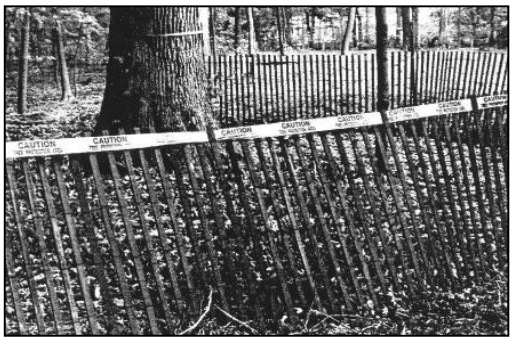
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

Tree Protection in Highly Urbanized Areas with Existing Green and Gray Infrastructure Conflicts

(each)
Code 990B



Source: IN Drainage Handbook

NOTE: Only use Practice Standard Code 990B when there are green and gray infrastructure conflicts and when adequate long-term monitoring of the trees exists. This standard must be used ONLY in consultation with a Professional Forester or Certified Arborist.

Definition

The protection of individual trees from damage during construction operations in highly urbanized areas where there are individual trees growing close to gray urban infrastructure.

Purpose

The purpose of this practice is to reduce damage to and loss of individual trees during construction by implementing these pre- to post-construction tree protection procedures. Tree protection fencing around the Tree Protection Critical Root Zone (TPCRZ) as defined below along with other soil, root, and tree protection measures shall be installed with this standard in order to maintain the health and integrity of the tree resources on site.

Conditions Where Practice Applies

This standard shall be used in lieu of no local ordinance or in tandem with local tree protection ordinances. When possible, Practice Standard TREE PROTECTION IN MODERATELY URBANIZED TO OPEN SPACE AREAS 990A shall be used instead of Practice Standard TREE PROTECTION IN HIGHLY URBANIZED AREAS WITH EXISTING GREEN AND GRAY INFRASTRUCTURE CONFLICTS 990B. Practice Standard TREE PROTECTION - AUGERING 991 should be used in conjunction with this standard, as needed.

This standard takes into consideration trees next to roads and sidewalks where there already exists an infrastructure conflict that can be resolved without compromise to either the green or gray infrastructure.

This practice applies on development sites that are highly urbanized, where the green and gray infrastructure has been developed or has grown in close proximity and where there are individual trees of importance that need to be preserved. Refer to Practice Standard TREE AND FOREST ECOSYSTEM PRESERVATION 984 for information on preserving stands of trees. Refer to Practice Standard TREE PROTECTION IN MODERATELY URBAN TO OPEN SPACE AREAS 990A for information on tree protection in all other areas with trees.

Criteria

Local Authorities – When working within the boundary of a municipality, local authorities such as the Urban Forester, City Arborist, Municipal Forester or Horticulturist, or Public Works officials should be contacted to determine locally enforced tree protection/preservation standards.

JULIE – Before any work has begun, call JULIE (Joint Utility Locating Information for Excavators) at 800-892-0123 at least 48 hours prior to any work being done. Equivalent local authorities shall also be contacted, where applicable.

Determining the Tree Protection Critical Root Zone (TPCRZ) – Tree Protection starts with determining the TPCRZ or area where the majority of roots are located and where tree protection fencing should be located. The TPCRZ is located one foot outside the Critical Root Zone (CRZ).

To determine the CRZ, one of the following two techniques shall be used. The first is by using the definition of CRZ or two feet outside the perimeter of the leaf canopy or drip line of the tree to be protected using the length of the longest branch as the radius of the circle. The second technique determines CRZ by referring to Table 1 Guidelines for determining tree protection zone (TPZ) radius for healthy, structurally sound trees per the International Society of Arboriculture (ISA) Best Management Practices for Managing Trees During Construction. This method measures the diameter in inches at 4.5 feet above ground (DBH diameter breast height) in combination with the trees age and tolerance to construction. See Table 2 for Species Tolerance Ratings.

The contractor shall use whichever method affords the greatest protection for the tree or whichever creates the larger CRZ area and then add an additional one foot to create the TPCRZ

Professional Advisement is Required in Highly Urbanized Areas – The TPCRZ is the area to be protected less the area in conflict with the gray infrastructure. Any limited space design protection measures shall be made per the advisement of the local Forestry Professionals and/or Certified Arborist with tree protection training.

In situations where the green and gray infrastructure can't be protected in its entirety, the alternative plans must be approved by the Professional Forester or Certified Arborist. In Highly Urbanized Areas where such space for protecting the trees does not exist, a Professional Forester and/or Certified Arborist must be consulted for any reduced Tree Protection or Fencing Standards.

Fencing – Per Standard Drawing TREE PROTECTION – FENCING (HIGHLY URBANIZED AREAS) IUM-690B, trees to be protected per the approved construction plan or by local ordinance shall be protected with fencing around the Tree Protection Critical Root Zone (TPCRZ).

Trees to be protected shall require tree protection fencing to be set at the TPCRZ as described in the Standard Drawing TREE PROTECTION – FENCING (HIGHLY URBANIZED AREAS) IUM-690B and Construction Specification CHAIN LINK FENCE 91. For projects without highly significant or historical trees and that will last for less than six-month duration, a non-treated wood lath snow fence or wire-mesh fence shall be used and solidly anchored to the posts. This area shall be protected from damage during construction operations.

For projects over a six-month duration or trees that are considered significant or historical, a chain link fence with Construction Specification CHAIN LINK FENCE 91 or better (as approved by the local Forester per local ordinances singularly or in tandem with the project Engineer) shall be used. Standard Drawing TREE PROTECTION – FENCING (HIGHLY URBANIZED AREAS) IUM-690B. Fencing shall be a minimum of 4 feet in height. For chain link fencing, metal posts shall be placed 6 feet (maximum distance) on center (OC) and the fencing solidly anchored to the posts.

Signage – Notices shall be posted on the fences prohibiting dumping and disposal of waste near protected trees. Signs shall be posted that identify the fenced areas as TPCRZ.

Soil Erosion Concerns – In Highly Urbanized Areas, low use areas inside the TPCRZ should be mulched with three to five inches of premium woodchip mulch.

In Highly Urbanized Areas, if foot or vehicular traffic or construction activities cannot be kept outside of the TPCRZ for the entire duration of the construction, actions shall be taken to disperse the

load, minimizing soil compaction and mechanical root damage.

These actions to be implemented by hand method include:

- Applying a minimum of 12 inches of woodchip mulch to the area,
- Laying three-quarter inch minimum thick plywood, beams, commercial logging or road mats over a four-plus inch layer of woodchip mulch,

Any erosion control method used within the TPCRZ shall be placed by hand and encompass the area 4 inches out from the tree trunk to three feet outside the dripline of the tree, meeting the fence line set at the TPCRZ. This area shall be maintained to prevent clearing, grading and development activities from encroaching within the TPCRZ.

Outside the TPCRZ, erosion and sediment control measures shall be installed to prevent sediment from reaching the TPCRZ. These measures include but are not limited to vegetative filter strips, woodchip mulch and rolled excelsior blankets. Measures such as woodchip mulch or excelsior blankets shall be a minimum of 3 inches deep up to 5 inches deep, extend out from the fence 10 feet and shall be continuous around the perimeter of the fence. Other methods may be used if approved by the Professional Forester, Certified Arborist or equivalent.

Installation shall cause no disturbance to soils. This area shall be maintained to prevent clearing, grading and development activities from encroaching within the protected TPCRZ.

Trunk Protection is Required in Highly Urbanized Areas – For sidewalk or other space limited areas, additional Tree Trunk Protection shall be used. Tree Trunk Protection shall be implemented using Standard Drawing TREE TRUNK PROTECTION IUM-690C. This standard requires a minimum of 2-inch x 8-inch x 8-foot boards banded continuously around each trunk to prevent scarring of the trees shown on the plan or

designated by the Professional Forester or Certified Arborist. Operations of the equipment shall not break the plane of the fencing regardless of Tree Trunk Protection being installed.

Root Protection Strategies – In Highly Urbanized Areas, the trees along sidewalks or other concrete barriers that are currently within the dripline of the tree shall be enclosed with chain link fence Construction Specification CHAIN LINK FENCE 91 and the Practice Standard TREE PROTECTION – AUGERING 991 shall be used in these cases. Other root/soil management techniques listed below can also be incorporated into the job specifications.

Trenching is Not Allowed – In Highly Urbanized Areas, do not trench within the TPCRZ of the protected tree. If there is a potential to impact the critical root zone, then augering must be used by following Practice Standard TREE PROTECTION – AUGERING 991. Also, use Standard Drawings TREE TRUNK PROTECTION IUM-690C and TREE ROOT PROTECTION FOR AUGERING PRACTICES (HIGHLY URBANIZED AREAS) IUM-690D.

In areas where green and gray infrastructure are intertwined, there must be consultation with a local Professional Forester or Certified Arborist concerning species tolerance to the construction practices. Refer to Table 2 - Tree Species Tolerance to Root Severance and Soil Compaction has been added as a reference.

Root/Soil Management – No construction activities, including the placement of topsoil manually, shall be permitted within the TPCRZ. Adding of woodchip mulch shall be done manually as specified in the contract, construction plan or equivalent document. All roadways, parking areas, and storage areas, parking, maneuvering of machinery, stockpiling of materials, or any other construction activities will not be allowed upon unpaved areas located within 10 feet of the TPCRZ of trees and plants designated to be protected.

In Highly Urbanized Areas where the infrastructure is close to the trunk of the tree and the roots are one half inch or greater in diameter, trenches should be excavated by hand, air spade or low-pressure hydro excavation. It is mandatory to tunnel under woody roots rather than cutting them.

When to Start Practice – All required protection measures shall be installed prior to the commencement of any site development activity and shall remain in place and in working, functional order until all site development activities have ceased or the surrounding area has been stabilized. If at any time fencing has been damaged, work shall be halted and fencing replaced at Contractor's cost. Once fencing has been replaced, work shall commence. At no point during site development shall protected trees be left without fencing.

No Changes in Contour – Special care shall be taken to follow the natural drainage patterns to avoid unnatural flow to protected trees. Changes in contour could also cause run-off with salt or herbicides that could harm the trees. Any changes to topography can cause the tree to get reduced or increased moisture over time thus eventually killing the tree. Water drainage patterns should remain the same.

Removal of topsoil around the tree is prohibited. The original grade shall be maintained. Any woody vegetation to be removed around the trees shall be cut out at the plant base by the appropriate tools to avoid roots.

Branch or Root Protection and Branch/Root Pruning – In situations where the plan, as approved by the Professional Forester or Certified Arborist, requires severing tree roots, the root pruning shall be done using an approved mechanical root pruning saw or industry authorized pruning tool. The appropriate pruning saws and tool(s), specifically designed for cutting wood are defined by the International Society of Arboriculture pruning standard and associated American National Standards Institute ANSI standards.

The pruning cut shall be a clean cut. This operation shall be performed prior to digging where noted on the plans and overseen by a Professional Forester or Certified Arborist.

Roots of protected trees impacted outside the fenced TPCRZ shall be pruned according to the International Society of Arboriculture Pruning Standard and associated American National Standards Institute ANSI A300 Standards. All roots impacted shall be pruned under the supervision of a Professional Forester or Certified Arborist and meet or exceed ISA, ANSI A300, or approved Tree Care Industry Standards. A Professional Forester or Certified Arborist shall be onsite during the entirety of root pruning. Note shall be taken of any roots greater than ½ inch that are severed since this could impact the safety and integrity of the tree resources that the local unit of government or person has to manage in the future.

The use of heavy equipment such as a backhoe for tree root pruning shall be prohibited. Axes, shovels, back hoes or other such potential severing devises not specifically engineered for tree root pruning shall not be used. Removal or breaking off branches of the above types of protected trees will not be allowed.

Removals – Trees deemed by the local Professional Forester or Certified Arborist to be at risk for current or future damage to a person or property should be removed. Trees not identified to be protected per local ordinance or construction plans may be removed per the advisement of the local Forester in charge.

All measures must be installed according to a site-specific plan and in accordance with all applicable local, state, and federal laws and regulations.

Considerations

For highly significant trees consider increasing the Tree Protection Critical Root Zone (TPCRZ) to 2 to 3 times to further minimize impact to tree roots. Also consider protecting the tree trunk using

Standard Drawing TREE TRUNK PROTECTION IUM-690C in all situations where the working conditions are close enough that the tree trunk might be impacted. Operations of the equipment should not break the plane of the fencing regardless of the type of tree trunk protection installed.

A Professional Forester or Certified Arborist shall be consulted for any clearing of trees and any actions that deviate from criteria within this standard. On-site supervision is recommended.
The dripline/leaf canopy shall be shown on the plan sheet to scale, (not only by symbol), to provide a better basis for site development evaluation.

Trees to be saved should be evaluated using the following criteria:

1. Species and condition (maintain a diversity of moderate to slower growing trees in good condition);
2. Above the minimum inches of tree diameter as designated by local ordinance;
3. Future potential safety and long-term suitability of the tree for its present location;
4. Length of time to mitigate losses;
5. Cost of mitigating tree losses;
6. Expected long-term maintenance costs for the tree compared to other trees of the same age/size;
7. Soil erosion prevention and reduction of storm water runoff;
8. The number of other trees growing under the same conditions and the precedent that would be set by removing the tree in question;
9. Impact on property value and aesthetics;
10. Ability to screen noise and visual improprieties or ability to enhance privacy;
11. Ability to moderate temperature changes, provide shade and reduce wind forces;
12. Per local ordinance in consultation with the local Professional Forester or Certified Arborist, determine if the tree(s) within the project area has historic, big, unique or protected designation.

Consultation with the local Municipal/Professional Forester or Certified Arborist is required.

If the entire TPCRZ cannot be protected and the area is reduced on one or more sides, then consideration should be given to increasing the TPCRZ on the opposite side or remaining sides of the tree in circumstances where this strategy would benefit the trees longevity.

Trees to be removed should be evaluated using the following criteria:

1. In the opinion of the Professional Forester or Certified Arborist, there is a clear and reasonable risk of failure that could cause injury or property damage including existing utility service and no corrective measures are feasible.
2. The tree is dead.
3. The tree is in poor condition with several dead branches or major crack(s).
4. Contiguous and fatal disease is present as diagnosed by a trained Entomologist, Plant Pathologist or Professional Forester.
5. Tree is below the minimum inches in diameter as designated by local ordinance.
6. Current tree damage is beyond repair or the tree is in extremely poor shape due to storm damage or previous mechanical injury.
7. There is a potential of the tree to damage existing or future hardscape features such as driveways or sidewalks and there is no gray infrastructure alternative.
8. There is no feasible way to avoid disturbing the soil around, grading over, or placing a hardened surface within the TPCRZ and the tree is an oak, hickory, red bud, horse chestnut, Kentucky coffee tree, larch, honey locust, or conifer. Consultation with a Professional Forester is required prior to using these criteria for tree removal.
9. Tree has a greater than 45-degree lean toward traffic or another target or it creates an unsafe clearance or visual barrier/sight line for pedestrians or vehicular traffic.

10. Tree is a fast growing or a weak wooded tree that is invasive such as box elder, silver maple, tree of heaven, Russian olive or black cherry. Exceptions may be made for large healthy specimens of these species.
11. Tree is within five feet of a structure or, when mature, will have a canopy spread that will overlap the structure. Consult with a Professional Forester or Certified Arborist.
12. The tree could be successfully transplanted with a tree spade onto another site.
13. Trees that are non-native species or invasive.
14. Upon consultation with the local forestry officials or a Professional Forester or Certified Arborist, it is determined that the increase in gray infrastructure will severely limit water supply and the new site condition would not allow the tree to survive and there is no way to change the site plan to avoid or compensate for these changes.

A mitigation plan for damaged trees and removed trees should be prepared in consultation with a Professional Forester or Certified Arborist and included with construction plans and contract documents. A one for one tree replacement policy or greater should be implemented.

When site soil resources have been greatly altered, it is recommended a soil restoration strategy be implemented by non-mechanical methods such as:

1. Scarifying compacted areas
2. Adding top soil to the original grade in areas of extreme erosion
3. Adding about 3-4 inches of woodchip mulch
4. Adding a structural soil system
5. When trees are to be within 25 feet of gray infrastructure pervious paving materials should be used. Install aeration vents in impervious paving. Use paving materials requiring a minimum amount of excavation such as reinforced concrete vs. asphalt. Design traffic patterns to avoid heavy loads adjacent

to trees. Specify minimum subgrade compaction under pavement near dripline.
6. If construction is during severe drought conditions, consider watering the tree per the recommendations of a Professional Forester or Certified Arborist.

For areas with mixed forest in moderately or highly developed areas, multiple standards may need to be used.

Plans and Specifications

A Professional Forester and/or Certified Arborist should be consulted in the design and planning stages of the project.

Plans and specifications for tree protection shall be in keeping with this standard and will describe the requirements for applying the practice.

At a minimum include the following items:

1. Identify all existing trees by species, location, diameter (at 4½ feet above the ground) and condition. Clearly indicate the trees and/or branches to be removed and those to be saved including their TPCRZ. All pruning must be done by a Professional Forester or Certified Arborist according to the ANSI A300 (Part 1) standards.
2. Identify locations of roadways, storage areas, truck clean-out areas, and parking pads in relationship to the trees to be protected.
3. Identify location, type and height of fencing to be used to protect trees, including the distance for placing the fencing around the TPCRZ. The TPCRZ must be drawn to scale on the plan.
4. Provide signage detail including verbiage to be used on the signs, type of materials used for signs and location of signs on fencing.
5. Designate the TPCRZ and tree trunk protection on the plan.
6. Identify soil sedimentation and protection measures outside the TPCRZ.

All plans shall include the installation, inspection and maintenance schedules with the responsible party identified. Fees for non-compliance per local ordinance should be noted. Standard Drawings TREE PROTECTION – FENCING (HIGHLY URBANIZED AREAS) IUM-690A, TREE TRUNK PROTECTION IUM-690C, and TREE ROOT PROTECTION FOR AUGERING PRACTICES IUM 690-D may be used as the plan sheets.

For root management purposes a 25-foot protected area where no equipment or activity is conducted outside the TPCRZ will afford the tree the best chance of survival.

Operation and Maintenance

The protective signs, fences and tree trunk protection will be removed only after all construction work has been finished and the site has been inspected by a Professional Forester for damages to the trees.

On active construction sites, it is recommended that trees be inspected daily to every 7 days for compliance.

Inspections shall include a listing of trees with:

1. Damage to trunks,
2. Damage to branches,
3. Mounding of soil around the trunk,
4. Evidence of root damage,
5. Evidence of improper pruning,
6. Notice of unauthorized changes to the topography,
7. Other infractions to the site around the tree such as chemical spills and soil compaction.

All damage to tree roots and branches shall be pruned according to International Society of Arboriculture and Tree Care Industry Association Pruning Standards.

References

Websites

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Videos

Root Injury and Tree Health. Illinois Arborist Association, the Morton Arboretum, the USDA Forest Service and the International Society of Arboriculture.

Trenching and Tunneling: A Video Guide for Excavating Around Trees. The Davey Resource Group. The International Society of Arboriculture and the Utility Arborist Association.

Table 1
Guidelines for determining tree protection zone (TPZ) radius for healthy, structurally sound trees per the ISA Best Management Practices: Managing Trees During Construction

Species Tolerance	Relative Tree Age*	TPZ Multiplication Factor
High	Young	6
	Mature	8
	Overmature	12
Medium	Young	8
	Mature	12
	Overmature	15
Low	Young	12
	Mature	15
	Overmature	18

DBH (inches) x TPZ Multiplication Factor = TPZ radius (inches)

Note: TPZ is the same as the CRZ in this standard.

*Consult with a local Professional Forester or Certified Arborist

Table 2
Tree Species Tolerance to Root Severance and Soil Compaction

Tree Species	Root Severance Tolerance	Soil Compaction Tolerance
Basswood	Intermediate	Sensitive
Blue Beech	Sensitive	Sensitive
Butternut	Sensitive	Intermediate
Paper Birch	Intermediate	Sensitive
River Birch	Tolerant	Tolerant
Box Elder	Tolerant	Tolerant
Ohio Buckeye	Intermediate	Intermediate
Catalpa	Intermediate	Tolerant
Kentucky Coffeetree	Intermediate	Intermediate
Eastern Cottonwood	Tolerant	Tolerant
Red-Osier Dogwood	Tolerant	Intermediate
American Elm	Tolerant	Intermediate
Slippery Elm	Tolerant	Intermediate
Hackberry	Tolerant	Intermediate
Hawthorn	Intermediate	Intermediate
Bitternut Hickory	Intermediate	Intermediate
Honey Locust	Tolerant	Intermediate
Ironwood	Sensitive	Sensitive
Black Locust	Tolerant	Sensitive
Red Maple	Tolerant	Tolerant
Sugar Maple	Intermediate	Sensitive
Mountain Ash	Tolerant	Intermediate
Black Oak	Sensitive	Sensitive
Bur Oak	Moderately Tolerant	Intermediate
Northern Pin Oak	Sensitive	Sensitive
Red Oak	Moderately Tolerant	Sensitive
Bicolor or Swamp Oak	Intermediate	Tolerant
White Oak	Sensitive	Sensitive
Wild Plum	Tolerant	Sensitive
Serviceberry	Intermediate	Sensitive
Black Walnut	Sensitive	Intermediate
Black Willow	Tolerant	Tolerant