeded by raking in.

.6 Repairs: Reseeding or resodding shall be carried out when necessary to restore damaged or failing grass areas. Where grass fails due to environmental conditions that cannot be adjusted (deep shade or heavy foot traffic) and would result in subsequent failure of the lawn if reseeded, other solutions should be considered.

.1 New sod or seed shall match the grass varieties in the surrounding area if growing conditions permit. Resodding may be carried out throughout the growing season. Reseeding should be performed during calm weather, on soil that is free from frost, snow and standing water, when seasonal conditions (Spring or Autumn) are likely to ensure successful germination and continued growth of all varieties of seed in the grass mix.

.2 Reseeded areas shall be protected and kept moist until the first mowing.

CHAPTER 18.

Integrated Pest Management and Plant Health Care

18.0 Introduction

18.0.1 Integrated Pest Management (IPM) is a multidisciplinary, ecological approach to the management of plant health problems based primarily on sound horticultural practices, and only when considered necessary, using chemical treatments as a control.

18.0.2 The objective of IPM is to reduce and maintain the populations of harmful organisms at non-damaging levels, rather than to eradicate them.

18.0.3 The predominant goal of IPM is to use a combination of management tactics (mechanical, cultural, biological, chemical and regulatory) to reduce pest populations or maintain them. Monitoring and evaluation are the fundamental principles to an IPM program.

18.0.4 Similarly the concept of Plant Health Care (PHC) was developed in the 1980's as an augmentation of maintenance and management practices for the landscape industry. PHC is an evolutionary concept derived from IPM.

18.0.5 PHC is a comprehensive approach to the care of all plants. It incorporates an array of practices such as pruning, nutrient management, and IPM, among others, into an overall approach to the care of trees and other plants in ornamental landscaping. PHC focuses on maintaining healthy plants, which stimulates their natural defensive systems.

18.0.6 The incorporation of IPM and PHC leads to healthier plants, trees, and turf in the landscape and further improves the environment by reducing pesticide usage. Many methods and principles are common to IPM and Plant Health Care.

18.1 Basics

18.1.1 An IPM program involves the following basic component steps:

.1 Site Review
.2 Identification- Pest and or Disease
.3 Monitoring/Scouting--monitor the pest or disease population and/or damage
.4 Threshold Determination/Action Decision--use injury and action levels to decide when to treat
.5 Control Strategy Management--application and selection of controls
.6 Evaluation -evaluate results make improvements.

18.1.2 Site Review

.1 Initial component is the review or assessment of the site and surrounding areas. This systematic inspection is performed to collect current and site-specific information to form the basis for mapping, referencing, record taking and formulates a strategic approach to monitoring.

.2 The type of data required for a site review includes, but are not limited to:

.1 Physical characteristics:

.1 Record soil conditions:

.1 such as type (sandy, loamy, clay)
.2 texture
.3 depth
.4 drainage
.5 pH
.6 fertility
.7 organic matter content
.8 cation exchange capacity

.2 Record micro-climatic conditions:

.1 temperature
.2 exposure to sun
.3 wind
.4 shade
.5 air circulation
.6 water features, both natural and man-made
.7 elevations variations
.8 light and shade patterns
.9 surface drainage patterns
.10 irrigation system

.2 Plant inventory:

.1 Identify the species of plants in the landscape and also the cultivars

.2 Record the locations and plant names on the site map.

.3 Inspection of each plant and noting:

.1 health
.2 pest problems
.3 signs of nutrient deficiency
.4 growth abnormalities
.5 pruning requirements
.6 structure

.4 Cultural maintenance practices such:

.1 transplanting methods,
.2 spacing
.3 watering
.4 fertilizing
.5 pruning
.6 staking
.7 mowing practices

.3 Use patterns:

.1 Use of the site and for what purpose
.2 Pedestrian and vehicular traffic patterns

.4 Environmental concerns

.5 The site review examination should consider conditions such as:

.1 Potential for runoff, erosion into water bodies, ditches or storm drains.
.2 Use by wildlife, such as birds, mammals, butterflies, and others.
.3 Impact on neighbouring properties

18.1.3 Identification

.1 This information provides the scouting or monitoring individuals with easy identification of any potential or current pests or pathogens.

.2 Profiles should be developed for each insect pest, disease or weed that is prevalent to the area.

.3 A basic profile should include:

.1 Pest and Disease Identification: common and scientific name
.2 Pest and Disease Identification keys, photos, diagrams
.3 General Life Cycle:
  .1 When and how damage occurs
  .2 Where pest and diseases are to be found
  .3 Knowledge of Treatment strategies
  .4 Which stages of Pest and Disease are most susceptible to the various control strategies
  .5 See Tables 18-1, 18-2
.4 Source and cause of pests
.5 Monitoring of pest populations
.6 Identification of host plant.
.7 Symptoms: Visible signs evident when activity is present
.8 Favourable Environmental Conditions: Seasonal and weather conditions that favour pest activity
.9 Record-keeping and assessment
.10 Reference Materials

18.1.4 Monitoring/Scouting

.1 Monitoring is the essential component of an IPM and PHC program. The goal of monitoring is to determine the presence and activity of a pest before turf or plant loss or damage occurs.

.2 Monitoring consists of regular and systematic inspections for pests and diseases.

.3 This is accomplished by visual inspection and specific sampling techniques.

.4 Correct identification of the plant and turf materials is the initial step.

.5 In addition, the life cycles of all insects, diseases and when to monitor is important. Weather and comprehensions of the conditions, which favour development, are important parts of a monitoring program.

.6 Primary Objectives of Monitoring:

.1 Identification and number of target pests and diseases and potential secondary pests.
.2 Identification and number of natural enemies.
.3 Location of areas where the concentrations of pest/disease populations are the greatest.
.4 Identification of maintenance or cultural practices that may affect pest activity.
.5 Notation of prevalent weather conditions:
.6 Air temperature, minimum and maximum
.7 Soil temperatures.
.8 Precipitation
.9 Cloud cover
.10 Wind direction and speed
.11 Hours of Sunlight

.7 Monitoring is used to:

.1 detect problems while pest numbers are low or below threshold levels
.2 assess the size, spread, extent of damage of a pest population
.3 presence and quantities of natural enemies of pests
.4 inspect for conditions that contribute to the pest problem
.5 evaluate the effectiveness of treatments or natural enemies

.8 Basic Tools:

.1 Bucket
.2 Camera
.3 Clipboard and recording forms/Note pad/pencils
.4 Cooler with ice to keep samples
.5 Cup cutter
.6 Dish detergent
.7 Flagging ribbon
.8 Hand lens (10-20X)
.9 Hand trowel
.10 Pest and disease guides
.11 Plastic bags, bottles and identification tags
.12 Pruning shears
.13 Rain gauge
.14 Rating grid
.15 Ruler/tape measure
.16 Secateurs
.17 Sharp knife
.18 Shovel or spade
.19 Soil probes
.20 Sweep net
.21 Thermometer “min-max” and soil
.22 Traps for monitoring

.9 A monitoring program consists of:

.1 a series of inspections or counts, performed at regular intervals, and

.2 written records of the observations and counts.

.1 When and where:

.1 The time and place to start monitoring varies according to the site, plants and the pest involved.
.2 Knowledge of the life cycle of various pests allows monitoring when they are most likely to be prone attack.
.3 See Tables 18 -1,2.

.2 Examples of monitoring information to record include:

.1 species of plant and location
.2 weather conditions
.3 counts of pests and beneficial species
.4 counts or notes of damage or symptoms
.5 notes on relevant site conditions
.6 growth stage of other plant material in the area called plant phenology

.10 Plant Phenology: Phenology is the relation between climate and a biological event involving a stage of plant development such as blooming. Plant growth depends on temperature, so the time a particular plant blooms is dependent upon the weather. Therefore, the calendar dates differ from year to year but plants generally develop in the same relationship to each other. Insect development is also dependent on temperature, and can be correlated to the appearance of particular insects to plant phenology rather than to a calendar date.

.11 Monitoring techniques:

.1 Insects:
.1 Soil sample
.2 Soap flush or irritating drench
.3 Flotation or flooding
.4 Traps (pheromone/light/pitfall)

.2 Diseases:
.1 Active fungal mycelia
.2 Colour/location/sclerotia
.3 Circular or irregular patterns

.12 Abiotic conditions to note at the time of damage:

.1 Soil: moisture, temperature, compaction, and fertility levels
.2 Thatch: thickness, density.
.3 Drainage
.4 irrigation patterns
.5 air circulation
.6 hours of direct sunlight or shade

.7 slopes
.8 mowing height and frequency

.9 damage during or following what kind of weather:

.1 high night temperatures
.2 high humidity
.3 heavy rainfall

18.1.5 Threshold Establishment:

.1 Insect, disease, or weed pests cannot be completely eliminated, so the contractor must learn to manage the grounds in the presence of pests. At the same time the site can usually tolerate one or two sources of stress without visible effects. Threshold levels describe the number of pests that the plant or turf can tolerate without causing unacceptable damage. When pest levels exceed the threshold level, control action should be considered.

.2 Some threshold limits are set out in sod/lawns and Grass Chapters of this guideline for turf insects and weeds. Thresholds are not guidelines and many have been established in Ontario Ministry of Farm and Rural Affairs publications. Disease and weed thresholds are more subjective and vary according to the maintenance levels and site usage. Limits can be established by the owner or consultant should there be no provincial guideline in existence.

18.1.6 Control Management Options

.1 A control strategy options should have the prescribed properties:

.1 Least disruptive product
.2 Least hazardous to human health
.3 Least toxic to non-target organisms
.4 Least damaging to general environment
.5 Most effective on target organism

.2 Control Options: are often divided into five major classifications:

.1 Cultural
.2 Biological
.3 Chemical
.4 Physical
.5 Mechanical

.3 Two primary objectives of cultural control options are:

.1 The alteration of the microenvironment to create a less favourable condition for pest and disease development that results in the suppression of pests and disease already present.

.2 The improvement of the growing conditions of the plant to make it less vulnerable to attack by pests, diseases and weed invasion. Cultural or selections that promote plant health care:

.1 Mowing Operations
.2 Irrigation
.3 Selection of species and cultivars
.4 Disease and Insect resistance or tolerance

.3 Abiotic soil Factors:

.1 pH
.2 Soil type and texture
.3 Compaction
.4 Salinity
.5 Thatch
.6 Cation exchange capacity
.7 Nutrient levels

.4 Biological Control Options:

.1 Incorporates the use of, or a by-product of living organisms to suppress the pest or pathogen populations. Biological control permits the reduction of traditional chemical pesticides and is more effective when used in conjunction with cultural practices.

.1 Insect Biological Control:

.1 Bacteria
.2 Endophytes
.3 Fungi
.4 Insect Growth Regulators (IGRS)
.5 Parasites
.6 Pathogens
.7 Predators

.2 Disease Biological Control

.1 Natural Biological Control
.2 Weed Biocontrol

.5 Chemical Control:

.1 Pesticides are a consideration when cultural and biological controls are insufficient to maintain pest populations at an acceptable level or threshold level.

.2 Pesticide usage consideration factors:

.1 Environmental risks:

.1 Bioaccumulation
.2 Effect on non-target organisms
.3 Leaching
.4 Runoff
.5 Toxicity
.6 Volatilization

.2 Timing of application for optimal effect:

.1 Curative
.2 Preventive
.3 Pre or Post application

.3 Characteristics of the pesticide:

.1 Formulation
.2 Mode of Action
.3 Residual Activity
.4 Speed of Efficacy

.4 Physical Control

.1 Physical controls include manual techniques such: as hoeing or pulling weeds and pruning. Passive techniques such as barriers and traps are to be included as part of the physical control option.

.1 **Barriers:** These simply stop or exclude pests and diseases from reaching their target host.

.1 Insect barriers (screens)
.2 Weed barriers (mulches and landscape fabric)
.3 Animal barriers (fences and meshes)

.2 **Traps:** These attract and catch pests thereby removing them from the population.

.1 Sticky tree bands
.2 Sticky yellow board traps
.3 Baited traps

.5 Mechanical Controls

.1 Mechanical controls are machines or devices used to control or suppress pests and diseases such as:
- .1 vacuum equipment
- .2 cultivators
- .3 mowers and line trimmers (used to control weeds)
- .4 Heat applicators, such as propane flamers
- .5 hot-water or steam applicators
- .6 infra-red radiation equipment
- .7 Animal repellers, such as devices that squirt water when activated by a motion sensor

18.2 PHC Section

18.2.1 PHC Plant Selection

.1 Maintenance or control options will not compensate for the site conditions if plants are not adapted to site. Species selection that is site tolerant is important.

.2 Horticultural considerations for plant selection include:

.1 Site Characteristics

.2 Planting site evaluation

- .1 Environment
- .2 Soil
- .3 Major insect/disease presence
- .4 Plant Characteristics Tolerance/Requirements
- .5 Cultural
- .6 Pests
- .7 Source of Plant Material
- .8 Health and Vigor
- .9 Plant and turf tolerance is specific and dependent on several factors:
  - .1 Pest or Disease species present or combination there of
  - .2 A plant, turf species and cultivars inherent tolerance to the pest or disease
  - .3 Vigor and condition of plants and turf
  - .4 Time of year

18.2.2 Planting

.1 Proper planting procedures include:

- .1 Preparation of planting area
- .2 Planting pit width/depth
- .3 Time of digging/planting
- .4 Watering
- .5 Fertilizing
- .6 Pruning roots/shoot
- .7 Backfilling
- .8 Staking
- .9 Mulching

.10 Sod or Seed

18.2.3 Plant Maintenance

.1 Cultural practices that optimize plant health.

.1 Monitor/regular check-ups
.2 Diagnose plant problems
.3 Cultural Considerations:

.1 Fertilization
.2 Soil pH adjustment
.3 Irrigation
.4 Aerification
.5 Mulch
.6 Pruning/Mowing
.7 Dethatching
.8 Overseeding

.18.2.4 Evaluation

.1 After any treatment option(s) monitoring and other methods to assess the effects on the pest or disease population should be conducted. The determination of the progress of the control program may indicate a necessity to perform additional monitoring or control options.

.2 The follow up monitoring, along with other records, observations from field staff, and feedback for the assessment the effectiveness of the IPM program should be analyzed and methods of improvement should be determined.

.3 The evaluation process should include: analysis of treatment results, fine-tuning of monitoring techniques and control options.

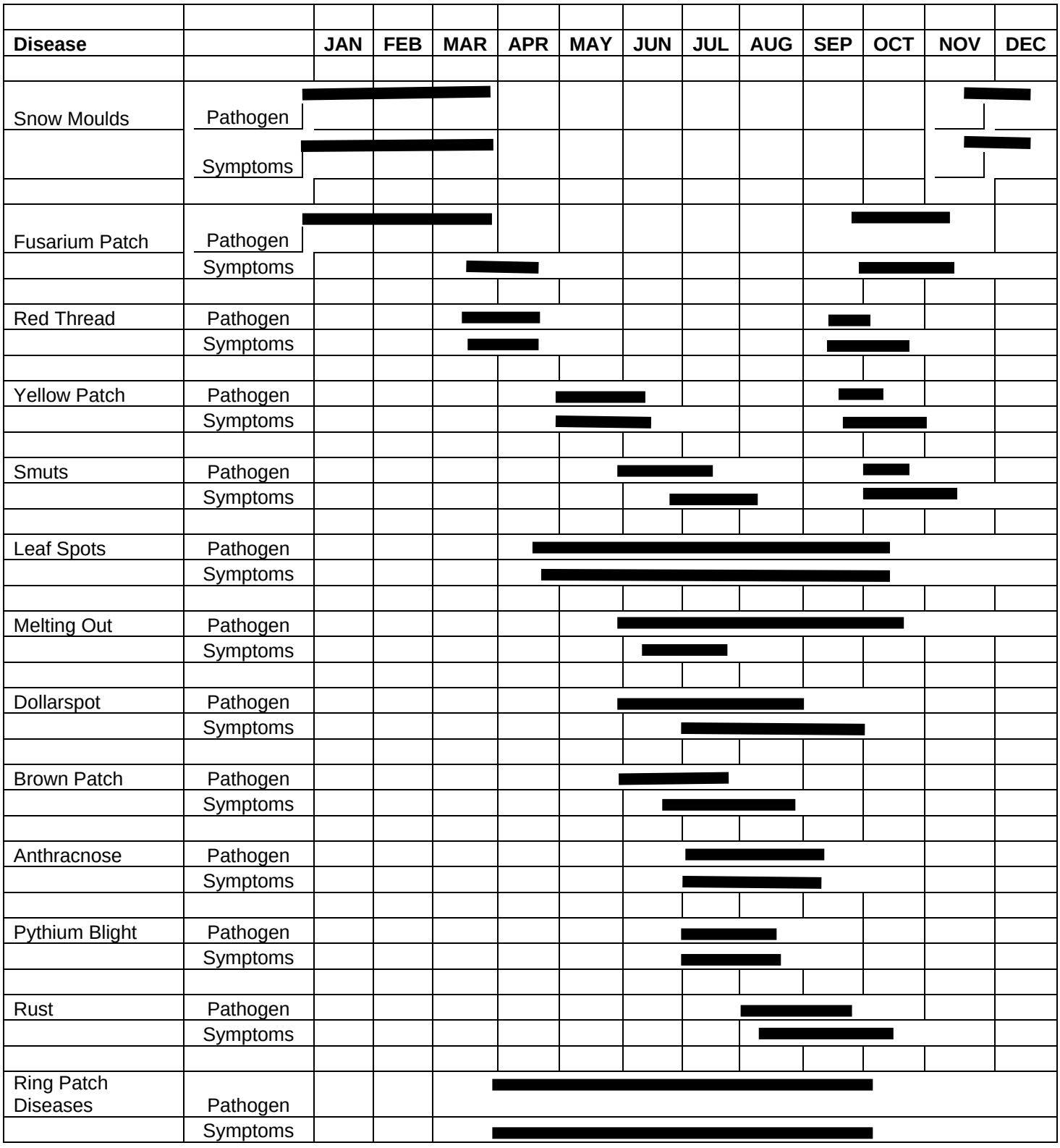
18.2.5 IPM & PHC Monitoring Form Outline

.1 Date of Observation(s)
.2 Monitor Name(s)
.3 Client Name/Address/Location/Grid Number
.4 Plant/turf Species
.5 Plant/turf Location
.6 Pest/Disease Quantity and Activity
.7 Natural Enemy Quantity and Activity
.8 Environmental Conditions
.9 Abiotic and biotic Conditions
.10 General Notes
.11 Recommendations

Table 18-1 Turfgrass Insect Development Timetable

Insect		APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
European Chafer	Adults/Egg Laying								
	Larval Feeding								
Japanese Beetle	Adults/Egg Laying								
	Larval Feeding								
June Beetle Year 1	Adults/Egg Laying								
	Larval Feeding								
Year 2	Adults/Egg Laying								
	Larval Feeding								
Year 3	Adults/Egg Laying								
	Larval Feeding								
Chinch Bug	Adults/Egg Laying								
	Larval Feeding								
Turfgrass Scale	Adults/Egg Laying								
	Larval Feeding								
Sod Webworm	Adults/Egg Laying								
	Larval Feeding								
Bluegrass Billbug	Adults/Egg Laying								
	Larval Feeding								
Crane Flies	Adults/Egg Laying								
	Larval Feeding								
Ataenius	Adults/Egg Laying								
	Larval Feeding								
Bluegrass Weevil	Adults/Egg Laying								
	Larval Feeding								
Black Cutworm	Adults/Egg Laying								
	Larval Feeding								

Table 18-2 Turfgrass Disease Development Timetable



CHAPTER 19. Interior Plantscapes

Introduction

The Ontario Landscaping Standard shall employ the latest edition of the American Landscape Contractors Association (ALCA) Guide to Interior Landscape Specifications as developed by The Associated Landscape Contractors of America (ALCA) and the former Florida Foliage Grower Association (FFGA).

The purpose of this section is to establish, illustrate the methods of measurement and grading for interior plants, potting and the general maintenance of installed interior plants. This section will form the basis for the Interior Landscaping Commodity Group of Landscape Ontario. Subsequent editions of this standard will further develop and increase the scope of this chapter.

19.1 General Requirements

19.1.1 Measurements: The imperial unit of inches shall define pot size, height and spread (width). (see Table 19-1 for the metric equivalents and the growing container data)

19.1.2 Plants

.1 Shall be correct as to the botanical name and of the size or grade indicated thereon.

.2 All nursery stock must be viable, free from pests, pathogens and undamaged.

.3 All nursery stock shall have an adequate fibrous root system that has been properly developed via cultivation practices, particularly transplanting or root pruning. Roots must not be exposed to drying winds, sun or frost, between digging and delivery.

.4 Root balls must be free from harmful perennial weeds.

19.2 Products

19.2.1 Foliage Plant Standards

.1 The contractor shall provide plants, as specified, of a quality and size equal to or surpassing Foliage No. 1 grade as described in the Interior Plant Specifications section of Guide to Interior Landscape Specifications, 1988 edition, published by ALCA.

.2 All plants in pot sizes larger than 10”, shall have been established for at least six months in their present growing containers prior to installation.

.3 The contractor shall ensure that all plants have been prepared for existence by acclimation to lower light, moisture, humidity and fertilization levels in conformance with accepted industry standards and as recommended in the Interior Plant Specification section of the ALCA Guide.

19.2.2 General Description Foliage No. 1

.1 A healthy and vigorous foliage plant, which is well shaped, heavily branched and densely foliated (subject to natural growth of the variety). These stated specifications shall constitute Foliage No. 1 designation or the minimum shipping-grade level.

.2 Plant material of Foliage No. 1 quality shall have the following general characteristics:

.1 Canes, Trunks, Stems And Branches

.1 Must be visibly free of pests and pathogens which could, by their presence, induce (or contribute to) the decline of the plant.

.2 Must be reasonably free of conspicuous scarring evidence: scars, conspicuous or not, must be substantially healed, providing no point of entry for deleterious pathogens or boring insects.

.3 There must be no splitting of canes or trunks at branching points.

.4 All canes or trunks must be well formed, sturdy, well rooted, stable and self-supporting in the growing container.

.5 Plant Height – Over all plant height shall be measured from base of growing container to the mean foliage top.

.6 Cane Heights – With some cane plant varieties, quality is determined by the height of rooted canes.

.7 Cane heights shall always be measured from the base of the growing container; Over-all height of the plant shall be from base of growing container to the mean foliage top. See figures 19-1,19-2,19-3.

.2 Foliage

.1 Must be visibly free of pests and pathogens which could, by their presence, induce or contribute to the decline of the health of the plant.

.2 Must be reasonably free of any chlorosis or yellowing or poor chlorophyll formation, turgid and substantially erect, as well as substantially free of blemishes resulting from mechanical, chemical, ecological, atmospheric and pathological or pest-induced damage.

.3 Must be cleaned and reasonably free of all dust, waterborne pesticide and fertilizer residue at time of project acceptance.

.4 Must be present in such quantity as may be required to produce an appearance representative of the species.

.5 Foliage Width and Origin – Measured across mean foliage width dimension, not including random outstanding branches. Foliage origin along a main trunk, cane or stem shall be measured from soil line. See figure 19-4.

Note: Width of foliage to be specified (%) of total plant height for best proportion.

19.2.3 Root System and Soil Mass

.1 The root system shall be well developed and upon inspection, shall be found to be visibly free of pests and/or pathogens. Development shall be adequate to:

.1 Be well distributed throughout the container, such that the roots visibly extend on all sides to the inside face of the growing container. Conversely, the root formation within the container, shall not have developed to the point where it becomes excessive (i.e., “pot-bound”) and prohibits water from permeating to the fine water-absorbing root hairs.

.2 Afford firm support and insure physical stability of the plant parts above the soil.

.3 Maintain life systems required to produce vigorous, healthy growth.

.2 The growing medium shall be comprised of such constituents as may be necessary to provide:

.1 Thorough drainage and satisfactory aeration of the root zone. The soil mass should be as uniform as possible.

.2 Adequate moisture and nutrient retention as may be necessary to promote vigorous but controlled plant growth.

.3 Sufficient density in the growing container to insure stability of the entire unit, i.e., plant and container.

.3 The growing medium shall be visibly free of pests, pathogens and weed and free of chemical residues, which could be harmful.

.4 The pH of the medium should be in the acceptable range for plants.

19.2.4 Delivery and Installation

.1 All transport of plants shall be via enclosed and environmentally controlled vehicles by personnel experienced in handling live plants.

.2 Planting procedures and methods shall be in conformance with accepted industry practices or as agreed to between parties.

19.3 Execution

19.3.1 Maintenance

.1 Horticultural services shall consist of a regularly scheduled program for maintaining the health and appearance of the installed or existing planting(s). The program shall be carried out by trained service technician(s).

.2 Service procedures and functions that should be included but are not limited to the following:

.3 Notification to Owner of service technician(s) arrival at and departure from the project premises;

.4 Inspection and maintenance of proper growing medium nutrient levels and soil moisture levels;

.5 Inspection for soil and foliar insect pests, diseases and other such infestations;

.6 Trimming and cleaning of all foliage, removal of debris from soil surface and addition of soil and or mulch to soil surface;

.7 Rotation of plants, as necessary, relative to any predominant light source in order to maintain attractive shape.

19.3.2 Waiver of Contractor's Plant Replacement Warranty

.1 The contract should include the clauses listed below in the event of any of the listed situations occurring. This shall release the Contractor from the (if any) plant replacement warranty:

.1 The occurrence of significant changes in plant location(s) without the Contractor's prior consent;

.2 The occurrence of vandalism or theft; accidental or malicious damage by employees, cleaning crews or other personnel to either plants or containers;

.3 The prolonged absence of light or malfunction of the HVAC systems;

.4 The prolonged absence of hot and cold running water at the project premises;

.5 The occurrence of temperatures below 13° C or above 32 °C or humidity extreme;

.6 Lack of access to the project premises;

.7 Introduction of any liquids into the plant's soil such as coffee, tea, cleaning chemicals, alcohol or the use of toxic gases such as strong ammonia from cleaning and stripping, watering or other well meaning care by any Client employees;

.8 Lowering of lighting levels below those, which were originally specified as a basis for the plant specification, or below those existing at the time of the initial quotation for the maintenance contract. A measured level of 65-foot candles at desk height for 10 hours per day is considered an absolute lower limit for most plants.

.2 The ALCA Plant Specifications Section, specifies a plant species minimum conditions that are outlined in; the owner shall be appraised of these conditions prior to installation are required for plant(s) to live.

19.3.3 Planting Methods

.1 It is important to specify the basic method and ingredients, which the contractor will be responsible for employing.

19.3.4 Moveable Decorative planters

.1 Floor planters, file top and hanging planters: In order to achieve an aesthetic and horticulturally sound planting, the contractor shall employ methods as depicted and specified as 'double potting' or 'direct potting'. Both are industry acceptable methods of planting. Plants are to be plumb and secure within the planters. Immediately after direct planting, the plant shall be watered to settle the soil mix.

.2 When planters with drainage holes and separate drainage trays (e.g. clay pots and saucers) are to be employed, soil separators and siphon tubes shall not be required and drainage fill shall be in the planter.

19.3.5 Fixed Planting Beds

.1 Generally such beds shall be direct planted, removing nursery pots from the plants. A light, airy, well draining soil mix shall be employed. (Soil mixes vary. Unless specific plant requirements dictate otherwise, a consistent mix shall be used throughout the entire project.)

.2 All fixed planting beds should have an integral drainage system. The best type of system is where the drain(s) is tied into the project's plumbing system. A sump pump linked to a siphon tube is acceptable, and a siphon tube, alone, will suffice for smaller beds.

19.3.6 Rotational and Special Plantings:

.1 When foliage or seasonal potted flowers are to be changed frequently 'triple potting' can both facilitate the removals and installations and allow for extremely various watering requirements.

Table 19-1. Growing Container Data

		Actual Dimension	Metric Diameter (mm)		Weight	Weight
Inches	**Pot Type**	**O.A.W. X O.A.H.**	**O.A.W. X O.A.H.**	**Pot Size**	**lbs.**	**Kg.**
6	STD	6.5 x 6	165.1 x 152.4	#1	3	1.4
6	AZ	6.5 x 5	165.1 x 127.0	6" Azalea	3	1.4
8	STD	8 x 7	203.2 x 177.8	#2	5	2.3
8	AZ	8 x 5.75	203.2 x 146.1	8" Azalea	5	2.3
9	STD	9 x 8	228.6 x 203.2	#2	9	4.1
10	STD	10 x 9.5	254.0 x 241.3	#3	13	5.9
11	AZ	11 x 8	279.4 x 203.2	# 3 Azalea	20	9.1
11	STD	11 x 10.5	279.4 x 266.7	#4	20	9.1
12	STD	12 x 11	304.8 x 279.4	#4	25	11.4
14	STD	13.5 x 12	342.9 x 304.8	#7	35	15.9
17	STD	17 x 15	431.8 x 381.0	#15	75	34.1
21	STD	21 x 18	533.4 x 457.2	#26	200	90.9
21	STD	21 x 24	533.4 x 609.6	#35	300	136.4
28	STD	28 x 21	711.2 x 533.0	#45	450	204.5
32	STD	32 x 22	812.8 x 558.8	#65	650	295.5
36	STD	36 x 24	914.4 x 609.6	#95	1000	454.5
48	STD	48 x 30	1219.9 x 762	#125	2000	909.1
48	STD	48 x 28	1219.9 x 711.2	#200	2000	909.1
60	STD	60 x 32	1524.0 x 812.8	#300	3000	1363.6
O.A.W.	Outer Average Width					
O.A.H.	Outer Average Height					

CHAPTER 20

SNOW CLEARING, REMOVAL AND ICE CONTROL

20.1 Introduction

There are many variables that are inherent with the weather, each storm and/or weather event may require different efforts and/or emphasis on any number of maintenance tasks, which when combined, determine the overall snow clearing and removal or ice control strategy. The planning process is difficult due to the many variable conditions encountered during each storm. The rate and accumulation of snowfall, moisture content, temperature, time of day or night, wind direction, duration and velocity, are all factors that interact to create a unique aspect for each storm.

20.2 Intent

.1 The intent of snow plowing/removal and ice removal is to provide the owner with a site that is reasonably free of ice and snow in such a fashion as to allow traffic flow, both pedestrian and vehicular, to and from the site.

.2 The execution of the maintenance and its specifications are site specific and vary according to prevailing climatic conditions. The work shall include the supplying of all labour, materials, equipment and services necessary for the execution and completion of all work to the Owner's satisfaction.

20.3 Legislation

.1 All work, materials and equipment shall be subject to all applicable Federal, Provincial and Municipal legislation, by-laws and regulations. Also See Appendix "B" for other applicable Legislation.

.2 It shall be the policy to consider the environmental impact of salt usage as well as safety of the public and owner.

.3 The Ministry of Transport and the Environment encourage the sensible and conservative use of sodium chloride and other de-icing compounds. The following operational guidelines are recommended:

.1 reduce the de-icing chemical(s) application(s) rate(s) to the minimum amount necessary to successfully perform the job

.2 where salt/sand mixtures are applied, only enough salt to achieve the desired results should be incorporated into the admixture

.3 protective measures should be employed when de-icing chemicals are applied to places in proximity to very salt-sensitive areas

20.4 Products:

.1 Materials for de-icing may include (in combinations of or singly) but are not limited to:

.1 Magnesium Chloride
.2 Sodium Chloride
.3 Calcium Chloride

.4 Potassium Chloride
.5 Sand
.6 Urea
.7 (CMA) Calcium Magnesium Acetate

.2 Equipment:

.1 The contractor shall provide all equipment necessary for execution of Work under the Contract.

.2 Equipment may include but is not limited to:

.1 plows
.2 salters
.3 blowers
.4 shovels
.5 winged plows
.6 brushes
.7 loader

.3 All vehicular equipment:

.1 should be rubber-tired in order to prevent damage to pavement and grounds in general.

.2 shall meet The Ministry of Transportation of Ontario regulations.

.3 shall be equipped and appropriately marked with the necessary lights and warning signals for night operation.

.4 shall have back-up devices for safety purposes and blue lights, plow lights etc.

20.5 Execution

.1 The contractor shall, prior to the season, inspect each property and those areas to be ploughed and note existing conditions with the property Manager, in writing, for the file of each building.

.2 Should the contractor require on site storage for his materials and or equipment, suitable arrangements must be made with the Owner's Representative.

.3 The site plan enclosed as an appendix to the specifications to indicate in general terms the extent of work to be included.

.1 Areas to be cleared and kept ice free shall include, but are not limited to:

.1 Roads that are fire routes
.2 Garage exit stairs
.3 Garage ramp and ramp approaches
.4 Parking lot driveways and vehicle parking areas
.5 All walkways (including all City sidewalks)
.6 Pedestrian ramps

.7 One meter clearance around fire hydrants and Siamese connections.
.8 Fire doors/exits
.9 Entrances, access doors
.10 Shipping and receiving areas
.11 All roadways
.12 All exterior stairs
.13 Vehicle turning areas

.2 Locations of:

.1 Curbs
.2 Fire Hydrants
.3 Irrigation Heads
.4 Property Lines
.5 Areas for Windrows
.6 Dumping areas
.7 Storage areas
.8 Snow Fence locations
.9 Culverts
.10 Drains and Sewers

.4 Snowplowing shall normally begin when accumulation reaches a mutually agreed to point by the owner and contractor or as specified.

.5 Snow should not be stacked over ends of culverts drainage structures or prohibit the flow of water to storm water systems.

.6 Maintenance should be clearly defined/outlined via map/written etc.

.7 When required the contractor shall ensure that plowing and clearing is done prior to salting.

.8 Bulk de-icing or salt/sand mixtures stockpiled on site, shall be covered and protected from precipitation and runoff with a suitable weather-tight materials to the satisfaction of the Owner's Representative to prevent environmental issues.

.9 Records: the contractor should maintain full records, including all vouchers and other correspondence and information in respect to the work.

.1 Records should include all relevant information such:

.1 as the number of employees engaged for the work
.2 hours worked type and quantity of equipment
.3 materials used
.4 areas treated
.5 time on site
.6 prevalent and prevailing site weather conditions.

20.6 Contract Outline:

.1 Landscape Ontario in conjunction with CNLA Hort Protect has developed:

.1 “Using the Standard Form Snow and Ice Maintenance Contract”

.2 “Standard Form Snow and Ice Maintenance Contract between Owner and Contractor”

.3 “Standard Form Snow and Ice Maintenance Contract between Owner and Contractor Schedule ‘A’”

.4 “Standard Form Snow and Ice Maintenance Contract between Owner and Contractor Schedule ‘B’”

.2 These forms have been developed primarily for use by Landscape Ontario members only. Landscape Ontario goal has been to establish wording that is fair to both the contractor and the property owner/manager. Landscape Ontario assures no liability to anyone whatsoever arising from the use of the Standard Form Contract.

APPENDIX A: REFERENCE PUBLICATIONS

This Guideline refers to the following publications. Such reference shall be to the latest edition and any amendments thereto approved by the organization issuing that publication.

1. Guidelines

American Association of Nurserymen (ANA) Z60.1-1996, American Standard for Nursery Stock. Available from the American Association of Nurserymen, 1250 I Street, N.W., Suite 500, Washington, DC, 20005 Fax: (202)789-1893, Phone: (202)789-2900

American National Standards Institute, Inc., ANSI A300-1995. Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices. , Can be purchased in pdf format on-line at ANSI's Electronic Standards Store (www.ansi.org). Use the Standards Search option to quickly locate the document by the ANSI publication number.

American National Standards Institute, Inc., ANSI A300-(Part 1)-2001 Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices (Pruning). , Can be purchased in pdf format on-line at ANSI's Electronic Standards Store (www.ansi.org). Use the Standards Search option to quickly locate the document by the ANSI publication number.

American National Standards Institute, Inc., ANSI A300-Part 2-1998. Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices - Part 2 - Fertilization. Can be purchased in pdf format on-line -at ANSI's Electronic Standards Store (www.ansi.org). Use the Standards Search option to quickly locate the document by the ANSI publication number.

American National Standards Institute, Inc., ANSI A300 (Part 3)-2000. Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance: Standard Practices - Part 3 - (Support Systems a. Cabling, Bracing, and Guying). Can be purchased in pdf format on-line at ANSI's Electronic Standards Store www.ansi.org). Use the Standards Search option to quickly locate the document by the ANSI publication number.

American National Standards Institute, Inc., ANSI Z60.1-1996 - American Standard for Nursery Stock. Available from: Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112, Phone: 303-397-7956, Fax: 303-297-2740, Email: global@ihs.com, Internet: www.global.ihs.com.

American National Standards Institute, Inc., ANSI Z133.1-1994 – American National Standard for Tree Care Operationa- Pruning, Trimming, repairing, Maintaining, and Removing trees, and Cutting Brush-Safety Requirements

Canada Nursery Landscape Association (CLNA), Canadian Standards for Nursery Stock . Available from the Canadian Nursery Landscape Association, R.R.#4, Stn. Main, 7856 Fifth Street, Milton, Ontario, Canada L9T 2X8. Fax:(905) 875-1840, Phone:(905) 875-1399 or 1-888-446-3499. Email: cnla@canadanursery.com

Canadian Standards Association (CSA) A60.1 - Vitrified Clay Pipe. This document has been archived by CSA. Reprints are available upon request. Contact the CSA at 1-800-463-6727 or 1-416-747-4316, or by email at sales@csa-intemational.org.

Canadian Standards Association (CSA) A60.3 - Vitrified Clay Pipe Joints. This document has been archived by CSA. Reprints are available upon request. Contact the CSA at 1-800-463-6727 or 1-416-747- 4316, or by email at sales@csa-intemation.org.

4. Municipal Legislation

*Tree protection and removal bylaws for various municipalities
*Zoning and development bylaws for various municipalities

5. Sources of additional Information

Agriculture and Agri-Food Canada, The Canadian System of Soil Classification. 1998. http://sis.agr.ca/CANSIS/PUBLICATIONS/MANUALS/cssc.2pdf

Alex, J. F. and Switzer, C.M., Weed Control in Lawns, Ontario Ministry of Agriculture and Food, Publication 529 (Agdex 270), 1973. An order form is available on-line at www.gov.on./OMAFRA/english/products/product.html.

Associated Landscape Contractors of America, Guide to Interior Landscape Specifications, 4th Edition, 1988. ALCA, 150 Elden Street, Suite 270, Herndon, Virginia 20170, Phone: (703) 736-9666 or 1-800-395-ALCA, Fax: (703) 736-9668.

Brady, Nyle C., et al, The Nature and Properties of Soils, New York: Macmillan Publishing Co. Inc., 1998. ISBN 0138524440

CMHC: Site Planning Criteria (under publication)

Environment Canada Forestry Service: Forest Landscape Development Handbook (visual)

Environment Canada Weather Services, Meteorological Service of Canada, has an Internet site (www.weatheroffice.com/) that gives current and long-range weather forecasts for Canadian cities, and provides a pay-per-call 'Weather by Phone' service.

Harris, Richard W.: Arboriculture: Integrated Management of Landscape Trees, Shrubs, and Vines. Third Edition, New Jersey: Prentice Hall Inc., 1999. Available from the American Nurseryman Publishing Company, Phone: 1-800-621-5727, Fax: (312) 782-3232, and order on-line at www.amerinursery.com.

International Society of Arboriculture, Arborists' Certification Study Guide. Product #P211. Order on- line in Catalog of Publications at www.isa-arbor.com, or call 1-888-ISA-TREE.

International Society of Arboriculture, Guide for Plant Appraisal. Product # P1239. Order on-line in Catalog of Publications at www.isa-arbor.com, or call 1-888-ISA-TREE.

International Society of Arboriculture, Journal of Arboriculture. Article abstracts and reprint information is available on-line at www.isa-arbor.com, or call 1-888-ISA-TREE.

International Society of Arboriculture, Tree and Shrub Transplanting Manual. Order on-line in Catalog of Publications at www.isa-arbor.com, or call 1-888-ISA-TREE.

International Society of Arboriculture, Trees & Development: A technical Guide to Preservation of Trees During Land Development. Product # P1239. Order on-line in Catalog of Publications at www.isa-arbor.com, or call 1-888-ISA-TREE.

Public Works & Government Services Canada, Canadian National Master Construction Specifications. http: //w3.pwgsc.gc.ca/rps/aes/tec/text/nms-e.html or 1-800-622-6232

Ontario Ministry of Agriculture, Food and Rural Affairs
1 Stone Road West
Guelph, Ontario
N1G 4Y2
E-mail: products@omafra.gov.on.ca
Website: www.gov.on.ca/omafra
Queen's Printer for Ontario

Ontario's Fertile Soil 92-031
Gardener's Handbook- An integrated Approach to Insect & Disease Control 64
Integrated Pest Management BMP09
Pruning Fruit Trees 00-005
Diseases and Insects of Turfgrass in Ontario 1996 162
Grubs in Lawns 97-023
Japanese Beetle in Nurseries and Turf 92-105
Pruning Ornamentals 483
Rough Bluegrass 92-054
Turfgrass Management Recommendations 384
Turfgrass Management Recommendations 2002 Supplemental 384S
Weed Control in Lawns and Gardens 529
Growing Greenhouse Vegetables 371
Production Recommendations for Greenhouse Floriculture 370
Management of Organic Soils 93-053
Soil Management BMP06
Hairy Chinch Bugs in Lawns 97-031
Pesticide Container Rinsing 87-057
Pesticide-Handling Facility 94-037
Pesticide Storage, Handling and Application BMP13
Annual Nightshades 94-075
Bindweed 01-007
Cocklebur 01-005
Herbicide Mode of Action Categories 00-061
Herbicide Resistant Weeds 01-023
Jerusalem Artichoke 94-077
Ontario Weeds 1992 Reprint 505
Pigweeds 01-009
Poison-Ivy 99-015
Proso Millet 87-025
Wild Mustard 88-085
Drainage Guide for Ontario 29

APPENDIX C Specification Categories

Specifications maybe defined as an essential technical requirement for items, materials, services and procedures which are used to determine whether the work requirement has been met.

The specification document should clearly and accurately describe the essential technical requirements for items, materials, services and work procedure by which the work will be executed.

Guidelines shall form the basis from which specifications are created.

Specifications are an essential component for contracts and bidding documents. There are many specifications available and each project will have details to be omitted or added to a generic specification.

This Appendix contains the list of three organizations and their classification systems. This Guideline outlines the Section Numbers and Titles of specifications in an attempt to use a consistent system for developing a set of specifications. Each system has their own consistent specifications and should be considered when developing project documentation.

These documents are intended to serve as a design and construction guideline for developing and putting together specifications for the construction industry.

The following systems were referenced:

NMS National Master Specifications

NMS: The National Master Specification (Public Works and Government Services Canada) is the largest generic master construction specification available commercially in North America. The NMS follows the guideline of North American formats documents.

CSI Construction Specifications Institute

The format of the specifications are jointly published and produced by Construction Specifications Canada (CSC) and the Construction Specifications Institute (CSI) in the United States.

MAS MasterSpec , The American Institute of Architects.

Listing of Specification Categories

Section Number				Section Title
	MAS	CSI	NMS	
				Division Zero: Design and Construction
00001				Title Page
00010				Table of Contents
00015				Site Plan/List of Drawings
00020			00110	Invitation to Bid
00100		00300		Information for Bidders
00200		X	X	Instructions to Bidders
00310		00400	X	Bid Form
00320			X	Geotechnical Data
00330				Schedule of Prices
00400		X	00431	Supplements to Bid Form
00430				List of Sub-Contractors
00500		X		Agreement Form
00511			X	Bid Acceptance
00701		00700	00710	General Conditions
00811		00800	00805	Supplementary Conditions
00892			X	Bid Rejection
00900		X		Addenda and Modifications
00910		X		Addendum Number
				Division One: General Requirements
01000	X			Project Information
01001				Basic Requirements
01010				Special Conditions
01011				General Requirements for Contractor Operating Within Site
01115			X	Summary of Project
01019				Contract Considerations
01025				Measurement and Payment
01028	01250	01250		Modification Requirements
01030		01230		Alternatives
01040				Project Coordination and Meetings
01045				Cutting and Patching
01095				Referenced Guidelines and Definitions
01110		X	X	Summary of Work
01140	X		X	Work Restrictions
01200			X	Alternatives
01210	X	X	X	Allowances
01270	X			Unit Pricing
01290	X	X	X	Payment Procedures
01300		X		Administration Requirements
01310	X	X	X	Project Management and Coordination
01320	X	X	X	Construction Progress Documentation
01322			X	Project Time Management-Critical Path Method
01323			X	Project Time Management-Bar GANTT Charts
01330	X		X	Submittal Procedures
01353		01350	X	Special Procedures: Traffic Control

01355			X	Waste Management and Disposal
01380				Construction Photographs
01400	X	X		Quality Control
01410			X	Regulatory Requirements
01420	X		X	References
01450		X	X	Quality Testing
01500	X	X		Temporary Construction Facilities and Temporary Controls
01510			X	Temporary Utilities
01520			X	Construction Facilities
01540				Security
01550				Access Roads and Parking Areas
01560				Temporary Barriers and Enclosures
01561			X	Environmental Protection
01570				Traffic Regulation
01580				Project Identification and Signs
01590				Field Offices and Sheds
01600	X	X	X	Materials and Equipment
01610			X	Basic Product Requirements
01700	01770	01780		Contract Closeout
01705			X	Health and Safety
01720			X	Preparation
01730	01700		X	Execution
01740				Warranties
01740			X	Cleaning
01770	X		X	Closeout Procedures
01780		01700		Closeout Submittals
01820			X	Demonstration and Training
01900				Reference Sheet
01950			X	Demolition

Division Two: Site Work

02050		X		Demolition
02050		X		Base Site Materials and Methods
02060				Building Demolition
02071			X	Geogrid Soil Reinforcement
02072			X	Geotextiles
02073			X	Geomembranes
02055				Soil Materials
02207				Aggregate Materials
02211				Rough Grading
02218				Landscape Grading
02222	02221	02220	X	Demolition of Structures
02222				Excavating
02223				Backfilling
02224				Excavating, Trenching & Backfilling for Irrigation Systems
02225			X	Trenching
02225			X	Site work Demolition and Removal
02226				Removal of Existing Asphalt Pavement
02229				Rock Removal
02230	02231			Site Clearing
02231				Aggregate Base Course
02231			X	Clearing and Grubbing
02232			X	Tree Pruning
02233			X	Preservation of Topsoil

02270		02370		Slope Protection and Erosion Control
02300	X	X	X	Earthwork
02311			X	Site Grading
02315		X	X	Excavating, Trenching and Backfilling
02316			X	Rock Removal
02340				Soil Stabilization
02361			X	Chemical Control of Vegetation
02362			X	Dust Control
02372			X	Gabions
02374		02370		Erosion Control Devices
02379			X	Preservation of Water Courses
02510				Utility Services
02510				Asphaltic Concrete Paving
02515				Concrete Work for Walkways
02516				Asphaltic Block Pavers
02517				Stone Pavers
02518				Concrete Pavers/ Interlocking Pavers
02519				Brick Pavers
02520				Portland Cement Concrete Paving
02525				Athletic Surface
02576				Asphaltic Concrete Removing and Recycling
02620			X	Sub-drainage
02621			X	Foundation Drainage
02623				Concrete Work for Walkways
02630		X		Storm Drainage
02634				Drainage Pipe
02661				Pond and Reservoir Liners
02700				Final Grading
02701			X	Aggregates
02721			X	Granular Base
02722			X	Pavement Surface Cleaning and Removal of Markings
02723			X	Granular Sub-base
02731			X	Crushed Stone Paving
02740		X		Flexible Pavement
02741			X	Hot Mix Asphalt Concrete Paving
02752			X	Portland Cement Concrete Paving
02770			X	Concrete Walks, Curbs, Gutters, Pads
02771				Asphalt Concrete Curbs
02772				Granite Curbs
02773				Portland Cement Concrete Curbs
02774				Precast Concrete Curbs
02780	X			Pavers
02785		02780	X	Unit Paving
02786			X	Pavement Sealing
02790		X		Synthetic Grass Surface
02795				Porous Paving
02800		X		Site Improvements and Amenities
02810	X	X		Landscape Irrigation
02811				Drip Irrigation
02813				Irrigation System Seasonal Set-up and Maintenance
02814				Irrigation Start-Up and Winterization
02820		02815		Fountains and Pools
02821	X	02820	X	Chain Link Fences and Gates

02822	X		X	Wire Fences and Gates
02823				Wood Fencing
02830				Metal Fences and Gates
02832				PVC Fences and Gates
02832	X			Retaining Walls
02833				Chain Link Fences
02841			X	Guide Posts
02853				Parking Bumpers
02863				Recreation/Sports Fields
02864				Maintaining Athletic Fields
02870	X		X	Site Furnishings
02880				Sculpture/Ornamental
02881	X	02882		Playground Equipment and Structures
02885				Outdoor Sculpture and Ornamental Work
02890				Landscaping
02901			X	Tree Planting and Preservation
02911			X	Topsoil and Finish Grading
02915				Transplanting
02920		X		Lawns and Grass
02921			X	Mechanical Seeding
02922			X	Hydraulic Seeding/Hydro Seeding
02923				Landscape Grading
02938			02933	Sodding
02945				Planting Accessories
02946				Steel Landscape Edging
02906		02900	02900	Planting: Trees, Plants and Ground Covers
02955				Inert Materials
02960				Chain Link Fence and Gates
02966				Pavement Repair and Resurfacing
02970				Landscape Maintenance/Garden Beds
02973				Mowing/Grass Cutting
02974				Pruning
02975				Watering
02980				Landscaping Accessories
02995				Snow and Ice Removal
02996				Snow Fencing and Barriers
02924				Seeding

Division Three: Concrete

03050		X		Concrete Specifications
03100		X	X	Concrete Formwork
03200		X	X	Concrete Reinforcement
03300			X	Footings
03300		X	X	Cast in Place Concrete
03410	X	03400	X	Structural Precast Concrete
03450	X		X	Pre Cast Architectural Concrete
03481			X	Precast Concrete Parking Curbs
03732				Concrete Repair

				Division Four: Masonry
04051		04050	X	Masonry Procedures
04060		X	X	Mortar and Masonry Grout
04211		04200	X	Brick Unit Masonry
04212		04210	X	Clay Tile Unit Masonry
04220		X	X	Concrete Masonry Units
04270		X	X	Glass Masonry Units
04400		X		Stonework
04410		X		Stone Materials
04411			X	Marble
04412			X	Granite
04420			X	Collected Stone
04430			X	Quarried Stone
04435			X	Dimension Stone
04451				Cut Stone Veneer
04452				Stone Masonry Veneer
04500				Masonry Restoration and Cleaning
04800				Exterior Stone Detailing
04911				Masonry Restoration
04930		04910		Masonry Cleaning
				Division Five: Metals
05100		X		Structural Metals
05210	X	X	X	Steel Joists
05500	X	X	X	Architectural Metal Fabrication
05520		X		Metal Hand Railings and Iron Work
05530	X	X		Gratings
05700	X	X		Ornamental Metal
05510			X	Fabricated Spiral Stairs
				Division Six : Carpentry (Wood and Plastics)
06070		X	X	Wood Treatments
06100	X	X	X	Rough Carpentry
06140			X	Treated Wood Foundations
06150	X	X	X	Wood Decking
06200		X	X	Finish Carpentry
06410		X		Custom or Pre-fabricated Woodwork
06460				Stairs
				Division Seven: Thermal & Moisture Protection
07100		X		Waterproofing and Damp proofing
07120	07115		X	Bituminous Membrane Waterproofing
07160		X	X	Sheet Membrane Waterproofing
07190	X	X	X	Water Repellent Coatings
07313			X	Cedar Shake Shingles
07320	X	X		Roofing
07620		X	X	Flashing and Sheet Metal
07720	X	X		Roof Accessories
07920	X	X		Caulking and Sealants
07710	X	X		Manufactured Roof Specialties

				Division Eight: Doors, Windows & Glazing
08210		X	X	Wood Doors
08360	08361	X		Garage Door
08500		X	X	Windows
08710	X	X	X	Door Hardware
08850				Glass Block
				Division Nine : Finishes
09300	09310	X		Tile, Marble, Slate
09380		X	X	Cut Natural Stone Tile
09410		X	X	Portland Cement Terrazzo
09900	09910	X		Paints and Coatings
09969				Graffiti Resistant Coatings
09980		X		Coatings for Concrete and Masonry
				Division Ten: Specialties
10350	X	X	X	Flag Poles
10441			X	Building Signs
10536	10431			Awnings
10290		X		Pest Control
				Division Eleven : Equipment
11150	X	X	X	Parking Control Equipment
				Division Twelve : Furnishings
12140		12100		Sculptures
12500		X	X	Furniture
12801	12815	12800	12800	Interior Plantings
12850	X			Interior Planters
				Division Thirteen : Special Construction
13052	13038			Saunas
13100		X	X	Lightning Protection
13127		13120	13120	Prefabricated Buildings
13128				Greenhouses and Equipment
13152		13150		In-Ground Concrete Swimming Pools
13171				Hot Tubs
13811			X	Lighting Control Equipment-Low Voltage
13812			X	Lighting Control Equipment-Photoelectric
				Division Fourteen : Conveying Systems
14421	14420		14420	Wheelchair Lifts

Division Fifteen : Mechanical

15440	15410			Plumbing Fixtures
15476				Swimming Pool Equipment
15630				Solar Energy Devices

Division Sixteen : Electrical

16111				Conduit
16130	X			Boxes
16140	X			Wiring Devices
16161			X	Outdoor Equipment Enclosures
16180				Equipment Wiring
16492			X	Ground Fault Equipment Protection
16505	16511	16510	X	Light Fixtures
16525	16521	16520	X	Flood Lighting-Exterior
16530		16520		Site Lighting
16550			X	Street Lighting and Luminaries

Appendix D

Representative Arborist's Report Guideline

General:

The arborist report is generally produced by an ISA (International Society of Arboriculture) certified arborist; or an ASCA (American Society of Consulting Arborists) consulting arborist or by an individual with a diploma or degree from a designated forestry or arborist program.

The report should contain the following elements in varying form as determined by the requirements of the Owner, Contractor or designated authority representative:

- Scope of Work
- Observations
- Analysis or testing
- Discussion
- Conclusion(s)
- Recommendations(s)
- Supporting Information

Scope of Work:

Clearly defines the specific scope of services requested from the Owner/Contractor or authority. This section should outline the parameters of the work, relevant background or site history, the use of the report, site survey, damage report, and tree evaluation.

Observations:

Non judgmental observations and facts are to be reported in a clear and concise manner. Historical or literature research may also be included in this section.

Details of observations formats may include but are not limited to the following:

- Description of the site location and Overall condition of the site
- Site Characteristics and topography
- Permanent Structural Features
- Climatic or weather conditions (if pertinent report)
- Soil types/Analysis
- Identification of species or variety:

    Quantity of trees
    Size in general and specific measurements
    Specie characteristics
    Condition and overall health of plant
    Specific locations and Function of plants

Analysis or Testing:

Analysis or on-site observations using field equipment and techniques, and/or samples for laboratory analysis or testing. The discussion of analytical methodology and testing should be included along with the resultant data.

The results may include but are not limited to:

- Description of any outside investigations
- Analyses and tests that were conducted in addition to the work on the site
- Plant, Insect, disease or other pest identification
- Soil
- Water or tissue analyses
- Microscopic studies
- Photo interpretation
- Statistical or numerical analyses
- Literature searches
- Distinguish work done by arborists or others
- Treatment of data
- Written results or interpretations provided by outside sources a copyrighted material.

Discussion:

Discussion of observations and analyses required to present rationale, justify judgments and support conclusions and any recommendations.

Conclusion:

Evaluation the data and facts gathered during the investigation.

Recommendations:

Format should be designed to make needs to be usable recommendations listed tasks in priority.

Supporting Information:

Supporting materials that are requested should be included. Supporting information can be in the form of excerpts from literature, site maps, research from other experts, photographs, or ISA specifications or governmental by-laws.

APPENDIX E

BOTANICAL NOMENCLATURE

Internationally the proper scientific name of any organism should be used. Generic or common plant names vary greatly form one geographical region to another. This difference creates issues within the industry and the working context of daily activities and interactions. Therefore the scientific name should be used to remove any uncertainties as to the exact plant specified or purchased. The scientific name need be used only once. Once the scientific name is introduced, the common name may then be used throughout the remainder of the document. The current system of naming is referred to as the "Linnaean Bionomial System of Nomenclature". Scientific names are in Latin and are composed of *genus* and *species,* the binomial and in some instances a *forma* or *forma specialis*.

Latin scientific names are italicized or underlined.
Genus is capitalized.
Species name, forma and forma specialis are not capitalized.
Varietal names in English are not capitalized, but not italicized or underlined.
The generic term 'species' is used when the specific *epithet* is unknown. "Species" is not capitalized or italicized. The abbreviations sp. (singular) or spp. (plural) are often used.
The common name is capitalized only when it is taken from a proper noun or begins a sentence.
The scientific name is generally placed directly after the common name and is enclosed in parentheses.

The publication Hortus Third, A Concise Dictionary of Plants Cultivated in the United States and Canada, 1976; shall be the basis for confirmation of botanical nomenclature with changes determined and governed by, the International Code of Botanical Nomenclature (ICBN), the governing body of plant names.

The user should be cognizant of the six basic principles of the ICBN code:

1. Botanical nomenclature is independent of zoological nomenclature.

2. The application of names of taxonomic groups is determined by the means of nomenclatural types, a specimen.

3. Nomenclature of taxonomic groups is based on priority of publication.

4. Each taxonomic group can have only one correct name, the earliest that is in accordance with the rules, with some exceptions.

5. Scientific names are Latinized.

6. The rules are retroactive, some exceptions apply.

APPENDIX F

Glossary

Note that the terms included in this glossary are for the sole purpose of use within this Guideline. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work. Abbreviations, names or acronyms that are used in Specifications or other Contract Documents are defined to mean the industry recognized name, trade association, guidelines generating organization, governing authority or other entity applicable to context of the text provision.

Since some landscape terms are based upon a “trade language” as well as “design terminology”, many of the technical terms are unfamiliar to developers, builders and community officials. An understanding of these definitions will allow better comprehension of each section.

Acceptable Workmanship: Satisfactory to and approved by the reviewing authority/owner associated with the contract.

Acceptance: The notification to the Contractor or the Owner, by the Authority that the work is complete and that the requirements and specifications of the contract documents have been met in regard to the Work.

Acclimatization: The process required to cause physiological changes within a plant system that will enable the plant to adapt to the changes from the i.e. nursery environment to the interior environment or vice versa without exhibiting severe damage or death.

Addendum: (Addenda) A document or formal written instructions that amends, clarifies, revises, modifies, adds to, or deletes from the previously issued Bid Documents or the project manual during the bidding period prior closing date for receipt of bids becomes part of the Contract Documents when the Contract is executed.

Additional Work: Is work which results from a change or alteration in the contract and for which there maybe existing contract unit prices. (See extra work)

Administration: The adoption, interpretation and enforcement by the Authority of this Guideline, and procedures undertaken by the Authority regarding this Guideline. Administration shall also include procedures by the Contractor and required by the Authority regarding this Guideline (e.g., reporting, calling for field reviews).

Aeration: Maintenance procedure to improve water penetration and soil structure by relieving compaction usually by coring.

Agent: A person, party or entity authorized by another who acts legally for or in place of that one another.

Aggregate: Crushed stone, crushed slag, or any granular mineral material or water worn gravel for use for surfacing a built up plane.

Agronomist: A specialist in the theory and practice of soil management and the cultivation of field crops.

Amount of the Bid: The total amount shown on the proposal form or bid document which is based either on a lump sum or unit price.

Amount of the Contract: The amount of the contract is the final contract cost and may vary from the amount of the bid depending on the final quantities of work, change orders, or extra work.

Annual: A plant that completes its life cycle (from seed to seed) within a single growing season.

ANSI Z60.1: is a nationally recognized system for sizing and describing plants. It was established to facilitate orderly trade in nursery stock.

Approve: The meaning of term "approved" will be held to limitations of the Owner/Agent/Authority responsibilities and duties as specified in General and Supplementary Conditions.

Arborist: A person with technical knowledge of tree care maintenance practices, planting, transplanting, and pruning as well as in diagnosing tree diseases gained through experience and training.

Article: A primary numbered subdivision of a section of the guideline specifications.

As-built drawing: Drawing(s) used to record the details of a construction project following its completion.

Authority: Any body, government, agency, corporation, or individual that adopts this Guideline in regard to the Work on behalf of the owner (may include the Owner or his/her agents). The authority has the power to enforce laws, exact obedience, command, determine, or judge.

Award: The decision of the Owner to accept the proposal of a Bidder for the work proposed and/or materials to be furnished, subject to the execution and approval of the contract, bonds, securities, and other conditions as may be required by law.

Balled and Burlapped (B&B): Plants established in the ground which have been prepared for transplanting by digging so that the soil immediately around the roots remain undisturbed. The ball of earth containing the roots of the plant is then bound up in burlap or similar mesh fabrics.

Bare Root (B.R.): Harvested plants or nursery stock from which the soil or growing medium have been removed from the root system.

Bark Mulch: Chips and small pieces of wood, which are spread out over the ground surface to prevent the soil from eroding by dissipating the energy of raindrops; protecting the underlying roots from freezing and evaporation, and to reduce competing weed growth.

Baskets, Daisy and Wire: A wire containment systems designed to maintain the structural integrity of a root ball after digging.

Bidder: Any individual, firm, partnership, limited liability company, or corporation formally submitting a proposal to perform the work, and/or supply the materials contemplated, acting directly or via an authorized agent or representative.

Branch: The major lateral shoots emanating from a tree trunk, as compared to twigs or spurs, which are minor shoots emanating from a trunk or branch. On large established trees, not nursery stock, branches are referred to as limbs.

Branch Collar: Wood that forms from the overlapping trunk and branch tissue around a branch attachment, frequently more pronounced below the attachment.

Budded: Referring to bud-grafting, where a bud from one plant has been grafted onto another plant (typically an understock) as a method of asexual propagation.

Buffering: The use of landscaping (other than mere grass on flat terrain), or the use of landscaping along with berms, walls or decorative fences that partially and periodically obstruct the view from the street, in a continuous manner, of vehicular use areas and parking lots.

Bulb: The resting phase of plants such as the onion and tulip, which have membranous or fleshy leaves forming a rounded underground mass, and which can develop into new plants.

Caliper: In the landscape or nursery trade, this is the diameter of a tree measured at a point that is; 15 cm above the ground level for trees up to 10 cm caliper, for trees of 10 cm caliper and greater, caliper shall be measured 30 cm above ground level. This is in contrast to the method used to measure caliper in the timber industry, which is Diameter at Breast Height (See DBH). DBH is used to measure trees that are above 30 cm in caliper.

Canadian Certified Horticultural Technician (CCHT): A person who is in good standing with the Canadian Nursery and Landscape Association (CNLA) certification department, has successfully completed the CCHT test and has maintained all requirements for certification, certification renewal, and is listed in the CNLA register of CCHT's.

Cane: The major shoots emanating directly from the basal area of a shrub.

Certified Arborist: A person who is currently in good standing with the International Society of Arboriculture, has completed and maintained all requirements for certification as an Arborist, and is listed in the ISA register of certified arborists.

Certified Nursery Stock: Designated free of injurious pests or diseases.

Change Order: A written order, issued by the Contractor, and approved by the Owner, to change the scope of the contract in conformance with instructions contained therein. A change order may clarify, revise, add to, or delete previous requirements of the work, adjust the contract sum or the contract time.

Clearing: Removing all surface vegetative material in a given area, generally performed in conjunction with grubbing. (see grubbing)

Codominant Stems: Two or more vigorous and upright branches of relatively equal size that originate from a common point, usually where the leader has been lost or removed.

Collar: The region of the plant where root and shoot meet, generally at the soil line.

Collected: Material dug from native stands, established woodlots or other non-cultivated areas. Plants must be designated as such.

Conifer: A member of the Coniferae family. In botany, a plant that is mostly needle or scale-leaved, generally evergreen. Cone-bearing gymnospermous trees or shrubs such as pines, spruces, and firs. Not all conifers are evergreens, and not all evergreens are conifers.

Construction contract: See Contract.

Construction Documents: All of the written including both the bidding, contract documents and graphic documents prepared or assembled for outlining the project design and contract administration.

Construction manager: The person or firm responsible for coordinating and managing all or part of the construction process, including the design and bidding phases.

Construction: Construction is the act, art, or business of moving, demolishing, installing, or building, structures, excavations, landscaping, site improvements, drainage systems and roads according to a plan or by a definite process.

Consultant: A person (or organization) with an area of expertise or professional training who contracts to render professional services to the Owner/Authority.

Container Grown: Plants grown in nursery containers appropriate to age and size, and are not field grown or collected.

Container: The pot in which nursery stock is sold or grown. Containers are manufactured of different materials such as peat moss, plastic, wood, paper, cloth, etc. and may vary greatly in size, shape and quality. However, in the context of nursery stock, containers are not used as a final installation for growing.

Contract Administration: The duties and responsibilities of the person or firm responsible for contract administration during the construction phase of a project as set forth in the design agreement and in the construction documents' General Conditions.

Contract Bonds: The approved forms of security, executed by the Contractor and the Contractor's surety or sureties, guaranteeing the complete execution of the contract and the payment of all legal debts pertaining to the contract.

Contract Completion Date: The calendar date stipulated in the contract by which the proposed work shall be complete.

Contract Documents: Documents containing the legally enforceable requirements that become part of the construction contract when the Agreement is signed. Contract documents may consist of the: Agreement, General Conditions, Specifications, List of Drawings, Drawings, Addenda, Certificates of Insurance, List of Subcontractors, Notice of Completion, and all other documents as identified in the Agreement.

Contract Schedule: The schedule that graphically shows each project work activity, the start and finish times required for each activity, and the interrelationships between all work activities. This schedule is made and used by the contractor/owner to coordinate the work.

Contract sum: The amount of compensation stated in the Agreement for the performance of the work. The contract sum may be adjusted only by change order.

Contract: The written agreement between the Owner and the Contractor, containing all the conditions of that agreement. The contract may include the proposal, contract form and bond, general provisions and requirements, guideline specifications, special provisions, detailed and guideline plans, addenda, change orders, and any agreements that are required to complete the work.

Contractor: The individual, firm, partnership, limited liability company, or corporation undertaking the execution of the work under the terms of the contract with the owner (client). The Contractor is the person or entity identified as such in the Agreement.

Critical path method (CPM): A planning and scheduling system which combines all relevant information into a single plan defining the sequence and duration's of operations and depicting the interrelationship of the work elements required to complete a project. The critical path is defined as the longest sequence of activities in a network that establishes the minimum length of time for accomplishment of the end event of a project.

Critical Root Zone: Is a circular region measured outward from a tree trunk representing the essential area of the roots that must be maintained or protected for the tree's survival. Critical root zone is one foot of radial distance for every inch of tree DBH, with a minimum root protection zone of eight feet.

Critical Zone: The critical zone is the area surrounding any element that must be protected to ensure the survival of the element.

Crown: In trees the foliated portion from the lowest branch to the treetop.

Cultivar: A contraction of the words cultivated variety. A named plant selection from which identical or nearly identical plants can be produced, usually by vegetative propagation or cloning. Cultivated plants that are specifically named, whose unique characteristics are retained during propagation and populations are maintained by human efforts. Distinguished from botanical varieties which are also distinct populations of plants in a species, but naturally occurring.

Cultivating: A term for the tilling of soil around plants to kill weeds and allow air and water to penetrate to plant roots.

Deciduous: Shedding foliage each year, as applied to trees and shrubs; losing fruit or leaves at maturity or at the end of the growing season, not evergreen.

Design Load: The "live load" that a structure is designed to resist (with appropriate safety factor) plus "dead load" (ie. weight of permanent loads)

Dethatching: A maintenance procedure that involves making a series of vertical cuts into the turf to penetrate and remove accumulated layers of decaying plant material on the soil surface.

Diameter Breast Height (DBH): A category of measurement for forestry work. The internationals metric guideline for DBH is over bark at a point 1.3 m above the ground.

Die-Back: The progressive dying, which may or may not lead to death from the tips downward or inward of shoots, twigs, tops, branches, or roots.

Direct Planting: The "planting" process whereby the nursery growing container is removed from the root soil mass of the plant prior to the plant being "planted" in the soil medium which fills the (decorative, fixed, floor typed or other type) planter.

Dormancy: Can be a normal part of the life cycle, or it may be induced by unfavourable environmental conditions. It may involve a period of reduced or suspended physiological activity during which plants may have no leaves or flowers.

Dormant: State of reduced physiological activity and growth between periods of active change.

Double-Potting: The "planting" process whereby the growing container is left around the plant root/soil mass and the unit is placed in a decorative planter which contains soil medium or drainage fill material surrounding the nursery container to aid in restricting root growth spread and future plant removal convenience.

Drip Line: An imaginary vertical line extending from the outermost edge of the tree's original canopy to the ground, the horizontal extent of the root system normally extends well beyond the drip line.

Edging: (1) A line that creates visual interest and separation, for example, between the lawn and an annual border. (2) Any non-biodegradable material, typically plastic or metal, installed in the ground to separate flower beds from lawn or other landscape areas.

Engineer: The Contract Administrator, acting personally, or by and through such assistants as may be specifically authorized to act for him.

Equipment: All tools, materials, machinery, assemblies, instruments, devices or articles, and supplies necessary for maintenance, for the proper construction of the work or contract components.

Establishment Maintenance: Procedures that should be carried out to, at least the requirements of this Guideline during the first two years or agreed to period, after landscape installation to ensure or increase the long-term success of the planting.

Experienced: Skilled or knowledge obtained or gained as the result of active participation or practice.

Extra Work: An item of work not originally a part of the contract, but necessary for completion and/or execution of the contract.

Fertilizer: Any organic or inorganic material of natural or synthetic origins that is added to a soil to supply one or more elements essential to the growth of plants.

Field Capacity: The highest amount of moisture remaining in a soil after free water has been allowed to drain away by gravity, usually expressed as a percentage of oven-dry weight of soil.

Field Potted: Plants dug with an intact soil ball and placed in a container, in lieu of burlap.

Field Review: In this Guideline the term field review and site review are used interchangeably. A field review is a periodic and irregular site visit to view the work and ascertain whether the work conforms to the contract documents.

File-Top Planter: Any decorative planter small enough or specifically designed to fit on top of a filing cabinet.

Fill: Means a deposition of earth material by artificial means.

Fixed Planting Bed: A permanent, non-movable planting area which is built into a building's construction (at grade level or at-finished-floor level or slightly above grade).

Floor Planter: Any decorative planter (e.g., basket, fiberglass, metal, ceramic, etc. type of container) that is designed and scaled to sit on the floor and maybe fixed or movable.

Flower Rotation: The cyclical process whereby potted flowers are placed in an interior landscape for "colour" under contract at agreed upon intervals for either a set or variable price.

Foliage Plant: Living green plant forms that are commercially grown in containers for their form, texture and growth habits instead of their flowers or blooms and that are capable of living indoors for long periods at relatively constant temperatures and under low light intensities.

Foot Candles: The units of light received by an object (plant) from a specific direction and source of variable distance. The measurement is based on light from one candle received by an object at fixed distance.

Furnish: The term is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance. (Same as SUPPLY.)

General Requirements: Refers to the provisions or requirements of Specification sections, and applies to the entire work of the Contract.

Girdling root: A root that partially or entirely encircles the trunk and/or large butress roots, which could restrict growth and downward movement of photosynthate.

Grade, Nursery Stock Grade: Any and all designations associated with a plant group signifying sizes, qualities and historical details of a nursery stock item.

Grade: The vertical location of the ground surface.

Grading: Altering natural terrain and elevation of the land as specified in the contract documents, landscape plans and grading plans.

Graft: A method of asexual propagation involving a product or procedure of joining two plants or plant parts together so that they will unite and continue their growth as one.

Green Laws: Municipal or provincial law that protects, preserves or restores nature to urban areas.

Ground Cover: A small low-growing dense growth (other than saplings) of plants, planted for ornamental purposes or to prevent soil erosion in areas where turf is difficult to grow, such as in deep shade or on a steep slope.

Growing Medium: Material selected or prepared, to the requirements of this Guideline or specification for planting and growing plants.

Grubbing: Removal of stumps, root systems, and vegetable matter from the ground surface by exposing and cutting the roots after clearing and prior to excavation. (See Clearing)

Guideline: A suggested course of action.

Hard Landscape: The portion of the landscape that consists of materials that are not living, or do not physiologically support living elements, i.e. paving, fencing, fountains, irrigation systems, lighting and site furnishings.

Hardening Off: A nursery process in which young plants are prepared for their final exterior location by exposing them to a gradual period of change in growing parameters such as water, light, and temperatures.

Hazard tree Assessment: A process of assessing a standing tree for signs of structural weakness caused by growth habit, disease or decay. Also an assessment of whether or not a target(s) exist in a potential fall zone.

Heeling In: A temporary measure process in the nursery or on site of storing planting stock that is being moved by temporarily covering the base of a plant, especially a dormant plant.

Holding Period: Time duration in which plants should be held by Contractor following their arrival from the growing nursery and prior to their installation of the job site. The objective of this period is to extend the acclimatization period usually implemented in a facility in which lighting, humidity and temperature can be controlled.

Included Bark: Bark embedded with the crotch between a branch and the trunk or between two or more stems that prevents the formation of a normal branch bark ridge.

Indicated: The term "indicated" is a cross- reference to details, notes, or schedules on drawings, to other paragraphs or schedules in the specifications.

Install: The term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of a particular construction activity, including installation, building, application and similar operations.

Integrated Pest Management (IPM): A systemic approach to pest control that uses a variety of techniques that are least disruptive such as planting resistant varieties, using biological controls, less toxic sprays and appropriate cultural techniques. The use of traditional synthetic pesticides are used as a last resort to reduce pest damage or unwanted vegetation to economically and threshold tolerance levels.

Irrigation: The distribution of water over the surface of land to encourage the growth of vegetation.

Land Clearing: Indicates those operations where trees and vegetation are removed and which occur previous to construction of buildings, road right-of-way excavation, utility excavation, grubbing, and any other necessary clearing operation.

Landscape Architect: Is a person who has the ability to stamp and certify a drawing and is currently a Member in good standing with the Ontario Association of Landscape Architects in accordance with that society's act, constitution and bylaws.

Landscape Fabric: A woven or non-woven geotextile that acts as a separator between various landscape elements. Drainage, strength, and other characteristics of the fabric should be specified in the contract documents.

Landscape Ordinance: A public law, requiring public review and approval of a permit, often contained within a zoning ordinance or land development code that regulates landscape designs, landscape installation and maintenance.

Landscape Plan: The preparation of graphic and written criteria, specifications, and detailed plans to arrange and alter the effects of natural features such as plantings, ground and water forms, walks and other features.

Landscaping: The combination of living plants, (trees, shrubs, vines, ground covers, flowers or grass); natural features and materials (rock, stone, bark chips or shavings); and structural features, including but not limited to, fountains, reflecting pools, outdoor art work, screen walls, fences, or benches.

Leachate: A product or solution containing constituents picked up through the leaching of soil such as dissolved organic matter leached from fallen leaves.

Leaching: The process of flushing the growing medium (i.e., soil mass within a nursery container or planter) with clean, pure (low in dissolved salts) water so as to wash out dissolved soluble salts which might otherwise "burn" the plant roots.

Leader: (Botanically) The primary or dominant shoot of a plant, which usually develops into the main trunk.

Leaf Density: The approximate percentage of the measurement plane seen as foliage as opposed to light passing through when viewed from the side or from above. For plants it is measured by spread.

Liners: Young, immature plants intended for growing on to mature sizes in nurseries, either by lining out in the field or in containers. Typically 1 or 2 years old and often sold bare-root or in small containers.

Maintenance: The improvement of the landscape via ground, fertilizing, mulching, staking, spraying, trimming, removing, snow removal and pruning.

Materials: Any items or substance which may be specified, incorporated into the construction, the work and its appurtenances.

Medium: The surrounding environment or substance in which a specific organism lives and thrives.

Mulch: Any material spread over the soil surface to retain soil moisture, moderate soil temperature, prevents the soil from eroding by dissipating the energy of raindrops and protects underlying roots from freezing and evaporation and the suppression of weed growth.

Native Plants: Usually a species known to have existed on a site prior to the influence of humans either indigenous or occurring naturally in a given geographic locale.

Notice to Proceed: Written notice to the Contractor instructing the Contractor to proceed with the work.

Noxious Weed: (1) a plant designated by the protection agency, by law to be a noxious weed and/or any species of plant which is, or is liable to be, troublesome, intrusive or destructive to agriculture, arboricultural, that is difficult to control or eradicate.

Nursery Stock: Any plant for planting, propagation or ornamentation, including but not limited to: a) All plants, trees, shrubs, vines, perennial grafts, cuttings and buds that may be sold for propagation, whether cultivated or wild. b) any other plant or plant part, including cut Christmas trees or any non hardy plant including but not limited to annuals, bedding plants and vegetable plants.

Nursery: Any location where nursery stock is grown, propagated, stored, or sold.

Owner: (Owner's authorized representative.) A term used to identify a person, firm, or corporation who commissioned the prime consultant and who contracted with the general contractor.

Percolation: The flow of water or other fluids through soil, rock, or a filter, under the influence of gravity in conditions of partial or complete saturation.

Perennial: A plant that normally lives more than two growing seasons and, after an initial period, produces flowers annually.

Permanent Wilting Point: The point where the soil moisture retained is unavailable to the plant, causing it to wilt and not regain turgidity at night without the addition of water to the soil.

Person: Includes individual, firm, corporation, company, or association.

Pest: Any biotic agent (any living agent capable of reproducing itself) or any of the following that is know to cause damage or harm to agriculture or the environment; (a) any infectious, transmissible, or contagious disease of an plant; (b) any form of animal life, (c) any form of vegetable life. This includes, but is not limited to insects, snails, nematodes, fungi, viruses, bacterium, microorganisms, mycoplasma like organisms, weeds, plants or parasitic higher plants.

Pesticide: Any substance or material, other than a device, that is sold or used to repel or manage a pest.

Plans: The official drawings, guideline plans, profiles, typical cross sections and supplemental drawings that show the dimensions, locations, details, and character of the work to be performed.

Plant Life: All plants including trees, dead or downed wood, shrubs, vines, wildflowers, grass, sedge, fern, moss, lichen, fungus, or any other member of the plant family.

Plant: Includes any part of a plant, tree, plant product, shrub, vine, fruit, vegetable, seed, bulb, stolon, tuber corm, pip, cutting, scion, bud, graft, or fruit pit including: (a) agricultural commodities: plant materials, including any horticultural product, (b) Nursery stock; (c) Non-cultivated or fedreral plants, gathered from the environment (d) plants produced by tissue culture, cloning or from stem cell culturess or other prepared media culture.

Planter: A decorative planter, hanging planter or fixed planting bed.

Plug: The term is generally used for seedlings and rooted cuttings and is a cylinder of medium in which a plant is grown.

Product: Item acquired from a manufacturer or supplier for incorporation into the construction. Product or Products can mean material, drawings, specifications, reports, manuals, presentations, verbal service and recommendations, training materials and training given machinery, equipment, and fixtures forming the Work.

Project: A word used to represent the overall scope of work being performed to complete a specific job.

Project Manager (Project Management): A qualified individual or firm authorized by the owner to be responsible for coordinating time, equipment, money, tasks and project team for all or specified portions of a specific project. (see Construction Manager).

Proposal: The properly signed and guaranteed written offer of the Bidder to perform all the work.

Provide: Means furnish and install, to acquire or purchase, ship to the site, unload and store, install in position, connect to utilities, and make ready for intended use.

Provincially Accredited Horticultural Program: A post secondary institution delivering a program approved by the Provincial Ministry of Training, Colleges and Universities .

Pruning: The act of removing branches or parts of trees and shrubs with a view to strengthening those that remain or to bringing the tree or plant into a desired shape.

Qualified: An individual or firm with a recognized degree, certificate, or professional standing; or who by extensive knowledge, training and experience, has successfully demonstrated his/her abilities to identify and solve or resolve problems associated with a specific subject matter or project type. (See Experienced)

Quality: A system for ensuring the maintenance of proper guidelines in manufactured goods, especially by inspection of the work or productis obtained by conscientious application of a thoroughly planned quality-assurance program implemented through a quality-control procedure.

Relocated Tree: Is an existing tree on a site that is moved to another location on the same site to accommodate development or to be moved outside an existing or proposed building envelope.

Replacement Tree: A replacement tree is a tree which is planted on a property after the removal of an existing tree on the same site. A replacement tree is generally required on a one-to-one basis with any removed tree.

Required: By this Guideline or by other guidelines, codes, laws, or regulations in force or referenced by this Guideline.

Restoration: The comprehensive maintenance activities intended to accurately recover the form and details of a property as it appeared originally or at a time of historic significance.

Reviewer: A person designated by the owner or authority to conduct field reviews. (see field reviews)

Root Ball: The clump consisting of the main growing roots of a plant and the soil (or other growing medium) adherent to them. The root ball should be kept intact when transplanting.

Root Bound: The condition in container grown plants in which the root system occupies most of the available space and has grown in a jammed, intertwined manner.

Root Collar: The flared area at the base of a tree where the roots and trunk merge, also referred to as the “root crown” or “root flare”.

Root Pruning: Means: (1) The act of cutting the roots of large plants, primarily shrubs or trees, to force more vigorous growth or to prepare the plant for transplantation. (2) The systematic pruning of roots of nursery plants growing in the field, in order to stimulate branching of roots and the production of fibrous roots.

Root Stock: A plant on which a variety or species is grafted or budded which is used to support and/or effect the growth habit of the variety.

Rotation (Rotational Planting): The cyclical process by which plants are removed from an installation site and simultaneously replacement with another plant so that the number of plants on a job always remains intact.

Samples: Physical examples that illustrate materials, equipment, or workmanship, and that establish guidelines by which the work will be assessed.

Saturation Point: A state where all pores in a soil are full of water.

Scarification: The physical or mechanical disturbance to loosen compacted soil and to create better conditions for plant material.

Section: A numbered chapter of the guideline specifications.

Shall: For this guideline means; will have to, will be able to, used to express a command or exhortation , used in laws, regulations, or directives to express what is mandatory.

Should: A certain sentence in this guideline is a recommendation.

Shrub: A woody plant, generally smaller than a tree, which generally produces several stems, rather than a single trunk from the base.

Site Clearing: Means the removal of trees, vegetation and/or alteration of the existing topography of a property.

Site Review: See field review.

Snowfall: The amount of snow that falls during a given period or in a specified area.

Soft Landscape: That portion of a landscape that consists of living elements and on which the living elements depend on physiologically for survival i.e. trees, shrubs, perennials, and soil.

Special Provisions: Additions to or modifications of the guideline specifications and supplemental specifications covering conditions peculiar to the work.

Specification: A written document with technical directions and conditions describing the quality of materials and the guideline of workmanship of the project or parts of. It deals with items are that are portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, guidelines and workmanship for the Work, and performance of related services that cannot be shown on drawings or in the schedules.

Specimen: A plant designation that may be used to indicate, usually a large shrub or tree, that exhibits all the best characteristics normally associated with its type.

Stress: A measure of force of the load on a structural member in terms of force per unit area.

Subcontractor: An individual, firm, partnership, limited liability corporation, or corporation to whom the Contractor subcontracts a portion of the work.

Subgrade: The level of the landscape profile that is below the build up to finish grade. In paved areas that level below the gravel or paver base, in planting areas that level below the accepted growing medium depth.

Subsoil: The “B” horizon of a soil profile.

Succession: The process of change in a plant community composition and structure over time.

Supervision: The act, process, or function of supervising construction materials, methods and processes for a specific project.

Supplier: A person, firm, or corporation that supplies materials or equipment to be included in the work, including that fabricated to a special design, but who does not perform labour at the site.

Supply: Means to acquire or purchase, ship or transport to the site, unload, re-package, replace damaged items, and store on-site.

Surety: The individual, firm, or corporate body bound with and for the Contractor for the acceptable completion of the work and the contract, and for payment of all just claims arising there from.

Testing Laboratories: A laboratory retained to perform specific inspections or tests and is an independent entity engaged to perform testing services required by the contract documents.

Thatch: In lawns, this is a layer of dead plant material at the roots of the grasses. A certain amount is beneficial in protecting roots from heat, cold, and drought, whereas too much smothers roots, blocks fertilizer and water from reaching the soil.

Thinning: A type of pruning cut that removes a lateral branch back to the branch collar on the parent branch.

Tissue Culture: The process of the propagation of plants from very small plant parts, tissues or cells grown in a test tube or container where the environment and nutrition are rigidly controlled.

Topdressing: The application of fertilizer, compost, manure, or other soil amendment to the soil's surface.

Topsoil: Imported or on site “A” horizon soil that meets, or can be modified to meet, the requirements of this Guideline or as specified.

Trades: Use of titles such as “carpentry” is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter”. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

Transplanting: The act or process of removing and resetting a plant one or more times to improve its size and growth potential characteristics. Also includes moving a plant from one site to another.

Tree Protection Zone: The area around a tree corresponding to the drip line or a minimum of ten (10) feet in all directions from the trunk.

Tree Survey: Detailed review and recording of information about trees in a particular area.

Tree Tie: Material used to attach trunk of tree or shrub to support stake, and designed not to damage tree bark.

Tree: A perennial plant which grows from the ground with a single permanent, usually tall, woody, self-supporting trunk or stem, and an elevated crown of branches and foliage. Any woody,

perennial plant characterized by having a main stem of trunk of six inches or more in diameter 4.5 feet above the natural grade.

Trimming: Clipping the ends of young branches using heading cuts.

Trunk: The main stem or axis of a tree that is supported and nourished by the roots and to which branches area attached.

Turgid: A plant that is fully supplied with water and showing no signs of wilting.

Utilities: Refers to overhead or underground wires, pipe lines, conduits, ducts, or structures, sewers or storm sewer drains.

Weed: Any plant growing where it is not desired.

Wildlife: Any wild animal, bird, amphibian, reptile, fish, shellfish, aquatic life, or invertebrate.

Winter Damage: Injury, damage or death of plant tissue caused by the climatic effects of the cold temperature and resultant precipitations. The majority of injury can be classified as due to desiccation, freezing, breakage and salt (de-icing).

Work: The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labour and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.