

CHAPTER 3.

Site Preparation and Protection of Existing Site Elements

3.1 General

3.1.1 Pertinent Standards 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 standard, 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 Standard 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 (measured 1.3 m above ground)	DISTANCE FROM TRUNK	
	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 Standard for Clearing, Close Cut Clearing, Grubbing , Removal of Boulders and Mechanical Stump Cutting, should be considered in conjunction with this Chapter of the Standard 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 Standard.
- .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.