on work zones. These areas should be away from

## Specifications

Get it in writing. All of the measures intended to protect your trees must be written into the construction specifications. The written specifications should detail exactly what can and cannot be done to and around the trees. Each sub-contractor has to be made aware of the barriers, limitations and specified work zones. It is a good idea to post signs as a reminder.

Fines and penalties for violations should be built into the specifications. Not too surprisingly, sub-contractors are much more likely to adhere to the tree preservation clauses if their profit is at stake. The severity of the fines should be proportional to the potential damage to the trees, and should increase for multiple infractions.

## Maintaining good communications

It is important to work together as a team. You may share clear objectives with your arborist and your builder, but one sub-contractor can destroy your prudent efforts. Construction damage to trees is often irreversible.

Visit the site at least once a day if possible. Your vigilance will pay off as workers learn to take your wishes seriously. Take photos at every stage of construction. If any infraction of the specifications does occur, it will be important to prove liability.

## Final stages

It is not unusual to go to great lengths to preserve trees during construction, only to have them injured during landscaping. Installing irrigation systems and rototilling planting beds are two ways the root systems of trees can be damaged. Remember also that small increases in grade, as little as 2-6", which place additional soil over the roots can be devastating to your trees. Careful planning and communicating with landscape designers and contractors is just as important as avoiding tree damage during construction.

## Post construction tree maintenance

Your trees will require several years to adjust to the injury and environmental changes that occur during construction. Stressed trees are more prone to health problems such as disease and insect infestations. Talk to your arborist about continued maintenance for your trees. Continue to monitor your trees, and have them periodically evaluated for declining health or safety hazards.

Despite the best intentions and most stringent tree preservation measures, your trees may still be injured from the construction process. There are remedial treatments that your arborist can suggest to help reduce stress and improve the growing conditions around your trees. In addition, the International Society of Arboriculture offers a companion to this brochure titled, "Treatment of Trees Damaged by Construction."

## For Additional Information

This brochure is one in a series published by the International Society of Arboriculture as part of its Consumer Information Program. You may have additional interest in the following titles currently in the series:

- Avoiding Tree Damage During Construction
- Avoiding Tree and Utility Conflicts
- Benefits of Trees
- Buying High-Quality Trees
- Insect and Disease Problems
- Mature Tree Care
- New Tree Planting
- Plant Health Care
- Proper Mulching Techniques
- Pruning Young Trees
- Pruning Mature Trees
- Recognizing Tree Hazards
- Treatment of Trees Damaged by Construction
- Tree Selection
- Tree Values
- Trees and Turf
- Why Hire an Arborist?
- Why Topping Hurts Trees

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For further information, contact: ISA, P.O. Box 3129, Champaign, IL 61826-3129, USA
www.isa-arbor.com



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# Avoiding Tree Damage During Construction

***As cities and suburbs expand, wooded land are being developed into commercial and residential sites. Homes are constructed in the midst of trees to take advantage of the aesthe and environmental value of the wooded lots. Woode properties can be worth as much as twenty perce more than those without trees, and people value the opportunity to live among trees.***

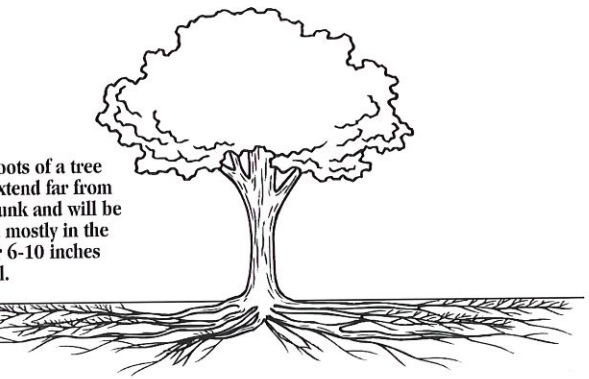
***Unfortunately, the processes involved with con struction can be deadly to the nearby trees. Furthe unless the damage is extreme, the trees may not d immediately, but could decline over several year With this delay in symptom development, you ma not associate the loss of the tree with the constructio***

***It is possible to preserve trees on building sites the right measures are taken. The most importan step is to hire a professional arborist during the planning stage. An arborist can help you decide which trees can be saved, and can work with the builder to protect the trees throughout each con struction phase.***

## How trees are damaged during construction

**Physical injury to the trunk and crown** • Construction equi ment can injure the above-ground portion of a tree by breaking branches, tearing the bark and wounding the trunk. These injuri are permanent, and if extensive, can be fatal.

ISA



oots of a tree
xtend far from
unk and will be
mostly in the
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l.

**ing of roots** • The digging and trenching that are necessary to truct a house and install underground utilities will likely sever rtion of the roots of many trees in the area. It is easy to appre- the potential for damage if you understand where roots grow. roots of a mature tree extend far from the trunk of the tree. In roots typically will be found growing a distance of 1-3 times eight of the tree. The amount of damage a tree can suffer from loss depends, in part, upon how close to the tree the cut is e. Severing one major root can cause the loss of 5-20 percent of oot system.

Another problem that may result from root loss due to digging and ching is that the potential for the trees to fall over is increased. roots play a critical role in anchoring a tree. If the major support s are cut on one side of a tree, the tree may fall or blow over.

**compaction** • An ideal soil for root growth and development out fifty percent pore space. These pores, the spaces between particles, are filled with water and air. The heavy equipment l in construction compacts the soil, and can dramatically reduce amount of pore space. This not only inhibits root growth and etration, but also decreases oxygen in the soil that is essential ne growth and function of the roots.

**othering roots by adding soil** • Most people are surprised to n that 90 percent of the fine roots that absorb water and minerals in the upper 6-12 inches of soil. Roots require space, air and er. Roots will grow best where these requirements are met, which sually very near the soil surface. Piling soil over the root system ncreasing the grade will smother the roots. It only takes a few nes of added soil to kill a sensitive, mature tree.

**posure to the elements** • Trees in a forest situation grow as ommunity, protecting each other from the elements. The trees w tall, with long, straight trunks and high canopies. Removal of ghboring trees, or opening the shared canopies of trees will ose the remaining trees to sunlight and wind. The higher levels of sunlight may cause sunscald on the trunks and branches. Also, the remaining trees will be more prone to breaking from wind or ice loading.

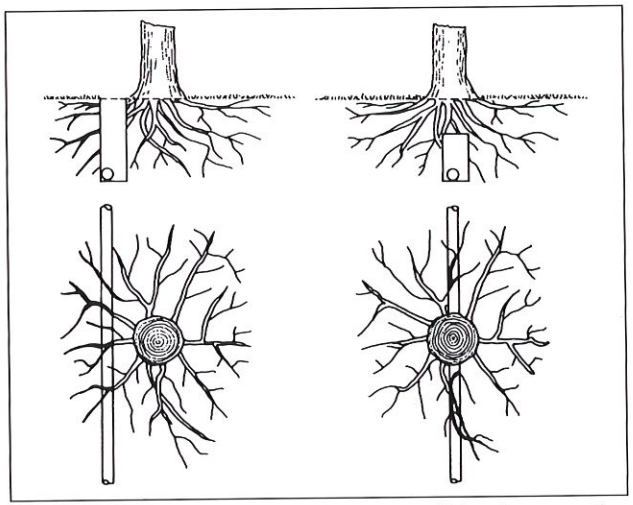
## Getting advice

Hire a professional arborist in the early planning stage. Many of the trees on your property may be saved if the proper steps are taken. Allow the arborist to meet with you and your building contractor. Your arborist can assess the trees on your property, determine which are healthy and structurally sound, and suggest measures to preserve and protect them.

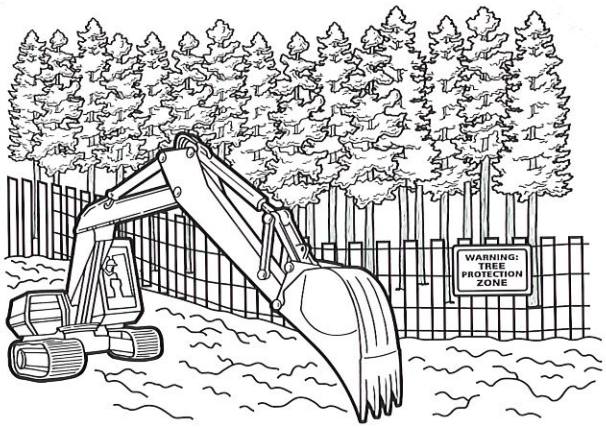
One of the first decisions is determining which trees are to be preserved, and which should be removed. You must consider the species, size and maturity, location and the condition of each tree. The largest, most mature trees are not always the best choices to preserve. Younger, more vigorous trees can usually survive and adapt to the stresses of construction better. Try to maintain diversity of species and ages. Your arborist can advise you about which trees are more sensitive to compaction, grade changes and root damage.

## Planning

Your arborist and builder should work together in planning the construction. The builder may need to be educated regarding the value of the trees on your property and the importance of saving them. Few builders are aware of the way trees' roots grow, and what is needed to protect them.



**Less damage is done to tree roots if utilities are tunnelled under a tree rather than across the roots.**




**Protective fences should be erected as far out from the trunks as possible in order to protect the root systems.**

Sometimes small changes in the placement or design of your house can make a great difference in whether a critical tree will survive. An alternative plan may be more friendly to the root system. For example, bridging over the roots may substitute for a conventional walkway. Or, instead of trenching beside a tree for utility installation, tunneling under the root system is much less damaging.

## Erecting barriers

Because our ability to repair construction damage to trees is limited, it is vital that the trees be protected from injury. The single most important action you can take is to set up construction fences around all of the trees that are to remain. The fences should be placed as far out from the trunks of the trees as possible. As a general guideline, allow one foot of space from the trunk for each inch of trunk diameter. The intent is not merely to protect the above-ground portions of the trees, but also the root systems. Remember that the root systems extend much farther than the driplines of the trees.

Instruct the construction personnel to keep the fenced area clear of building materials, waste, and excess soil. No digging, trenching or other soil disturbance should be allowed in the fenced area.

## Limited access

If at all possible it is best to allow only one access route on and off the property. All contractors must be instructed where they are permitted to drive and park their vehicles. Often this same access drive will later serve as the route for utility wires, water lines or the driveway.

Specify storage areas for equipment, soil and construction materials. Limit areas for burning (if permitted), cement wash-out