

**CITY EROSION AND SEDIMENT CONTROL HANDBOOK
TREE PLANTING AND PRESERVATION GUIDELINES**

Authority

The City of Alexandria has adopted these guidelines in conjunction with Ordinance No. 3019, amending Title 5, Chapter 4 on Erosion and Sediment Control. These guidelines are hereby incorporated by reference and shall become part of the City's Erosion and Sediment Control Handbook referenced in Section 5-4-9 of the City Code. These regulations were adopted pursuant to the authority of Title 21, Chapter 1, Article 6.1 of the Code of Virginia (1981, as amended).

3-1.87. Introduction

Prompted by the unnecessary destruction of trees in Alexandria, especially by developers in the process of development, the City Council considered and approved this addition to the City's Erosion and Sediment Control Handbook. These regulations were designed to control unnecessary tree destruction and to delegate the authority for administration of these regulations and the related Tree Preservation aspects of Title 5, Chapter 4 of the City Code on Erosion and Sediment Control, to the City Arborist.

These regulations, Chapter 3 of the City's Erosion and Sediment Control Handbook, contain the standards, policies and guidelines prompted by Ordinance No. 3019 amending Title 5, Chapter 4, as well as other revisions as they become necessary. These regulations are directed toward both the design of plans and their implementation in the field.

By:



Vola Lawson, Acting City Manager

Issued: March 5, 1985

3-1.88. Intent and Purpose

Whereas trees and other vegetation moderate effects of sun and wind, provide buffers and screens against noise and air pollution, contribute to the intake of carbon dioxide and the release of oxygen of our atmosphere; filter out pollutants from the air; serve to decrease storm water runoff through canopy interception and root zone uptake; assist in the stabilization of soil and in the prevention of erosion; act to moderate temperature changes and provide shade; provide a haven for animals and for birds which in turn assist in the control of insects; are important psychological, sociological, and aesthetic counterpoints to the man-made urban setting; and tend to conserve and increase property values; it is therefore, the purpose and intent to regulate the removal of vegetation from public and private property within Alexandria in order to preserve, protect and enhance a most valuable natural resource entrusted to the Commonwealth and protect the health, safety and welfare of its citizens; to establish standards limiting the removal of vegetation and insuring the replacement of vegetation sufficient to safeguard the ecological and aesthetic environment necessary to a healthy and happy community; to prevent the unnecessary clearing and disturbing of land so as to preserve, insofar as is practicable, the natural and existing growth of vegetation; and to replace when necessary the removed vegetation with the same or comparable species.

3-1.89. Definitions

- A. Clearing - Any intentional or negligent act to (1) cut down, (2) remove all or a substantial part of or (3) damage a tree or other vegetation which will cause the tree or other vegetation to decline and/or die. Such acts shall include but not be limited to damage inflicted upon the root system of the vegetation by the application of toxic substances, by the operation of equipment and vehicles, by storage of materials, or by the change of nature grade due to unapproved excavation or filling, or damage caused by the unapproved alteration of natural physical conditions.
- B. Commercial forest - Forest land which is producing or is capable of producing forest products.
- C. Drip line - A vertical line extending from the outermost edge of the tree canopy or shrub branch spread to the ground.
- D. Limits of clearing - The boundaries of that area of land to be cleared of trees and other vegetation in conjunction with the proposed development or land use, except that the area within these limits for such proposed development or use shall not include the removal of any outstanding or monarch trees unless approved by the Arborist. Subject to the Arborist's approval, the limits of clearing as shown on the plan shall generally include:
 - 1. Street construction and necessary slope construction. However, such clearing shall meet the criteria of the Department of Transportation and Environmental Services.

3-1.89.D.

2. Public service or utility easements and rights-of-way. This shall include area for utility line installation with any construction easements for maintenance access. Timing of clearance shall be approved by the City Arborist.
 3. Building roof coverage area and ancillary structures such as patios and porches plus 15 feet on all sides for construction activity.
 4. Driveways, alleyways, walkways, parking lots, and other land area necessary to the installation of the proposed development or use. Other necessary land area may include area for gardens, tennis courts, swimming pools, and lawn areas and related structures or uses.
 5. Sediment basins - Only the area necessary for construction of the dam, the area in which sediment will collect, and the area necessary for construction and maintenance of the basin shall be cleared of vegetation. Configuration of the basin shall utilize natural terrain as much as possible to minimize vegetation removal. Any vegetation which dies as a result of the deposition or sediment and/or debris shall be removed by the permittee.
 6. Detention ponds - Only the area necessary for construction of the dam and the area necessary for construction and maintenance of the pond shall be cleared of vegetation. Configuration of the pond shall utilize natural terrain as much as possible to minimize vegetation removal. Any vegetation which dies as a result of the deposition of sediment and/or debris shall be removed by the permittee.
- E. Limits of grading - The outermost edge of the area the existing topography is to be altered by cutting or filling.
- F. Outstanding or monarch tree - A tree which has been determined by the Arborist to be of high value because of its species, size, age, form, historical significance, or some professional criteria.
- G. Permittee - Any individual, applicant, owner, developer, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, county, city, town, or other political subdivision of the State, any interstate body, or other legal entity or agent thereof responsible for carrying out the plan.
- H. Seedling - A plant which will become a tree with further growth, is not over three years old, and has been transplanted no more than twice.
- I. Shrub - A woody plant that usually remains low, produces shoots or stems from the base, and is not usually tree-like nor single-stemmed.

- 3-1.89. J. Toxic substances - A substance which when allowed to enter the ground will produce detrimental effects on vegetation which may result in its mortality. Examples of these substances are petroleum products and minerals.
- K. Tree - Any self supporting woody plant growing upon the earth which usually provides one main trunk and produces a more or less distinct and elevated head with many branches.
- L. Vegetation - All plant life; however, for purposes of this section it shall be restricted to mean trees, shrubs and vines.
- M. Vine - A woody plant whose stem climbs by tendrils or twining or creeps along the ground.

3-1.90. Erosion and Sediment Control Plans

- A. Applicability - See Sections 5-4-1 through 3 of the City Code.
- B. Exception to applicability - A Plan is not required to be submitted under the following conditions.
1. Those exceptions to land disturbing activity as specified in Section 5-4-5 of the City Code.
 2. A Plan shall not be required for the removal of trees grown and intended to be sold as live trees in the course of business on nursery or dealer properties registered by the Virginia Commissioner of Agriculture and Immigration (Plant Pest Act of 1952). This provision in no way eliminates the necessity of obtaining an approved Plan prior to engaging in any other land disturbing activity.
 3. Subject to approval by the Arborist, a Plan shall not be required to clear any tree(s) which has become or threatens to become a danger to human life property due to accidental causes, acts of God, or other emergency.
- C. Vegetation preservation & planting requirements for Plans
1. Existing trees - The existing tree line must be accurately and clearly shown and labelled so that it is understood where the existing trees are located. This shall include groups of trees and individual trees standing apart from any woods on the site. Existing trees shall include those 5" in diameter or greater measured 30" from the ground.
 2. Trees and other vegetation to be retained
 - a. The limits of clearing shall be located at the outermost limits of the area to be cleared and accurately shown and labelled. It shall not include any unnecessary clearing. (See definition of "Limits of clearing" Section 3-1.89).

3-1.90.C.2.

- b. Groups of trees and individual trees standing alone that will be retained on the site shall be accurately located on the plan and designated as "Trees to be saved".
 - c. The location of all outstanding or monarch trees shall be accurately shown on the plans. Every attempt shall be made to save these trees.
 - d. The limits of clearing shall be shown for all items listed in the definition of "Limits of clearing" (see Section 3-1.89.D.) off-site as well as on-site.
 - e. The limits of clearing for the installation of utility lines shall be adequate for the size of line and depth of installation.
 - f. If existing trees are proposed to be retained in a parking lot area, sufficient ground, as determined by the Arborist, shall be left ungraded around the tree to allow for its survival.
 - g. The limits of clearing shall be shown for only the work proposed pursuant to that plan.
3. Tree wells or tree walls - If tree wells or tree walls are to be constructed in order to preserve trees on the site, they shall be accurately located on the site plan. Construction of such wells or walls shall be in accordance with Section 3-1.92.E. of this manual.
4. Proposed utilities
- a. Proposed utilities, when practical, should be located so that their installation will not adversely affect vegetation retained on the site.
 - b. Laterals from houses, when practical, should be located so installation will have minimum impact on the vegetation retained.
5. Sediment and erosion control measures
- a. All control measures shall be shown on the plans.
 - b. All controls shall be placed at the limits of grading and not in areas shown to remain undisturbed. This should preclude the depositing of sediment within the drip line of the trees to be retained.
 - c. Insofar as is possible, sediment basins shall be constructed so as to take advantage of natural terrain in order to minimize grading and vegetation removal. If the construction of the sediment basins requires the clearing of trees, replacements as specified in Section 3-1.90.C.7.b.2 shall be required by the Arborist so that the area is restored to a natural condition when the basin is removed.

3-1.90.C. 6. Retention and detention ponds - Insofar as is possible, ponds shall be constructed so as to take advantage of the natural terrain in order to minimize grading and vegetation removal.

7. Replacements

a. The Arborist may require that individual trees shown to be saved on an Erosion and Sediment Control Plan be replaced by other trees of the same or comparable species. The value of the replacement trees shall not exceed the value of those being removed as determined by the formula in the latest revision of the "Guide for Establishing Values of Trees and Other Plants" prepared by the Council of Tree and Landscape Appraisers. The quantity shall be dictated by the constraints of the site.

b. Specifications

1. Replacement trees shall be a minimum of 2"-2 1/2" and maximum of 6" caliper measured 30" from the ground unless approved or otherwise required by the Arborist. The type of plant material required shall be appropriate for the site condition.

2. When areas have been cleared for temporary landfills, basins or ponds, such areas are to be replanted to restore the area to a condition as may be required by the Director and/or the City Arborist, or to meet site plan approval requirement, whichever is less. At least 25% of the area shall be planted with trees as specified in b.1 above. The remainder of the area shall be planted with seedlings as specified in Section 3-1.95.E.2., the quantity to be specified on the Planting Plan. In addition, the area shall be seeded with a mixture containing grasses, perennials and woody vegetations as approved by the Arborist.

c. The trees that are to be planted shall be of species suitable for the proposed site conditions. For example, if the location for the tree is to be wet, then the tree must be able to withstand wet conditions. If the tree is to be located near an area where the pollution will be at a high level such as near or in a parking lot or near a highway, then the tree to be planted must be able to withstand the high pollution. (See Tree Selection Chart.)

d. The replacement trees shall not be planted within a utility easement or in an area which will interfere with existing or proposed utilities or obstruct or interfere with access of maintenance personnel or equipment.

3-1.90.C. 8. Planting Plan

- a. If trees or other vegetation are required to be planted, a planting plan shall be submitted.
- b. Each plant to be planted shall be accurately located and labelled as to species.
- c. The planting plan shall include a plant schedule (see sample) which shall include the following:
 1. Plant name, both botanical and common.
 2. Quantity of each species used in the plan.
 3. Size of plant to be planted (caliper, height or spread).
 4. Type of root stock to be planted: i.e. balled and burlapped (B&B), bareroot, container.
 5. Description of seed mixture and rate.

SAMPLE PLANTING SCHEDULE

Key	Botanical Name	Common Name	Quant.	Size	Remarks
A	Acer saccharum	Sugar Maple	5	2-2-1.2" Caliper	B&B
Q	Quercus palustris	Pin Oak	10	6-8'	B&B
P	Pinus strobus	White Pine	100	3 year seeding	Bareroot

NOTE: Remarks column may also be used to note any other characteristics which that plant should exhibit (i.e. sheared, specimen, multi-stem, tree form, etc.).

9. Other Information - Other information shall be furnished as deemed necessary by the Arborist.
- D. Factors to consider for approval of Conservation Plans - In addition to reviewing for conformance to other policies, standards and guidelines contained in this manual, the following factors shall also be taken into consideration.
 1. The extent to which the area would be subject to environmental degradation due to removal of the trees and other vegetation.

- 3-1.90.D. 2. The heightened desirability of preserving trees and other vegetative cover in densely developed or densely populated areas.

E. Approval of Conservation Plans

1. If the Plan conforms to all policies, standards, and guidelines, and there are no objections resulting from consideration of the factors listed in D. above, the Plan shall be approved.
2. A construction plan approved by the Arborist shall constitute an approved Conservation Plan which shall include but not be limited to approval to clear vegetation in conformance with the approved plan.

- F. Rejection of Conservation Plans - If the plan does not conform to all policies, standards, and guidelines or there is an objection resulting from the consideration of the factors listed in D. above, the Plan shall be rejected. The Arborist shall require that the Plan be modified to bring it into conformance with the policies, standards, and guidelines or to eliminate any objection to the plan if the Plan is to be approved.

3-1.91. Violations

- A. Failure to comply with these regulations or any other provisions of Title 5, Chapter 4 of the City Code shall constitute a violation.
- B. When vegetation is cleared in violation of Section 5-4 of the Code, or the approved Conservation Plan, replacement trees and/or other vegetation may be required by the Arborist according to the guidelines set forth in Section 3-1.90.C.7.a.
- C. Revegetation required due to a violation of this Section shall be accomplished in a time frame specified by the Arborist on the violation notice. At the discretion of the Arborist a revision to the approved Conservation Plan may be submitted and approved showing the required revegetation to be planted at a later date. Such plan shall be prepared in accordance with Section 3-1.90.C.8.a.

3-1.92. Preservation of Vegetation

- A. Stresses of Construction - Trees may appear to be inanimate objects; but they are living organisms that are constantly involved in the process of respiration, food processing, and growth. Construction activities expose trees to a variety of stresses resulting in injury ranging from superficial wounds to death. An understanding of these stresses is helpful in planning for tree protection.
 1. Surface Impacts: Natural and man-related forces exerted on the tree above the ground can cause significant damage to trees.

- a. Wind damage - Removal of some trees from groups will expose the survivors to greater wind velocities. Trees tend to develop anchorage where it is most needed. Isolated trees develop anchorage rather equally all around, with stronger root development on the side of the prevailing winds. The more a tree is protected from the wind, the less secure is its anchorage. The result of improper thinning or clearing is often wind thrown trees. Selective removal in favor of a single tall tree may also create a lightning hazard.
 - b. Excessive pruning - Unprotected trees are often "topped" or carelessly pruned to prevent interference with utility wires or buildings. If too many branches are cut, the tree may not be able to sustain itself. If the pruning is done without considering the growth habit, the tree may lose all visual appeal. If the branches are not pruned correctly, decay may set in.
 - c. Trunk damage - Tree trunks are often nicked or scarred by trucks and construction equipment. Such superficial wounds provide access to insects and disease.
2. Root Zone Impacts: Disturbing the delicate relationship between soil, roots and the rest of the tree can damage or kill a tree. The roots of an existing tree are established in an area where essential materials - water, oxygen and nutrients - are present. The mass of the root system is the correct size to balance the intake of water from the soil with the transpiration of water from the leaves.
- a. Raising the grade as little as 6 inches can retard the normal exchange of air and gases. Roots may suffocate due to lack of oxygen, or be damaged by toxic gases and chemicals released by soil bacteria.
 - b. Raising the grade may also elevate the water table. This can cause drowning of the deeper roots.
 - c. Deep fills and relatively impervious fills may also retard the normal exchange of soil gases and air to such a degree that root mortality occurs.
 - d. Shallow fill over heavy turf or thick leaf litter can cause root mortality and seriously affect a living tree.
 - e. Lowering the grade is not usually as damaging as raising it. However, even shallow cuts of 6 to 8 inches will remove most of the top soil, natural mulch and ground vegetation, removing some feeder roots and exposing the rest to drying and freezing.
 - f. Deep cuts may sever a large portion of the root system, depriving the tree of water and increasing the chance of wind-throw.

3-1.92.A.2.

- g. Lowering the grade may lower the water table, inducing drought. This is a problem in large roadway cuts or underdrain installations.
- h. Trenching close to individual valuable ornamental shade trees or trees in woodland tracts in development is often necessary to facilitate the installation of utility lines, the construction of buildings, driveways, walkways and the construction of necessary curbing and guttering. Trenching can be extremely detrimental to established trees due to the partial or nearly complete severing of roots which can cause the mortality of individual ornamental trees and edge trees of existing woodlands. Trenching or excavating through a tree's root zone can eliminate as much as 40 percent of the root system. Trees suffering such damage usually die within 2 to 5 years.
- i. Tunnelling usually causes less disturbance and mortality of the root system and where pipe can be driven under a tree's root system, the physiological impact is lessened considerably.
- j. Compaction of the soil within the drip line of a tree by equipment operation, materials storage, or paving can block off air and water from roots.
- k. Construction chemicals or refuse disposed of in the soil can change soil chemistry or be toxic to trees.

B. Site Planning for Tree Protection

1. If lot size allows, trees to be saved should be selected before siting the building. No tree should be destroyed or damaged until the design of buildings and utility systems are final.
2. Critical areas, such as flood plains, steep slopes, and wetlands, should be left in their natural condition or only partially developed as open space.
3. Locate roadways to cause the least damage to valuable stands. Follow original contours, where feasible, to minimize cuts and fills.
4. Minimize trenching by locating several utilities in the same trench. Excavations for basements and utilities should be kept away from the drip line of trees.
5. Construction material storage areas and worker parking should be noted on the site plan, and located where they will not cause compaction over roots.

- 3-1.92.B. 6. When retaining existing trees in parking areas, leave enough ground ungraded around the tree to allow for its survival or use grass pavers to allow air and moisture to reach the tree roots.

C. Guide for selection of trees and other vegetation to be retained

1. Grading - Consideration must be given to the proximity of proposed grading to the trees and other vegetation retained. Grading shall not take place within the drip line of trees retained unless approved by the Arborist.
2. Tolerance to sudden exposure - Consider the tolerance of the trees and other vegetation to the new environmental conditions such as increased direct sunlight, increased radiant heat from proposed buildings and pavement, and increased wind. Trees with a strong tap or fibrous root system should be given priority over those with a weak root system. (See Tree Selection Chart, Section 3-1.9).
3. Water table - Consideration should be given to the effect of grading on the water table and its accompanying effect on trees and other vegetation retained. Grades that are lowered will cause the water table to drop which will reduce the ground water available to the vegetation.
4. Outstanding specimens - Trees and other vegetation of impressive size or shape, of historical significance, or rare species shall be preserved if possible.
5. Appearance - Trees with a well developed crown should generally be given preference over those with misshapen crowns or trunks, those with a small crown at the top of a tall trunk or those with narrow, V-shaped crotches. Those trees which are open grown usually possess better form than those which are grown in the woods.
6. Wildlife value - Leave trees and other vegetation which provide a good source of food, cover and nesting sites for wildlife. Example: Oaks, Hickories, and Dogwoods have a high food value.
7. Other vegetation - Consideration should be given to other vegetation growing in the immediate area. Example: Virginia Pine, which would not be of particular value if growing with hardwoods, would increase in value if this were the only species present on the site, trees which have been standing alone are of higher value than those in a wooded situation.
8. Comfort - Consider the location of the trees to be retained in relation to the planned use of the site. Trees provide relief from summer heat and strong winds.
9. Health and disease susceptibility - Check for scarring caused by fire or lightning, insect or disease damage, and rotted or broken trunks or limbs. Pest- and pollution-resistant trees are preferred.

3-1.92. D. Protection of vegetation retained

1. General

- a. The permittee shall be responsible for the protection of the tops, trunks and roots of all existing trees as well as other vegetation that are to be retained on the site. After vegetation has been removed within the area authorized to be cleared, protective devices shall be installed along the limits of clearing prior to any construction work or traffic taking place within 50 feet of the vegetation retained on the site. Protection shall be maintained until all work in the vicinity has been completed and shall not be removed without the consent of the Arborist. If the Arborist finds that the protective devices are insufficient to protect the vegetation retained on the site, additional protective devices shall be installed to insure adequate protection.
 - b. Heavy equipment, vehicular traffic, stockpiling of any materials, or deposition of sediment, shall not be permitted within the drip line of trees to be retained.
 - c. Trees being removed shall not be felled, pushed or pulled into trees being retained. Equipment operators shall not clean any part of their equipment by slamming it against the trunks of trees to be retained.
 - d. No toxic materials shall be stored within 100' from vegetation areas to be retained.
 - e. Fires authorized by Alexandria Air Pollution Control Ordinance, Fire Code, or any other State or City law shall not be permitted within 100' of vegetated areas retained unless approved by the Arborist in accordance with such ordinance, code or law. They shall be limited in size so as not to adversely affect the vegetation.
 - f. No protective devices, signs, utility boxes or other objects shall be nailed to the trees to be retained on the site.
2. Devices - Any device may be used which will effectively protect the roots, trunk and top of the trees and other vegetation retained on the site. The less formidable the barrier used, the greater the care that must be taken to avoid inflicting damage. Personnel working in the vicinity of the vegetation area retained must be instructed to honor the protective devices. The devices for protection outlined below are suggested devices only and are not intended to exclude the use of other devices, subject to the Arborist's approval, which will protect the vegetation retained.

3-1.92.D.2.

- a. Snow fence - Standard 48" high snow fence shall be placed at the limits of grading on posts mounted 6' apart.
- b. Filter fabric fence or Silt fence - This fencing shall be placed at the limits of grading and constructed as specified in Standard 1.06 in the Virginia Erosion and Sediment Control Handbook.
- c. Additional trees - Additional trees may be left standing as protection between the trunks of the trees to be retained and the limits of grading. The trunks of trees in this buffer shall be no more than six (6) feet apart to prevent passage of equipment and material through the buffer. When additional trees are used as protection, the limits of clearing shown on the approved plan shall be flagged in the field so that the additional buffer area is delineated. When this method of protection is used, these additional trees shall be removed prior to completion of the project if required by the Arborist.
- d. Cord fence - Fencing shall be placed at the limits of grading and shall consist of 2" x 2" posts set securely in the ground spaced no more than eight (8) feet apart and protruding at least four (4) feet above the ground, and connected to each other by two cords 1/4" or thicker two (2) feet apart. Strips of surveyor's flagging shall be tied to the cord at intervals no greater than three (3) feet.
- e. Berm - The temporary perimeter dike which has been constructed for erosion and sediment control may double as a protective device for vegetation to be retained. This temporary perimeter dike shall be constructed as specified in Standard 1.15 in the Virginia Erosion and Sediment Control Handbook and shall be constructed at the limits of grading outside the drip line of the trees to be preserved.

E. Grade changes

1. Lowering grade - Grade cuts of 12" or more which in the determination of the Arborist are harmful to trees can be reduced or eliminated by the construction of a tree wall as shown and described in the diagram. Once grade has been lowered, the wall shall be constructed within two weeks.
 - a. When excavating, all tree roots that are exposed and/or damaged shall be trimmed cleanly, and covered temporarily with moist peat moss, burlap or other suitable material to keep them from drying out. (See Section 3-1.94.D.4.)
 - b. Tree walls shall be constructed in accordance with the Tree Wall Detail. (Note: If wall is over 3'6" in height, a building permit shall be required.)

3-1.92.E.

- c. Backfill with top soil to retain moisture and aid root development.
- d. Apply fertilizer according to the Fertilization Table. Broadcast fertilizer evenly over root area of the tree affected, as per 3-1.95.E.2.
- e. Prune tree crown reducing leaf surface to compensate for root loss in accordance with Section 3-1.94.C.
- f. Provide a means for drainage through the wall so water will not accumulate behind the wall. Weep holes shall be required with a solid masonry wall.

FERTILIZATION TABLE

Greater than 6" Caliper except American Beech and Crabapples	4 lbs. 5-10-5 or 2 lbs. 10-6-4 Per inch Caliper
Smaller than 6" Caliper including American Beech and Crabapples	2 lbs. 5-10-5 or 1 lbs. 10-6-4 Per inch Caliper

NOTE: For optimum results, apply in mid-late March.

- 2. Raising grade - When fill of 6" or more is necessary within the drip line of a tree to be retained, a tree well shall be required and shall be installed prior to any filling. The following method shall be used to insure survival of the tree.
 - a. Before making a fill, remove the green vegetation, sod, leaf litter and other organic matter from beneath the tree or trees and loosen the surface soil without damaging the roots.
 - b. Apply fertilizer according to the Fertilization Table. Broadcast fertilizer evenly over root area of the tree or trees affected, as per 3-1.95.E.2.
 - c. The dry well shall be constructed so as to allow for tree trunk diameter growth. Clearance for a younger tree shall be greater than that for an older tree.
 - d. The well shall be built high enough to bring the top just above the level of the proposed fill.

3-1.92.E.2.

- e. The well shall be constructed of large stones, brick, building tile, concrete blocks, or cinder blocks with care being taken to insure that ample openings are left through the wall of the well to allow for free movement of air and water. Mortar shall only be used near the top of the well and only above the porous fill.
- f. One or more drain lines shall begin at the lowest point inside the well and extend down and outward from the tree trunk. Additional drain lines shall also radiate out from the well wall with vertical tiles and/or pipes being used if fills over 2' are contemplated. (See Diagram.)
- g. Tar paper or approved equivalent shall be placed over the tile and/or pipe joints to prevent clogging and large stone shall be placed around and over the drain tiles and/or pipes for protection.
- h. A layer of stone (2" - 6" stone) shall be placed over the entire area under the tree from the well out at least as far as the drip line as shown on the detail. For fills up to 2 feet deep, a layer of stone 8-12" thick is usually adequate. A thicker layer of stone not to exceed a maximum of 30" will be needed for deeper fills.
- i. A layer of small stone (3/4" x 1" stone) covered by straw or a fiberglass mat shall be used to prevent soil sifting through the stone.
- j. Filling shall be completed with porous soil such as top soil until desired grade is reached.
- k. To prevent clogging of the drain lines, crushed stone shall be placed inside the dry well over the openings of the radial tiles. Vertical tiles shall also be filled with crushed rock and may also be covered with a screen.
- l. To prevent anyone from falling into the dry well and leaves and debris from accumulating there, the area between the trunk and the well wall may either be covered by an iron grate or filled with a 50-50 mixture of crushed charcoal and sand. (This will also prevent rodent infestation and mosquito breeding.)

F. Trenching and tunnelling (See Appendix A12-5 and A12-5A)

1. If in the determination of the Arborist a tree or group of trees shown to be preserved on the approved plans is of significant value or importance, the Arborist shall determine whether trenching or tunnelling is required when working within the drip line of these trees.

- 3-1.92.F.
2. Trenching shall be done outside the drip line of the tree unless otherwise approved by the Arborist, so as to reduce the amount of root area damaged or killed by trenching activities.
 3. Tunnelling shall be conducted in accordance with the specifications in Appendix A12-5A.
 4. The avoidance of large roots or root concentrations can be accomplished by curving the trench or by tunnelling under large roots and areas that do not have a large taproot.
 5. Roots shall not be left exposed to the air. The ends of damaged and cut roots must be cut off smoothly. 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.
 6. Trenches and tunnels shall be filled as soon as possible. Air spaces in the soil shall be avoided by careful filling.
 7. The tree shall be mulched and fertilized to conserve moisture and stimulate new root growth and enhance general tree vigor. Fertilize according to the Fertilization Table. Broadcast fertilizer evenly over the root area of the tree affected, as per 3-1.95.E.2.
 8. If a significant amount of root system has been damaged or killed, the tree shall be pruned in accordance with Section 3-1.94.C.

3-1.93. Guide for Selection of Trees to be Planted

- A. Proposed development - Consider the mature height and spread of the trees to insure they will not interfere with proposed structures and overhead utilities. Consider the root development characteristics to insure they will not cause interference with walls, walks, drives, patios, and other paved surfaces or affect water and sewer lines, septic systems, or underground drainage systems.
- B. Proposed use - Consider the proposed use of the developed area. Select trees which exhibit a tolerance to air pollution if a large amount of air pollution will be present (see Tree Selection Chart). Select trees which are suitable for buffering or screening if noise or objectionable views are going to be a problem. (Evergreens provide better buffering and screening than deciduous trees). Select trees which can tolerate de-icing salts if there is a chance these will be used. (See Selection Chart.)
- C. Landfills - Consider the proximity to landfills. Gases generated can travel underground for a considerable distance to kill trees.

- 3-1.93. D. Life span - Preference should be given to trees with long life spans.
- E. Resistance to disease and insects - Trees that are known to be resistant to attacks by disease or insects should be given preference to those known to be susceptible.
- F. Esthetic value - Consideration should be given to flowering habits, autumn foliage, bark and crown characteristics, and type of fruit.

3-1.94. Standards for Field Practice

A. Pre-construction

1. Marking of limits of clearing

- a. Prior to requesting a pre-construction meeting as specified in 3-1.94.A.2., the limits of clearing shall be visibly marked on the trees to be retained with surveyor's tape or water-base paint.
- b. If paint is used, only the minimum amount necessary for marking shall be used.
- c. Limits of clearing shall not exceed that shown on the approved plans.

2. Pre-construction meeting

- a. When the aforementioned marking has been completed, a meeting shall be requested with the Arborist and assigned Department of Transportation and Environmental Services inspector to inspect the marking.
- b. During any pre-construction meeting, tree preservation and protection measures should be reviewed with the contractor as they apply to that specific project.
- c. The permittee may at this option retain additional vegetation over and above that which is required by the approved plan. However, in doing so, he must realize that it must be protected and same as other vegetation if it is to survive. Otherwise, it risks the chance of dying, in which case it must be removed, usually at greater expense.
3. Once clearing is completed and protective devices installed a follow-up inspection shall be requested.
4. If at any time subsequent to the initial clearing it becomes necessary to remove additional trees which were shown on the plan to be preserved, the Arborist shall be notified and must grant approval prior to performing any additional clearing.

3-1.94. B. Dead or dying trees

1. In the event any tree or portion thereof which is dead or dying due to construction or environmental changes brought about by construction and/or clearing and poses a hazard to either life or property, the permittee shall be required to take such action as requested by the Arborist to carefully eliminate the hazard.
2. If any trees shown on the approved plan to be saved are dead or dying due to acts of negligence by the permittee, they shall be taken down (see 4.) and replaced. Number of replacement trees shall be specified by the Arborist based on the guidelines as set forth in Section 3-1.91.C. Replacement trees shall be planted as nearly as possible to the location of the dead or dying tree taken down unless other arrangements are agreed to by the permittee and the City Arborist.
3. It shall be the responsibility of the permittee to obtain written permission from the property owner or his agent to enter upon such property for the purpose of complying with 1. or 2. above, prior to commencing remedial action. In the event such permission is denied and such denial is demonstrated to the satisfaction of the Arborist, the permittee may be relieved of his obligations under 1. and 2. above.
4. When trees must be taken down, removed, or pruned as a result of 1. or 2. above, the wood from these operations shall remain the property of the property owner.

C. Pruning

1. All pruning of branches shall be done as shown on the Pruning Diagram. Cuts must be made properly to prevent additional bark from being torn from the tree. Flush cuts are unacceptable. All final cuts shall be made sufficiently close to the trunk or parent limb without cutting into the branch collar or leaving a protruding stub, so that wound closure can readily start under normal conditions.
2. If a large amount of the root system has been damaged and killed, the crown leaf surface shall be proportionately reduced to balance the reduced root system. This may be accomplished by pruning 20 to 30% of the crown foliage as shown in the Crown Reduction Diagram. If roots are cut during the winter, pruning shall be accomplished before the next growing season. If roots are cut during the growing season, pruning shall be done immediately.

D. Repair of damage

1. Any damage to the crown, trunk or root system of trees retained on the site shall be repaired immediately.

- 3-1.94.D. 2. Branches - All damaged branches shall be cut off cleanly as specified in Section 3-1.94.C.
3. Bark - All jagged bark wounds (Fig. A) shall be cut clean immediately by making all edges smooth and rounding the wounds at the top and the bottom (Fig. B). In the event that callous growth has already started to grow it shall not be removed when trimming the wound.
4. Roots - Damaged roots shall be cut off cleanly behind the damage and covered with topsoil.

3-1.95. End of Construction

- A. Inspection - Inspection shall be requested at the completion of construction to ensure that the work accomplished agrees with the approved plans.
- B. Repair - All trees that have been damaged as a result of construction activity shall be repaired as specified in Section 3-1.94.
- C. Dead or dying trees
1. Work shall have been accomplished as stated in Section 3-1.94.B.
 2. If any trees shown on the approved plan to be saved are dead or dying due to acts of negligence by the permittee, they shall be removed and replaced by the permittee. The size, species, and quantity of replacement trees shall be specified by the Arborist based on the value of the trees that were to have been saved as determined by the formula in the latest revision of "Guide for Establishing Values of Trees and Other Plants" prepared by the Council of Tree and Landscape Appraisers. The quantity shall be dictated by the constraints of the site.
- D. Soil Aeration - If the soil has become compacted over the root zone of any tree, the ground shall be aerated by punching holes with an iron bar, or by use of an alternative method approved by the City Arborist. The bar shall be driven one foot deep and then moved back and forth until the soil is loosened. This procedure shall be repeated every 18 inches until all of the compacted soil beneath the crown of the tree has been loosened.
- E. Fertilization - The permittee shall fertilize trees that in the opinion of the Arborist have been stressed or damaged during construction.
1. Trees shall be fertilized in the late fall (after October 1) or early spring (from the time frost is out of the ground until May 1). Fall applications are preferred, as the nutrients will be made available over a longer period of time.

- 3-1.95.E. 2. Fertilizer shall be applied to the soil over the feeder roots. (See Fertilization Table, Appendix A12-3.) In no case should it be applied closer than three feet to the trunk.
3. Fertilizer shall be applied using approved fertilization methods and equipment.
4. Formulations and application rates shall conform to the guidelines given in the Fertilization Table.

F. Newly planted vegetation

1. Any vegetation required by the approved Conservation Plan or the Arborist which in the opinion of the Arborist is dead or is not healthy shall be replaced by the permittee.
2. Trees shall be restaked and rewrapped by the permittee if necessary.

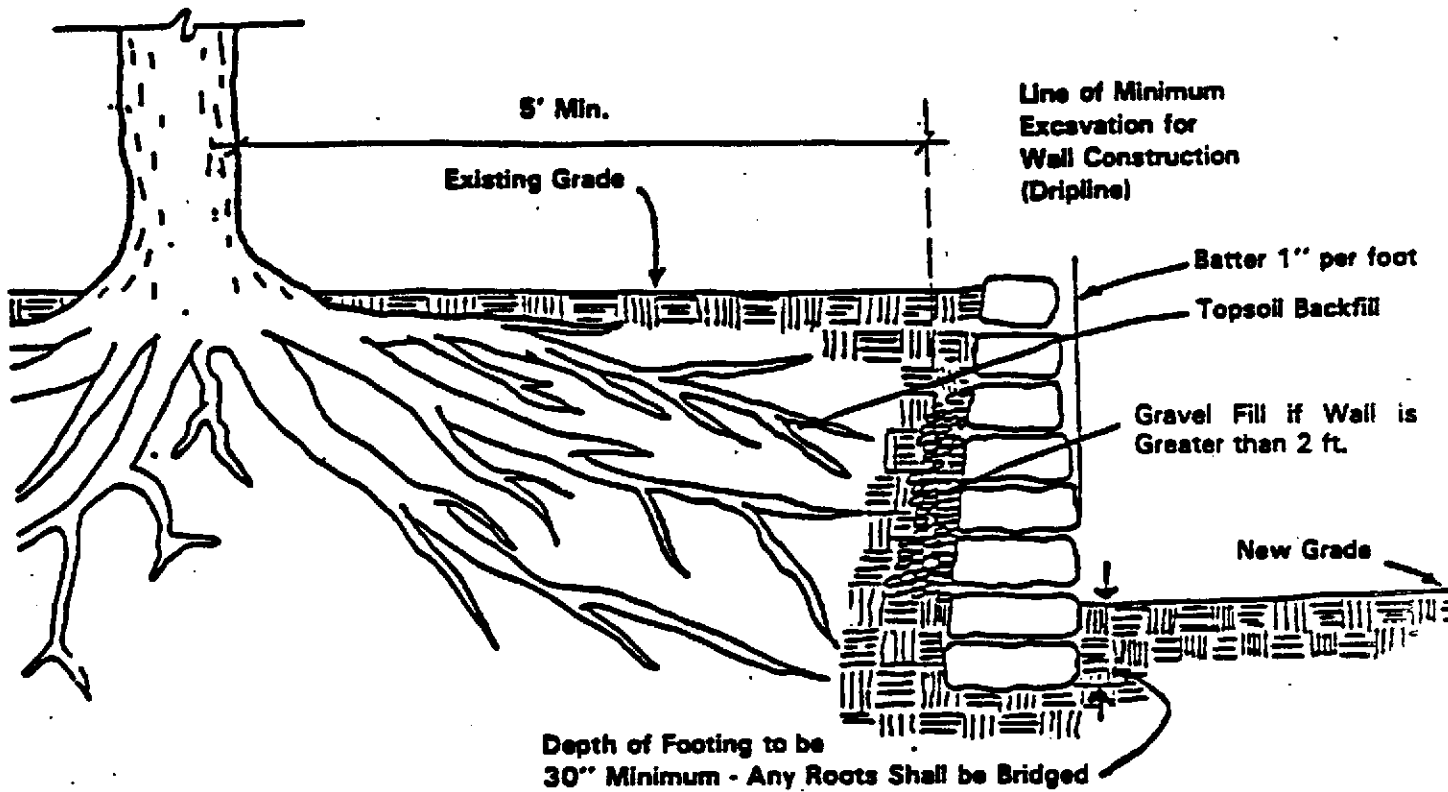
3-1.96. Tree Selection Chart

The charts in Appendix A12 contain information which will be helpful in the selection of trees to be preserved on sites planned for construction as well as the selection of trees to be planted on sites after construction has been completed. This information is by no means all inclusive but does contain some of the trees commonly found existing on sites where construction will take place as well as some of the trees commonly planted on construction sites in the City of Alexandria.

APPENDIX A12
VEGETATION PRESERVATION AND PLANTING

TABLE OF CONTENTS

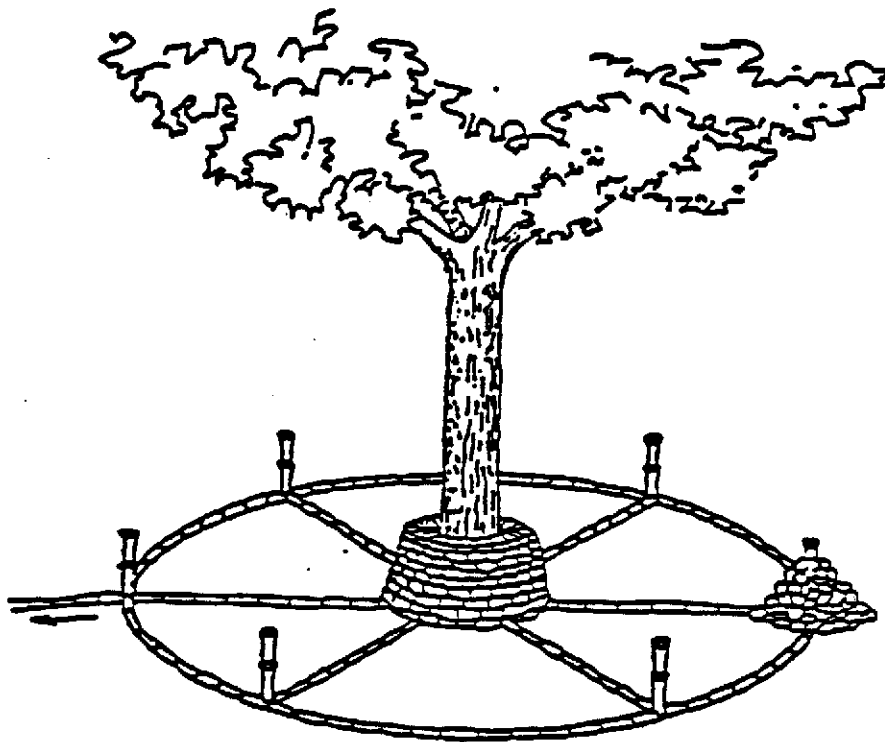
CHART DESIGNATION	CHART TITLE
A12-3	Tree Wall Detail and Fertilization Table
A12-4	Tree Well Detail
A12-5	Tunnelling and Trenching Diagram
A12-5A	Tunnelling Details
A12-6	Crown Reduction Diagram
A12-6A	Pruning Diagram
A12-7	Planting Details - Trees of 3 Inch Caliper and Below
A12-8	Planting Details - Trees of 3 Inch Caliper to 6 Inch Caliper
A12-9	Tree Selection Chart Key
A12-13	Tree Selection Chart
A12-14	Tree Selection Chart



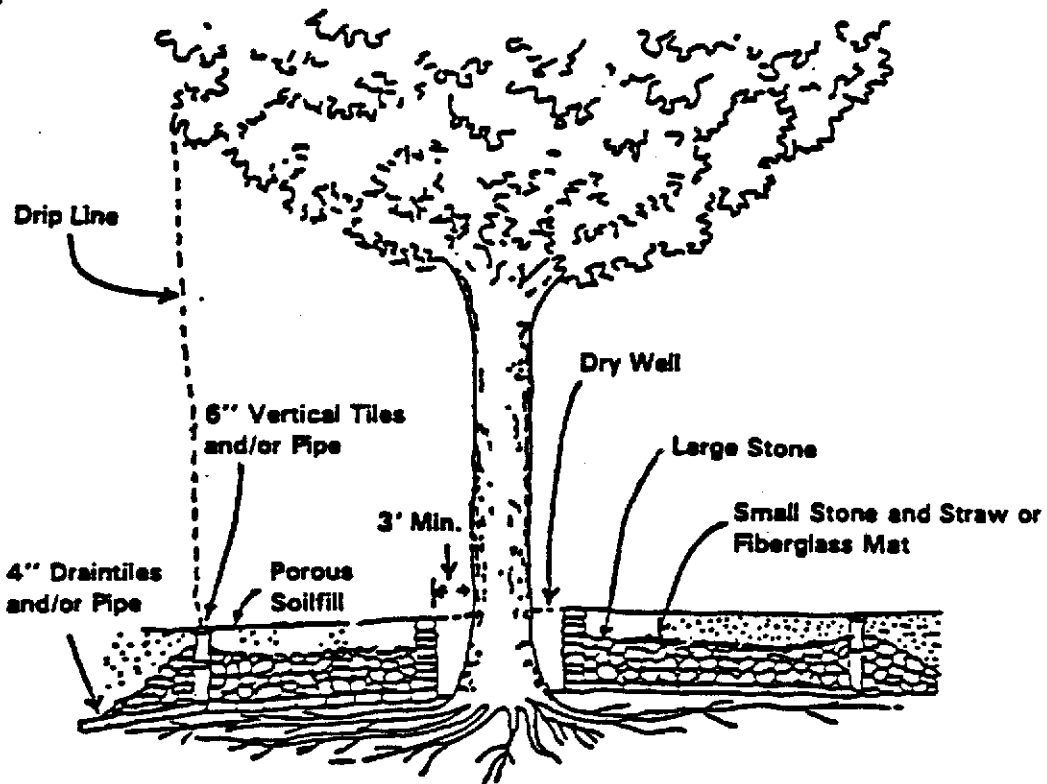
Greater than 6" DBH except American Beech and Crabapples	4 lbs. 5-10-5 or 2 lbs. 10-6-4 Per inch DBH
Smaller than 6" DBH including American Beech and Crabapples	2 lbs. 5-10-5 - or 1 lbs. 10-6-4 Per inch DBH

NOTE: for optimum results, apply in mid-late March.

<p>TREE WALL DETAIL AND FERTILIZATION TABLE</p>	REVISION		PAGE N
	NO.	DATE	A12-



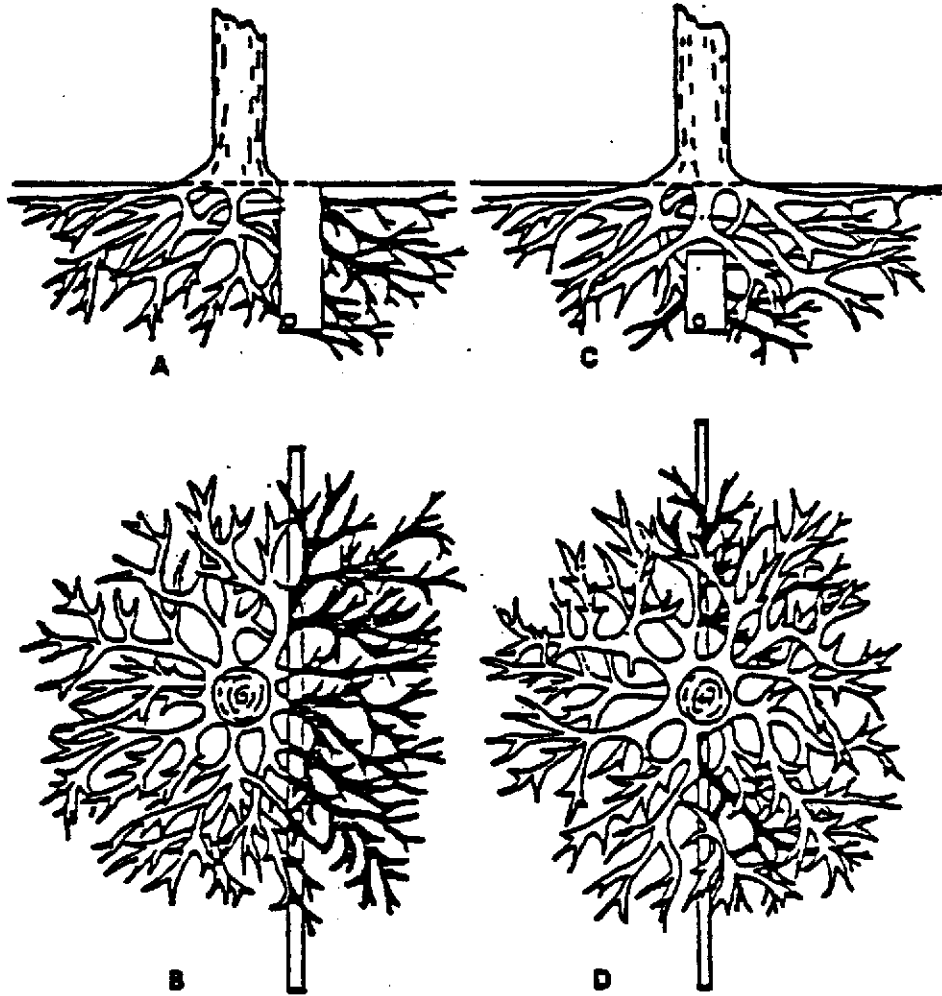
DRAINAGE PIPE LAYOUT



CROSS SECTION DETAIL

TREE WELL DETAIL

REVISION		PAGE NO.
NO.	DATE	
		A12-4



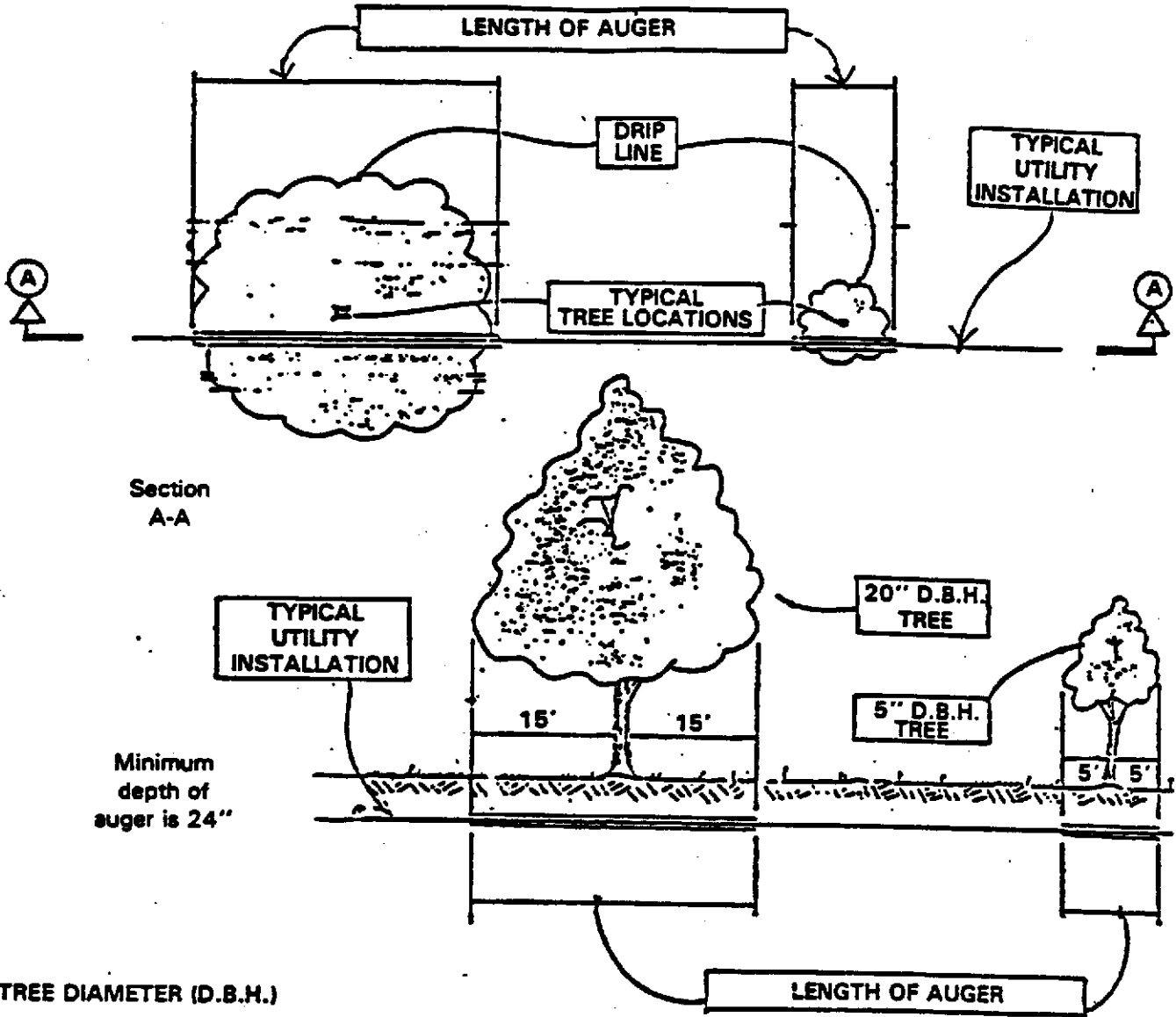
Roots severed, as indicated in solid black, by digging trenches near tree (side and top views): A and B, many roots destroyed by trenching close to tree trunk; C and D, only few roots destroyed by trenching directly toward trunk and tunnelling under base of tree.

TUNNELLING & TRENCHING DIAGRAM

REVISION | PAGE NO

NO. | DATE |

A12-8



TREE DIAMETER (D.B.H.)

0-2 inches D.B.H.

3-4 inches D.B.H.

5-9 inches D.B.H.

10-14 inches D.B.H.

15-19 inches D.B.H.

20 inches D.B.H. and over

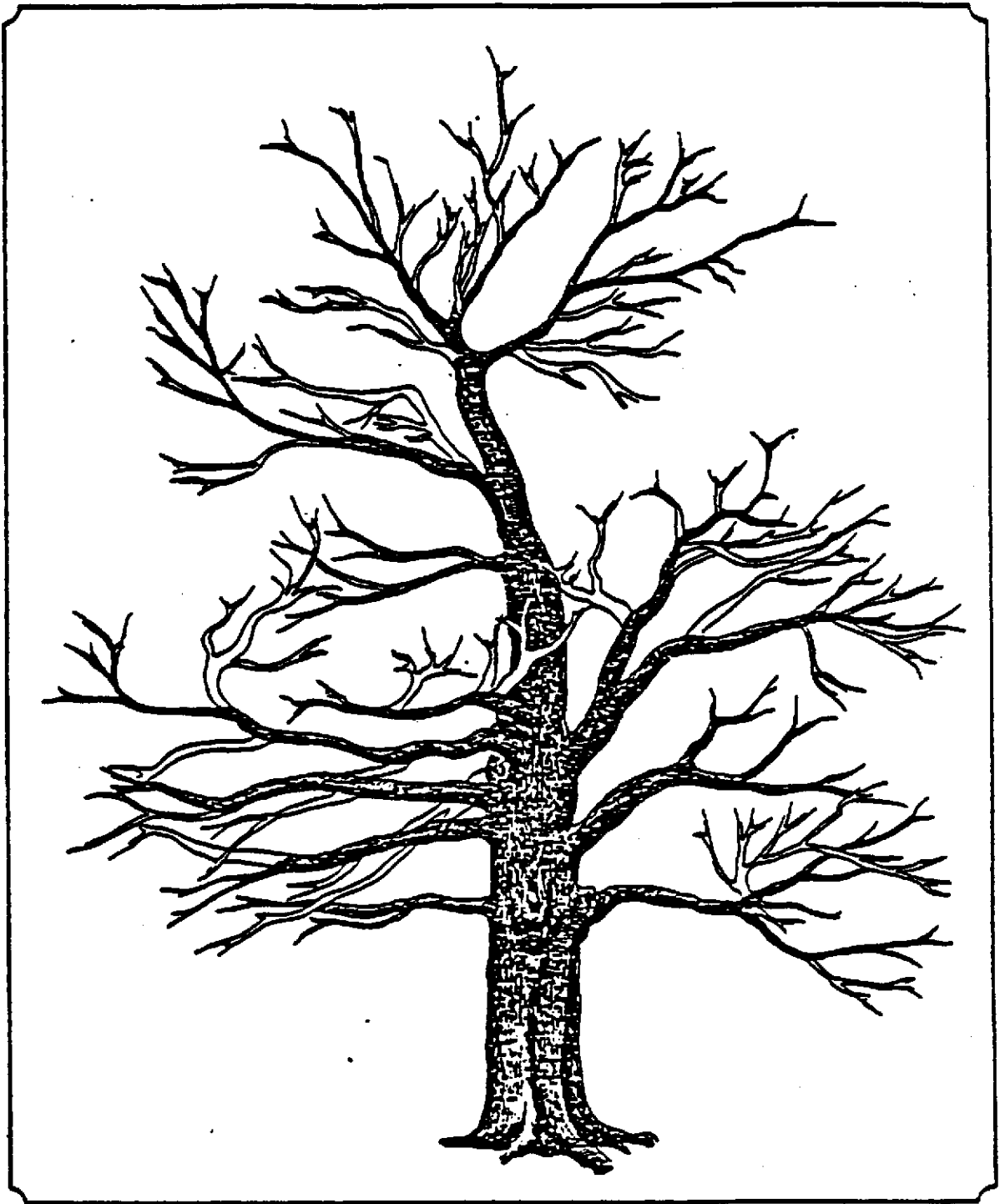
- Auger under drip line when trench is to come within 1 foot of the face of the tree in any direction.
- Auger under drip line when trench is to come within 2 feet of the face of the tree in any direction.
- Auger under drip line when trench is to come within 5 feet of the face of the tree in any direction.
- Auger under drip line when trench is to come within 10 feet of the face of the tree in any direction
- Auger under drip line when trench is to come within 12 feet of the face of the tree in any direction.
- Contact the Office of the County Arborist for specifications.

D.B.H. - Diameter Breast Height, measured at 4.5 feet above ground.

The minimum depth of auger within the root zone, as described above, shall be 24 inches below the soil surface.

TUNNELLING DETAILS

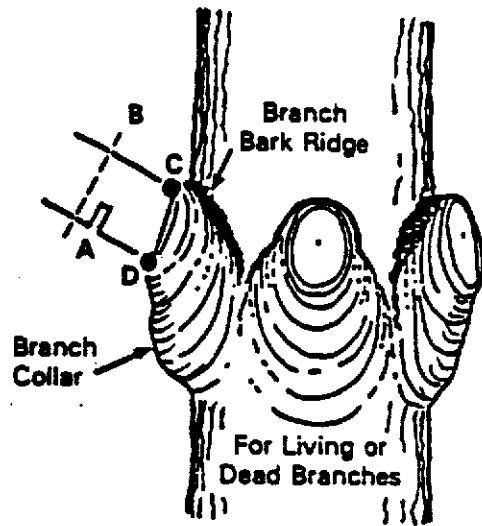
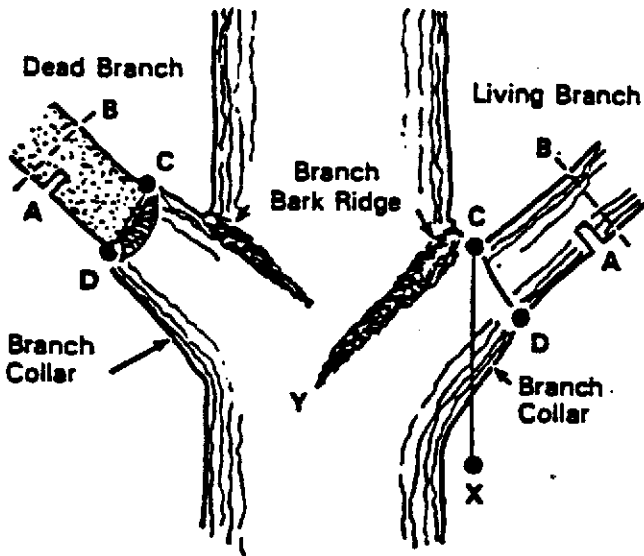
REVISION	STD. NO.
NO. DATE	
1 1-1-86	
	PAGE NO.
	A12-5A



CROWN REDUCTION DIAGRAM

REVISION	PAGE NO.
NO.	DATE

A12-

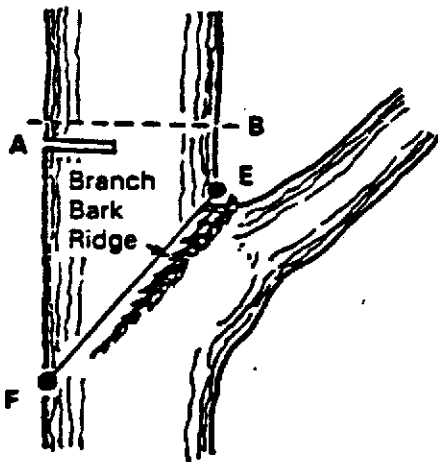


Hardwoods

Conifers

PRUNING A BRANCH

1. Remove branch weight by undercutting at A and remove limb by cutting through at B.
2. Remove stub at CD (line between branch bark ridge and outer edge of branch collar).
3. If D is difficult to find on hardwoods, drop vertical from C (line CX). Angle XCY = XCD.

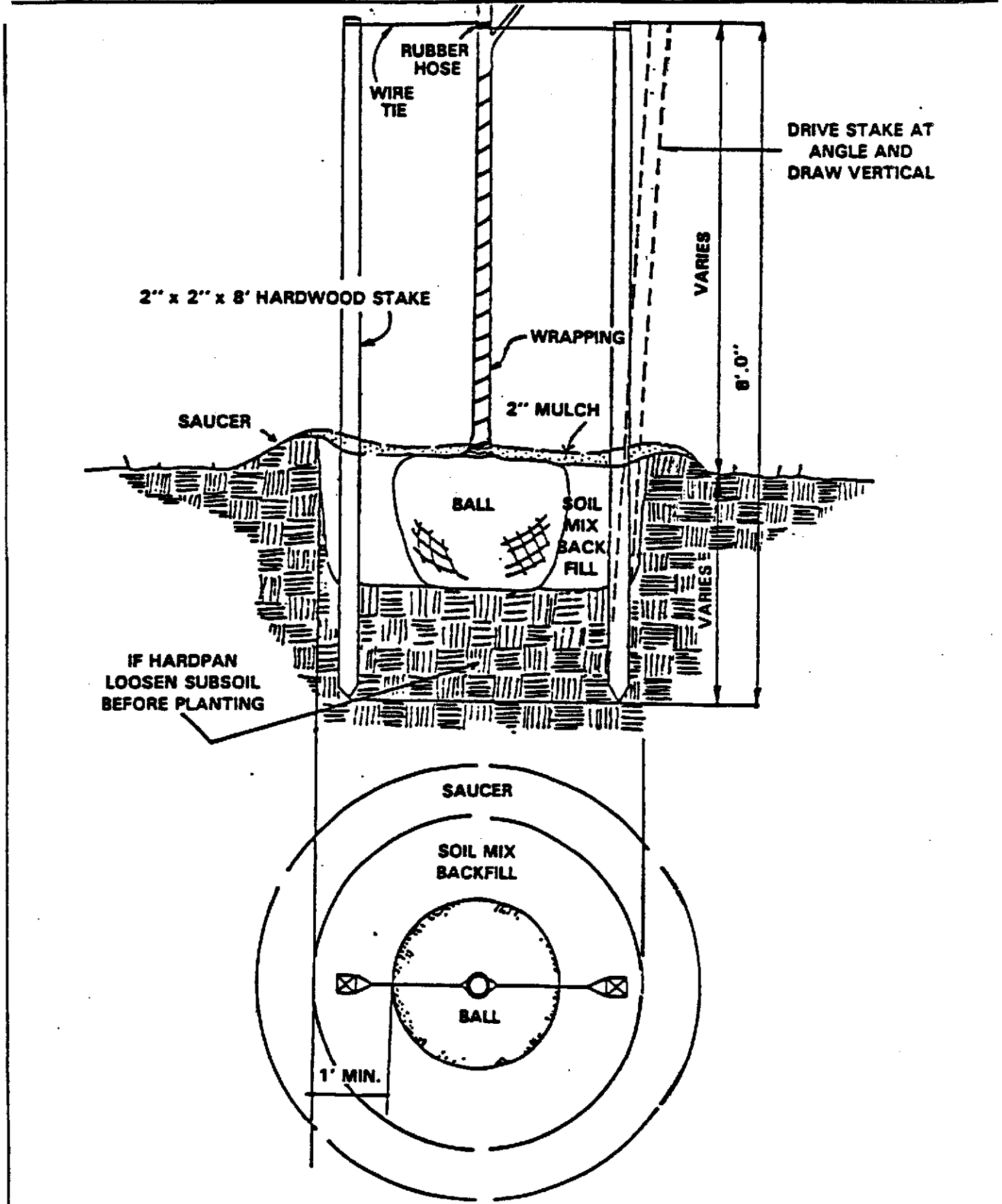


PRUNING A LEADER OR TO REDUCE SIZE

1. Remove top weight by cutting at A & B.
2. Remove stub at EF parallel to the Branch Bark Ridge.

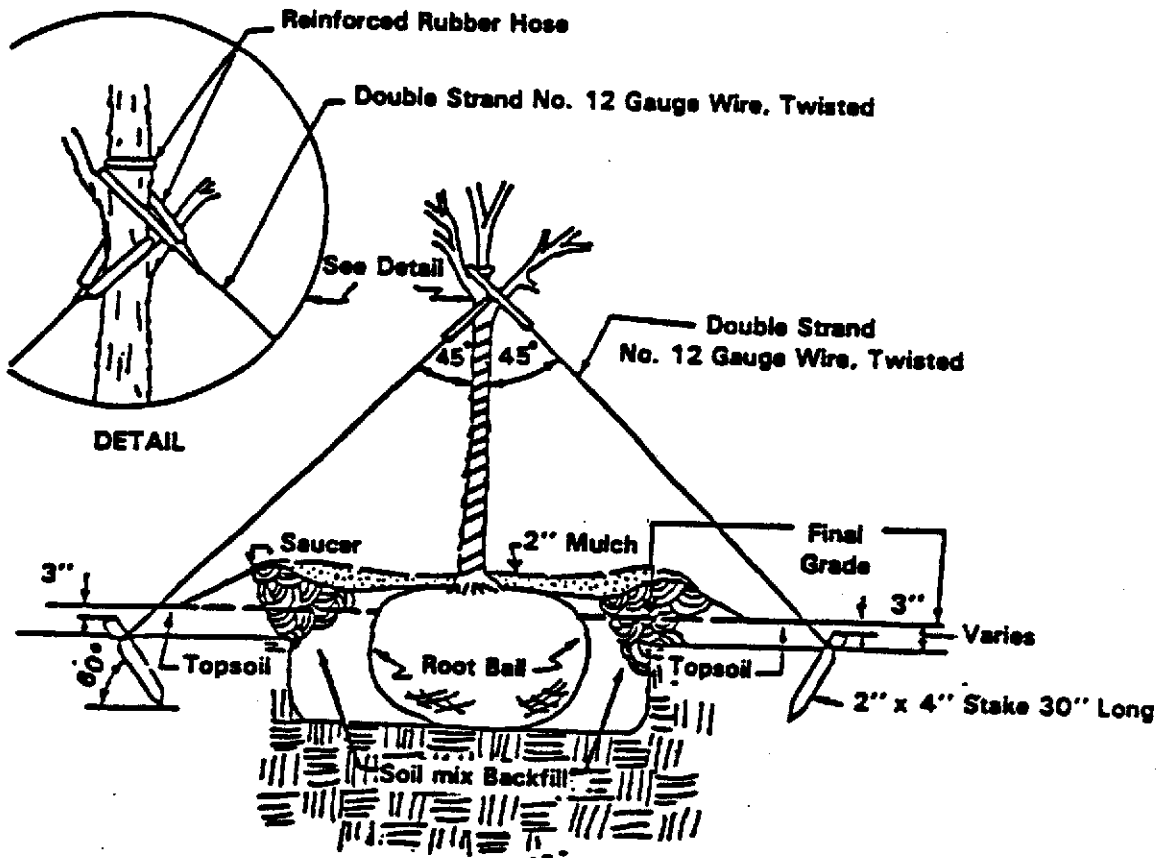
PRUNING DIAGRAM

REVISION NO.	DATE	STD. NO.
1	1-1-82	
		PAGE NO.
		A12-6A



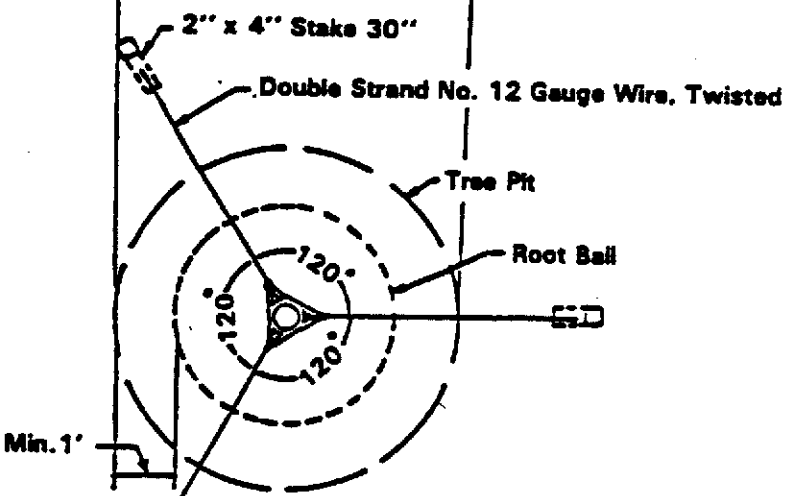
**PLANTING DETAILS—
TREES OF 3" CALIPER AND BELOW**

REVISION		PAGE NO
NO.	DATE	
		A12-



DETAIL

SECTION



PLAN

**PLANTING DETAILS—
TREES OF 3" TO 6" CALIPER**

REVISION		PAGE NO.
NO.	DATE	
		A12-8

Moisture Requirements

- MW - Moist to Wet Soil
- M - Moist Soil
- DM - Dry to Moist Soil
- D - Soil
- DW - Dry to Wet Soil

Withstands Dry or Poor Sterile Soil

- X - Does Withstand

Types of Root System

- S - Shallow Lateral Root
- I - Intermediate with Wide Spreading & Deep Lateral Roots
- D - Deep Penetrating or Tap Root

Tolerance to De-icing Salts

- T - Tolerant
- I - Intermediate Tolerance
- S - Sensitive

Sensitivity to Air Pollution

- T - Tolerant
- I - Intermediate
- S - Sensitive
- (I) - Intermediate or Tolerant depending upon reference source
- (S) - Sensitive or Intermediate depending upon reference source
- - Generally Tolerant of parking lot conditions

VDH & T Approved Trees

- T - Approved as Tailored Tree for Strips 6' and over
- C - Approved as Columnar Tree for Strips 8' and over
- P - Approved as Pyramidal Tree for Strips 12' and over
- - A Variety of the Species has been Approved

	TREE SELECTION CHART KEY	REVISION		PAGE NO
		NO.	DATE	A12-9

1. Moisture Requirements

This column shows the preference of the listed trees for soil moisture. Some trees are tolerant of a wide range of moisture and conditions while some are not.

2. Withstands Dry or Poor Sterile Soil

The trees so designated in this column will do better than most others in a location where there is dry or poor soil. However, every effort should be made to avoid this situation to permit the tree to grow under the best possible circumstances.

3. Types of Root Systems

The information in this column provides the types of root systems for the listed trees stating whether they have a taproot system. This information should prove valuable in determining what trees can be planted near pavement (shallow rooted trees may lift pavement) and what trees may be subject to wind throw (shallow rooted trees are more subject to wind throw).

4. Sensitivity to Air Pollution

This series of four columns indicates the sensitivity of some of the listed trees to the air pollution found in our suburban-urban county. Air pollution can not be treated as a general category as there are many different pollutants which either individually or collectively are called air pollution. Four of the more common pollutants are listed here. It should be noted that while some trees are tolerant to one form of air pollution, they might be sensitive to another form. Therefore, when deciding on trees for a certain location, it is necessary to determine to what form(s) of air pollution they will be subjected. The following discussion lists possible sources for each of the pollutants listed.

A. Sulfur dioxide (SO₂)

This pollutant may arise from many sources. However, the burning of coal such as that which is burned for the generation of electricity accounts for the majority of sulfur dioxide. Other sources include the production, refining, and utilization of petroleum and natural gas and industries which use or manufacture sulfuric acid.

B. Ozone (O₃)

This pollutant is derived from the photochemical reaction in the presence of sunlight of the hydrocarbons and oxides of nitrogen emitted into the air from automotive exhaust.

C. Fluorides (F1)

This pollutant is released when the material containing fluoride is heated or treated chemically. This occurs in the manufacturing of steel, brick, tile, pottery, cement, aluminum, glass, enamel, fiberglass, and phosphate fertilizers. The most common forms of fluoride emission harmful to vegetation are gaseous hydrogen fluoride (HF1) and silicon tetrafluoride (SiF1₄).

D. Oxides of Nitrogen (NO_x)

This pollutant is produced in internal combustion engines where oxygen and nitrogen are subjected to heat and pressure. In addition, oxides of nitrogen are emitted from the manufacture of nitric acid, stainless steel, sulfuric acid, paint, roofing, rubber, soap and nylon; petroleum refining; combustion of natural gasses, fuel oil, and coal, and incineration of organic wastes.

E. The trees that have been marked with an asterisk (*) are ones which will do well under general parking lot conditions although information is unavailable regarding their tolerance to the various pollutants in air pollution.

5. Tolerance to De-Icing Salts

This column indicates the tolerance of some of the listed trees to de-icing salts (sodium and calcium chloride) which are used. This indicates their tolerance to foliar salt spray or salt take up by trees from the soil. This information is of great importance when selecting trees for along roadways and in and around parking lots.

Botanical Name/Common Name	Moisture Requirements	Withstand Dry or Poor Sterile Soil	Type of Root System	Tolerance to De-icing Salts	Sensitivity to Air Pollution				VDH & T Approved Street Trees
					SO ₂	O ₃	F1	NO _x	
Abies concolor/White Fir	M	X	I	T	(I)	(I)	I	I	I
Acer ginnala/Amur Maple	M	X	S	T	T	T	I	I	I
Acer platanoides/Norway Maple	M	I	S	T	T	T	I	I	I
Acer pseudoplatanus/Sycamore Maple	DM	I	I	T	T	T	I	I	I
Acer rubrum/Red Maple	WM	I	S	S	S	T	I	I	I
Acer saccharinum/Silver Maple	MW	I	S	S	T	S	I	I	I
Acer saccharum/Sugar Maple	M	I	S	I	T	T	I	I	I
Aesculus hippocastanum/Horsechestnut	M	I	I	T	S	S	I	I	I
Amelanchier canadensis/Serviceberry	M	I	S	T	S	S	I	I	I
Betula nigra/River Birch	M	I	S	I	S	S	I	I	I
Betula Pendula/European White Birch	MW	X	S	I	S	T	I	I	I
Betula populifolia/Gray Birch	D	X	I	I	S	S	I	I	I
Carpinus caroliniana/American Hornbeam	DM	I	S	S	T	I	I	I	I
Carya species/Hickory sp.	DM	I	D	I	S	I	I	I	I
Catalpa species/Catalpa sp.	M	I	I	S	S	I	I	I	I
Celtis occidentalis/Hackberry	DW	X	D	S	T	T	I	I	I
Cercis canadensis/Redbud	M	I	S	I	S	T	I	I	I
Cornus florida/Flowering Dogwood	M	I	S	T	T	T	I	I	I
Crataegus phaenopyrum/ Washington Hawthorne	DM	I	D	I	T	S	I	I	I
Elaeagnus augustifolia/Russian Olive	-	X	I	T	T	I	T	I	I
Fagus grandifolia/American Beach	DM	I	S	S	S	I	I	I	I
Fraxinus americana/White Ash	MW	I	I	I	S	S	I	I	I
Fraxinus pennsylvanica/Green Ash	MW	X	I	I	S	S	I	I	I
Ginkgo biloba/Ginkgo	DM	X	I	T	T	S	S	I	I
Gleditsia triacanthos inermis/ Thornless Honeylocust	DM	X	I	T	I	S	I	I	I
Ilex opaca/American Holly	M	I	I	I	T	T	T	I	I
Juglans nigra/Black Walnut	M	I	D	S	I	(I)	I	I	I
Juniperus virginiana/Eastern Red Cedar	DM	X	D	I	T	T	I	I	I
Koeleruteria paniculata/Goldenrain tree	DM	X	I	T	I	S	I	I	I
Larix laricina/Larch	MW	I	S	T	S	S	I	I	I
Liquidambar styraciflua/Sweetgum	MW	I	S	S	S	(S)	T	I	I
Liriodendron tulipifera/Tulip poplar	M	I	D	S	T	S	I	I	I
Magnolia grandiflora/Southern Magnolia	DM	I	I	I	I	S	I	I	I
Magnolia soulangeana/Saucer Magnolia	M	I	I	I	I	S	I	I	I
Magnolia stellata/Star Magnolia	M	I	I	I	I	S	I	I	I
Malus species/Crabapple	M	I	S	I	T	T	I	I	I
Nyssa sylvatica/Black Gum	DW	I	S	I	T	T	I	I	I
Oxydendron arboreum/Sourwood	M	I	I	I	T	I	I	I	I
Paulownia tomentosa/Royal Paulownia	DM	I	S	I	I	S	I	I	I
Phellodendron amurense/Amur Cork Tree	DM	X	S	I	I	S	I	I	I
Picea abies/Norway Spruce	M	X	S	S	I	I	I	I	I
Picea glauca/White Spruce	M	I	S	T	(I)	T	(I)	S	I
Picea pungens glauca/ Colorado Blue Spruce	M	I	D	T	T	T	S	S	I
Pinus echinata/Shortleaf Pine	DM	X	D	T	I	I	S	I	I
Pinus nigra/Austrian Pine	M	X	D	T	(S)	(I)	I	S	I
Pinus resinosa/Red Pine	D	I	D	S	S	T	I	S	I

TREE SELECTION CHART

REVISION		PAGE NO
NO.	DATE	A12-1

Botanical Name/Common Name	Moisture Requirements	Withstand Dry or Poor Sterile Soil	Type of Root System	Tolerance to De-icing Salts	Sensitivity to Air Pollution				VDH & T Approved Street Trees
					SO ₂	O ₃	Fl	NO _x	
Pinus strobus/White Pine	M	X	S	S	S	S	S	S	I
Pinus sylvestris/Scotch Pine	D	X	S	I	S	S	S	S	I
Pinus thunbergii/Japanese Black Pine	M	X	I	T	S	S	S	S	I
Pinus taeda/Loblolly Pine	DW	I	I	I	S	S	S	S	I
Pinus virginiana/Virginia Pine	DW	X	I	I	S	S	S	S	I
Platanus occidentalis/Sycamore	MW	I	I	I	T	S	S	T	I
Populus grandidentata/Bigtooth Aspen	DM	I	I	T	(S)	S	I	I	I
Populus deltoides/Eastern Cottonwood	MW	I	S	T	S	S	I	I	I
Prunus serotina/Black Cherry	M	X	S	T	S	I	I	I	I
Prunus serotina/Kwanzan Cherry	M	I	S	T	I	I	T	I	I
Pseudotsuga menziesii/Douglas-fir	M	I	D	S	I	T	T	S	I
Pyrus calleryana Bradford/Bradford Pear	M	X	I	I	D	I	T	S	I
Quercus alba/White Oak	DM	I	D	T	I	S	I	I	I
Quercus coccinea/Scarlet Oak	DM	I	D	T	I	(S)	I	I	I
Quercus falcata/Southern Red Oak	DM	X	D	T	T	T	I	I	I
Quercus palustris/Pin Oak	DM	X	D	T	T	S	I	I	I
Quercus phellos /Willow Oak	DW	I	I	T	T	S	I	I	I
Quercus prinus/Chestnut Oak	DW	I	I	T	T	S	I	I	I
Quercus rubra (borealis)/Red Oak	DM	I	I	T	T	T	I	I	I
Quercus stellata/Post Oak	DM	X	I	T	I	I	I	I	I
Quercus velutina/Black Oak	DM	I	D	T	T	I	I	I	I
Robinia pseudoacacia/Black Locust	DM	X	S	I	T	(I)	I	S	I
Salix babylonica/Weeping Willow	M	I	S	T	S	S	T	I	I
Sassafras albidum/Sassafras	DM	X	D	I	I	I	I	I	I
Sophora japonica/Japanese Pagoda Tree	DM	X	S	I	I	I	I	I	I
Sorbus americana/Mountainash	M	I	S	I	S	S	T	I	I
Taxodium distichum/Bald Cypress	MW	I	I	I	I	I	I	I	I
Thuja occidentalis/Arborvitae	MW	I	I	T	T	T	I	I	I
Tilia americana/American Linden	M	I	I	S	(I)	T	T	I	I
Tilia cordata/Littleleaf Linden	M	X	I	S	(I)	(I)	T	S	I
Tsuga canadensis/Canadian Hemlock	M	I	S	S	S	(I)	T	I	I
Ulmus americana/American Elm	M	I	I	S	(S)	T	I	I	I
Ulmus fulva/Slippery Elm	W	I	I	I	I	I	I	I	I
Zelkova serrata/Japanese Zelkova	M	I	S	T	I	I	I	I	I

TREE SELECTION CHART

REVISION		PAGE NO.
NO.	DATE	A12-14