

900 Access Control, R/W Use Permits and Drive Design

Table of Contents

901 PURPOSE	1
901.1 General	1
901.2 Background.....	1
901.3 Additional Information.....	1
902 GENERAL SAFETY	1
903 PLAN REQUIREMENTS.....	1
903.1 Preliminary Field Review	1
903.2 Scoping	2
903.3 Landscape Plan Details	2
903.4 Permit Applications.....	2
903.5 Final Field Review.....	2
904 LANDSCAPE DESIGN CONSIDERATIONS.....	3
904.1 General	3
904.2 Landscaping Elements & Fixed Objects	3
904.3 Bodies of Water	4
904.4 Accessories.....	4
904.5 Irrigation Systems.....	4
905 PLACEMENT FOR SAFE ROADSIDE DESIGN	4
905.1 Roadside Grading.....	4
905.1.1 Safety Graded Sections	5
905.1.2 Clear Zone Graded Sections	5
905.1.3 Common Graded Sections	5
905.1.4 Barrier Graded Sections	5
905.1.5 Gating End Terminals.....	6
905.2 Urban Design.....	6
905.3 Highway Design Elements.....	6
905.3.1 Interchanges.....	6
905.3.2 Intersections.....	7
905.3.3 Roundabouts.....	7
905.4 Additional Planting Constraints.....	9
906 PLANT MATERIAL	10

900 Access Control, R/W Use Permits and Drive Design

906.1 Native or Non-Invasive Plants	10
906.1.1 Wildflowers.....	10
906.1.2 Seedlings	10
906.1.3 Trees and Shrubs	10
906.1.4 Species	10
906.2 Zones	10
906.3 Emerald Ash Borer Insect	11
907 PLANTING	11
908 MAINTENANCE	11
908.1 General.....	11
908.2 Watering, Pruning, Mowing, and Replacement	11
908.3 Planting Stakes	12
908.4 Winter Hazards	12
908.5 Maintenance of "NO MOW" Areas.....	12
LIST OF FIGURES	13

900 Access Control, R/W Use Permits and Drive Design

901 PURPOSE

901.1 General

These guidelines provide direction for landscaping within highway rights-of-way. The information provided in this guide is primarily safety-related and is intended for use by designers who already possess a good working knowledge of roadside safety design and landscape design. ODOT's Vision is to provide a safe and mobile transportation system. Landscape projects, therefore, shall be designed with the safety of the traveling public and maintenance crews as the top priority. The following guidelines follow the principles offered by AASHTO's Roadside Design Guide.

901.2 Background

The basis for this section stems from the fact that trees are a major cause of injuries and fatalities on the nation's highways. While it is desired to increase the amount of aesthetics on the State highway system, and these guidelines try to encourage that end, it cannot be understated: trees are proven killers when placed by the roadside. Single vehicle crashes with trees account for 3,000 fatalities each year nationwide. Trees are not generally a highway element that engineers have control over, except in landscaping projects where the designer can make decisions to reduce the consequences of vehicles leaving the road.

901.3 Additional Information

This section is written for primarily the roadside safety aspect of landscaping. However, by necessity, this section contains other information for the landscape designer to consider in developing themes, schemes and layouts. But in no way is this information considered to be all inclusive.

902 GENERAL SAFETY

Trees are potential obstructions by virtue of their size and their location in relation to vehicular traffic. Generally, existing trees with an expected mature size of greater than 4 inches are considered fixed objects. Landscaping elements shall be selected and located to maintain adequate sight distances and clear zone setbacks. These elements shall not interfere with the function of the pavement, shoulders, longitudinal barriers, end treatments, drainage systems, traffic signs, signals, utilities and other highway structures and appurtenances.

903 PLAN REQUIREMENTS

903.1 Preliminary Field Review

All landscape projects should involve a preliminary field review prior to the scoping meeting with the consultant/designer and a district/county designee(s) knowledgeable in landscape design and roadside

900 Access Control, R/W Use Permits and Drive Design

design/safety. At the preliminary field review, conceptual locations available for planting wildflowers, seedlings, trees, shrubs and other landscaping elements should be identified.

903.2 Scoping

Experience has shown that proper project scoping is invaluable in heading off later misunderstandings between landscaping proponents and highway engineers. Agreeing in advance of the project to require detailed plans, permissible landscape elements, final field reviews, and maintenance agreements are important to providing a beautiful, yet safe roadside landscaping.

903.3 Landscape Plan Details

Landscape plan should be concise and easily understood. Plans should be drawn to scale and developed on standard plan and profile sheets. Plans should indicate the following:

- design and legal speeds for the landscaped roadways
- type of adjacent land use (e.g. farmland, commercial, residential, etc.)
- topographic features such as slope limits and slope rates
- contour grading at interchanges is preferred
- locations of all utilities
- location and descriptions of existing landscaped areas
- location of all existing longitudinal barriers, end treatments, impact attenuators,
- curbs and sidewalks
- location and configuration of ditches and other drainage features
- plant lists (including botanical and common names)
- size and spacing of plants as well as area of occupancy at maturity

Although many landscape designers desire to use "conceptual" layouts, it is imperative for the highway engineer to have as much of the above information as possible in a standard format to make informed decisions on the safety merits of the plan. Omission of such information will only lead to delays, and possibly to denial of otherwise acceptable planting arrangements.

903.4 Permit Applications

Landscaping permit requests shall include landscape plans as described in *Section 903.3* and be directed to the District Deputy Director. A Maintenance & Repair permit application (M&R 505) can be obtained from the District Permit Office. The District should consult the ODOT County Manager before issuing the permit to ensure coordination of different projects scheduled in the same area.

903.5 Final Field Review

After the plans have been accepted and all permits have been approved, the consultant/designer and a district/county designee(s) knowledgeable in landscape design and roadside design/safety should conduct a final field review.

900 Access Control, R/W Use Permits and Drive Design

904 LANDSCAPE DESIGN CONSIDERATIONS

904.1 General

Landscape design can serve several important functions within the highway environment. In addition to making the roadway more aesthetically pleasing, landscaping can also be used to do the following:

- control erosion
- create a living snow fence
- minimize maintenance requirements and costs
- screen undesirable views
- preserve desirable views
- shield headlight glare
- preserve/enhance the natural environment
- reduce unwanted noise, and possibly to serve as a substitute for noise barrier at the request of a local community (see *Figure 904-1* Vegetative Screening in lieu of Noise Barrier)

Landscaping projects must be done as a part of a community sponsored comprehensive plan. The plan must be sponsored by the public agency that will also be responsible for maintenance of the landscape features. Landscaping at an interchange should incorporate the entire interchange rather than just individual ramps. Landscaping may be permitted along highway segments if it is sponsored and maintained by a public agency. The goal is to provide a community endorsed, consistent theme along the highway rather than isolated, independent projects. Landscaping that contains advertising or company logos will not be permitted. It is permissible for individual property owners abutting the highway to request a permit to clear, mow, or plant replacement trees along their frontage to improve the visibility from the highway.

It is recommended that the designer choose plants carefully. Highway plantings used in the roadside environment should be hardy for the Planting Zone, salt sprays, and air pollutants (see *Section 906*).

Trees are not to encroach on the sight distances, have trunks greater than 4" mature diameter when planted in certain locations (see *Section 905*), or have canopies that will encroach over the road.

Highway landscaping should result in designs that do not require extensive maintenance. In fact, at the end of the five year maintenance period described in *Section 908.1*, landscaped areas should not require any more maintenance than the natural roadside. Therefore, plant materials noninvasive to the area should be used whenever practical.

904.2 Landscaping Elements & Fixed Objects

Landscaping elements may consist of natural as well as manmade features, e.g., groundcovers, flowers, trees, and pavers. Many of these features such as most groundcovers and pavers allow a vehicle to safely pass over them and, therefore, do not pose a significant risk to an errant motorist. However, other features may be considered fixed objects and are, therefore, potential safety hazards. In general, a fixed object is any object that cannot be driven over safely by an errant vehicle. This includes but is not limited to the following:

- individual trees with a trunk caliper (diameter) greater than 4 inches at maturity, trunk caliper is measured at 54" up from the ground,

900 Access Control, R/W Use Permits and Drive Design

- clusters of smaller caliper trees or shrubs with multiple trunks or groups of small trees planted close together (within 6 feet), where the sum of their calipers at maturity exceeds 4 inches,
- decorative walls,
- rock formations and other free standing objects or fixed objects with a diameter or height greater than 4 inches. Fixed objects shall not be installed within medians or along the roadside within the setback areas specified in *Section 905*.

904.3 Bodies of Water

Bodies of water present unique safety concerns. The department recommends the use of longitudinal barriers to protect naturally occurring ponds located within the setback areas. Ponds/pools and other landscape water features shall not be built within highway rights-of-way. This does not preclude the construction of treatment ponds or water retention basins within the right-of-way when mandated in the environmental process.

904.4 Accessories

In community gateways and downtown business districts many municipalities seek to install street furniture, pavers, bollards, ornamental lighting, planters and other landscaping features to the design. Features within the lateral offset distances described in *Figures 904-2 & 904-3* are to be crashworthy, as specified in NCHRP Report 350 or MASH. Amenities located beyond the appropriate offset distances shown in this guideline may be allowed. Any feature placed within ODOT's Right-of -Way is allowed solely at ODOT's discretion. Landscaping plans that include decorative signs must conform to *Section 210-3* of the Traffic Engineering Manual.

904.5 Irrigation Systems

Many lavish plantings will not survive unless maintenance is provided. Some communities protect their investment by installing irrigation systems. Irrigation systems cannot be a hazard to the motorist. Systems cannot have hazardous stub heights (4" diameter max.), exposed pipes or meters in the specified offset distance. Nor should the spray be directed to the roadway, nor is ponding or sheet flow permitted on the traveled way. In all cases, maintenance and repair of irrigation systems will be the responsibility of the project sponsor.

905 PLACEMENT FOR SAFE ROADSIDE DESIGN

905.1 Roadside Grading

Since operational safety can be affected by the landscape, a continuous length of the highway must be visible to the driver (sight distance) and a lateral run out area (clear zone) must be traversable and free of physical obstructions.

Clear zones provide areas for drivers of errant vehicles to regain control after running off the road. Although minimum setbacks for large trees and other fixed objects are prescribed in the following sections, consideration should be given to providing additional clearance where practical. Setback distances are measured to the face of the fixed object from the traveled edge line of the adjacent

900 Access Control, R/W Use Permits and Drive Design

roadway. For facilities with curb and gutter, setback distances are measured from the face of curb to the face of the object. Bike lane and parking lane widths may be included in the setback distance. For trees, this measurement shall be taken to the face of the trunk 2 feet above the ground line.

Large trees and shrubs may be planted within the setback limits specified in this section where the likelihood of an impact by an errant vehicle is negligible; for example, on cut slopes above a retaining wall or behind existing longitudinal barrier. See *Section 307* for details on the following types of grading, *Section 600* for clear zone criteria, and *Section 201* for details on required sight distances.

905.1.1 Safety Graded Sections

Trees and large shrubs shall not be planted within 50 feet of the edge of the traveled way on safety graded sections. Low maintenance flowers, ground covers and other plants 18 inches or less in height at maturity may be located within this setback area as long as adequate sight distance is provided. See *Figure 307-1* for Safety Grading.

Trees and other plants taller than 18 inches may be located beyond this setback distance with the following restrictions:

- These plants shall not be located within a ditch or on a backslope within 20 feet of the ditch flowline.

905.1.2 Clear Zone Graded Sections

Trees and large shrubs shall not be planted within 30 feet of the edge of the traveled way on clear zone graded sections. Low maintenance flowers, ground covers and other plants 18 inches or less in height at maturity may be located within this setback area as long as adequate sight distance is provided. See *Figure 307-3* for Clear Zone Grading.

Trees and other plants taller than 18 inches may be located beyond this setback distance with the following restrictions:

- These plants shall not be located on foreslopes
- These plants shall not be located within a ditch or on a backslope within 10 feet of the ditch flowline

905.1.3 Common Graded Sections

Plantings shall be located at least 4 feet behind the ditch line in cut sections and 2 feet outside the shoulder break in fill sections. See *Figure 307-4* for Common Grading.

905.1.4 Barrier Graded Sections

An ideal location for large trees and shrubs is behind existing longitudinal barriers, provided the landscape designer allows for a maintenance access. The lateral offset to these plants shall be 15 feet measured from the face of a w-beam guardrail to allow the barrier to deflect to its design deflection in an accident, but to also allow maintenance vehicles to navigate on the back side of the barrier. Other types of barriers have different deflection limits. Barriers shall not be installed solely to permit the use of large trees or other potentially hazardous landscaping elements along the roadside. See *Figure 307-4* for Barrier Grading.

900 Access Control, R/W Use Permits and Drive Design

905.1.5 Gating End Terminals

Advances in the performance of guardrail end terminals and impact attenuators (crash cushions) have dramatically increased the safety of the traveling motorist. Many of these systems are designed to be "gating" (or "non-redirective") in certain types of impacts. Gating terminals function successfully by allowing approaching vehicles to pass through (or "gate") the very end of the end terminal. Impacting vehicles are only slightly impeded by the interaction with the terminal, and possibly still are traveling at a high speed. Thus, no fixed objects are allowed in a runout area that is defined by FHWA to be a minimum of 20 feet wide behind and perpendicular to the rail and 75 feet long beyond the terminal parallel to the rail. *Figure 905-1* shows the permitted landscaping offset needed to protect this runout area behind gating terminals.

If the landscaping designer does not know which treatment is used at the end of a guardrail run, for the purpose of the landscaping plan it will be considered to be gating. All associated runout areas will remain free of fixed objects.

905.2 Urban Design

The Roadside Grading section generally deals with high speed rural roadways. Municipalities may desire to landscape gateways into their communities, which is often a state highway or an interchange that leads to an arterial. The highway facilities in these gateways are often roadways with lower speeds than found on the rural state system. These roads may be lower speed, divided or not, or curbed or not. Refer to *Section 600.2.2* for discussion on Urban Lateral Offsets where Clear Zone cannot be achieved and *Figures 600-3, 600-4, 904-2 & 904-3*. The following discussion gives highway engineers and landscape designer's additional guidelines for placement of large trees, small trees and foliage in urban areas. Other landscaping features, such as lighting, stones, boulders, bollards, or water ponds, etc. are to meet guidelines listed elsewhere.

Refer to *Figure 904-2* for treatment in curb sections. Curbing is considered mountable, a vertical 4-inch curb (or even 6 inches or more) is not going to stop a vehicle. Large trees are considered to be non-frangible and have a final (mature) trunk diameter of 4 inches or greater. The sum of the individual trunk dimensions of multi-stemmed tree are considered as one object over a 6-foot vehicle width. Setbacks in curbed sections are from the front face of the curb unless bike lanes or full-time parking lanes are present. Since urban tree locations have considerably less offset than high speed facilities, vertical clearance becomes an issue. All trees, especially those planted close to a curb will have their canopies clipped by trucks in the lane adjacent to the trees. Plant trees to ensure their mature canopy will not infringe on this area.

905.3 Highway Design Elements

Certain highway features provide a special opportunity for communities to express themselves through landscaping. Interchanges and intersections are ideal locations, although they do require special attention by designers.

905.3.1 Interchanges

Interchanges provide an opportunity for establishing and/or preserving attractive landscapes along our highways. Because an interchange often serves as a major focal point, both from the highway and from the cross road, the major components should be coordinated to achieve an overall design that is

900 Access Control, R/W Use Permits and Drive Design

aesthetically pleasing. Major components of an interchange include: structural design, texture and detailing, railings, lighting, contour grading and plant material.

Generally, a minimum 50-foot setback (from the edge of traveled way) within a loop ramp is considered an appropriate sight distance setback for trees and shrubs with mature heights above 18 inches. *Figures 905-2 & 905-3* provide details for landscape plantings at cloverleaf and diamond interchanges. For interchanges, all plantings shall provide ramp and collector-distributor road sight distances equal to or greater than those required by the design speed criteria in *Section 201*.

905.3.2 Intersections

A driver attempting to enter a through road must be able to see traffic at a distance along the intersecting road in order to safely enter the intersection. The required intersection sight distance varies with the speed of the traffic on the main highway. *Section 201.3* provides standards for various intersection sight distance conditions. The triangular setback areas shown in *Figure 905-4* are based on these principles. No plantings above 18 inches shall be permitted within these setback areas. This figure shows a tangent condition; a graphical solution is required when the through road is curved.

In general, an offset of 50 feet on the inside of a curve with a degree of curvature of 2 degrees or greater should be provided to ensure adequate horizontal sight distances.

905.3.3 Roundabouts

Landscape elements are vital to the proper operation of a roundabout and needs to be in place when the roundabout is opened to traffic. The purposes of landscape elements in the roundabout are to:

- Make the central island conspicuous to drivers as they approach the roundabout
- Clearly indicate to drivers that they cannot pass straight through the intersection. Restrict the ability to view traffic from across the roundabout through mounding of the earth and plantings. This will lead to slower entering speeds, which increases safety.
- Require motorist's to focus toward on-coming traffic from the left
- Help break headlight glare
- Discourage pedestrian traffic through the central island
- Help blind and visually impaired pedestrians locate sidewalks and crosswalks
- Improve and complement the aesthetics of the area

When designing landscaping for a roundabout it is important to:

- Consider maintenance requirements early in the program stages of development
- Develop a formal municipal agreement describing the landscaping and maintenance requirements for roundabouts elements early in the scoping process and prior to design of the facility.
- Maintain adequate sight distances
- Avoid obscuring the view to signs
- Minimize fixed objects such as trees, poles, or guardrail
- Apply the guidance below relative to approach speeds and the permissible use of fixed objects such as trees, poles, non-hazard walls, non-hazard rocks/boulders, or guardrail

Clear zone and lateral clearance requirements are provided in *Section 601*.

Typically a portion of the splitter island is situated within the critical sight triangles, the landscaping in these areas may be constructed with low-growth plants or grass. Grass or low shrubs are also desirable due to their ability to blend well with nearby streetscapes and the fact that they require only limited maintenance. Splitter islands should generally not contain trees, planter boxes, or light poles. Hardscape

900 Access Control, R/W Use Permits and Drive Design

treatments like a simple patterned concrete or paver surface may be used on splitter islands in lieu of landscaping.

Landscape the central island by mounding the earth and providing plantings. Refer to *Figure 905-5* for the general layout of the central island. The truck apron is not included in the clear zone distance. The clear zone for the central island is considered to begin at the inside curb adjacent to the central island landscaping. The combination of the earth mound and plantings in the central island shall provide a visual blocking such that drivers will not be able to see through the roundabout central island. The central island area is considered a low speed environment; however errant vehicles occasionally end up in the central island or crossing the central island.

The approach highway speed is an indicator of the probability of an errant vehicle entering the central island. Therefore, when the posted speed on any approaching leg to the roundabout is greater than 35 mph, hazards and fixed objects such as concrete, stone, or wood walls and trees having a mature diameter greater than 4 inches are prohibited within the central island.

Where the approaching leg to a roundabout has a posted speed of 35 mph or less there may be objects that appear to be hazardous such as walls or rocks, but they are to be constructed with materials and in a manner that is not hazardous to errant vehicles. It is important to minimize the consequences of an errant vehicle that may impact a wall or rocks/boulders. The inner portion of the central island is typically most vulnerable to drivers/vehicles that for some reason leave the roadway and enter the central island at a high impact angle. If in the event that a driver is driving too fast to negotiate a curved approach to a roundabout, or otherwise distracted and/or is not aware of the upcoming roundabout the impact angle entering the central island typically will be much greater than 25 degrees and outside the realm of roadside design. The consequence of hitting a fixed object at an angle greater than 25 degrees is severe.

Minimize the consequence of hitting a wall or boulders by following these guidelines:

1. *Do not allow* any walls in the central island with cast in-place or reinforced concrete or natural boulders.
2. Construct any walls with light-weight, Styrofoam type, artificial bricks/blocks typically used in landscaping and boulders with chicken wire and stucco. No mortar or reinforcing between the bricks/blocks. Minimize the wall thickness while maintaining stability.
3. If light-weight walls are desired for aesthetic reasons then construct at a height 20-inch or lower. This will tend to keep flying debris at a lower level as not to penetrate a windshield, or impact other vehicles.
4. Do not allow fill material in back of the light-weight brick/block wall for approximately 2 feet. Then at ground level begin to slope the earth up and away from the non-hazardous wall at a 6:1 slope or flatter.

Design the slope of the central island with a minimum grade of 25:1 and a maximum of 6:1 sloping upward toward the center of the circle. The earth surface in the central island area forms an earth mound that is a minimum of 3.5-feet to a maximum of 6-feet in height, measured from the circulating roadway surface at the curb face. As an absolute minimum, keep the outside 6 feet of the central island free from landscape features to provide a minimum level of roadside safety, snow storage, and unobstructed sight distance. In some situations this central island area may need to maintain a low profile beyond 6-feet to allow over sized vehicle loads to pass over the central island without the axles passing over the central island.

Avoid items in the central island that may be considered an attractive nuisance that may encourage passersby to go to the central island for pictures, or other objects that might distract drivers from the driving task. When reasonable, consider a frost proof water supply (small hand hydrant, not fire hydrant)

900 Access Control, R/W Use Permits and Drive Design

and electrical supply to the central island. The water supply should be considered for long term use not just to establish plant material.

905.4 Additional Planting Constraints

Accident Locations - Offset distances greater than the minimum setbacks should be considered at locations with a history of run-off-the-road crashes.

Agriculture - Plants shall not obstruct, shade, or cause harm to crops planted in adjacent farm fields. When wind breaks and living snow fences are proposed adjacent to agricultural use properties, permission to plant should be obtained from the property owner.

Billboards - Plants shall not obstruct the view of billboards. However, naturalized trees blocking billboards should be cut only with permission of the district. This work shall be done by permit using a certified arborist.

Businesses - Trees, shrubs and wildflowers should be planted to blend in with the natural environment.

Canopy Obstruction - Trees and shrubs shall be offset far enough from the edge of the traveled way to prevent damage to vehicle windshields or interference with overhead utilities and signals.

Ditches - No planting other than seeding shall occur within ditches.

Irrigation Systems - Irrigation systems should be designed to minimize overspray onto the traveled way. The systems should be located so that the potential for damage to and from vehicles is prevented.

Scenic Views - Materials should be selected and placed to preserve desirable scenic views along the roadside.

Sight Distance - Proposed plants shall not restrict the horizontal and vertical sight distance of the roadway. Although the minimum setbacks provided in these guidelines were selected to ensure adequate sight distances, this should be field-verified and the setbacks shall be increased where necessary. In cases where an existing facility does not already provide adequate sight distance because of geometric restrictions, no further reduction of the sight distance shall be allowed.

Slopes - Evergreen and deciduous seedlings are the preferred vegetation; mature trees may be used when required for mitigation. Wildflower and native grasses (Construction and Material Specification (CMS) 870, Seed Mixtures Table) may be used with District Deputy Director approval.

Snow Fence - Only evergreens may be planted as living snow fence. Multiple rows shall be staggered. A general rule of thumb is that snow will be deposited on the leeward side of a snow fence over a distance approximately equal to the height of the snow fence. Care should be taken to ensure that the snow fence is planted far enough from the edge of the pavement to prevent snow from being deposited onto the roadway. (Also see Windbreak.)

Windbreak - Use the Ohio Windbreak Guide, published by the Ohio Department of Natural Resources as a source for design and species selection. An excellent source of information is found on-line at http://www.dnr.state.oh.us/portals/18/landowner/pdf/windbreaks_guide.pdf.

900 Access Control, R/W Use Permits and Drive Design

906 PLANT MATERIAL

Several lists of acceptable plants are available through ODOT Central Office, or certain ODOT District Offices.

906.1 Native or Non-Invasive Plants

All plant material shall be disease and pest free. A copy of the nursery inspection should be made available upon request.

906.1.1 Wildflowers

Wildflower sites should be composed of Ohio native perennial forbs and grasses. Other mixtures should be approved by the District Deputy Director, or designated employee. Wildflower areas should be designated as No Mow. See CMS Item 659.09 for available species acceptable for planting on the Right-of-Way.

906.1.2 Seedlings

Both Deciduous and Evergreen Seedlings should be salt tolerant and planted area should be signed as "No Mow."

Evergreen Seedlings may be used to create living snow fences and screenings. Locations include but are not limited to:

- slopes
- erosion prone areas
- interchanges (see *Figures 905-2 & 905-3*)

906.1.3 Trees and Shrubs

Site design should use plant materials in a way that is low maintenance, has multi-seasonal interest and looks natural. Approval of locations should be based on safety, aesthetics and maintenance concerns. Typically trees and shrubs may be planted in the spring and fall. However, for optimum growth, trees shall be planted during the months recommended for the individual species.

906.1.4 Species

An acceptable list of tree and shrub species is available in the Ohio section of The Roadside Use of Native Plants, FHWA ep-99-014 or the Ohio State University Extension Office's The Native Plants of Ohio_ (Bulletin 865, 1998), and from the Office of Material's Management. It is preferable that noninvasive species be used. Hybrids and cultivars may be substituted only with permission from the District Deputy Director, or designated employee, when native species are not available.

906.2 Zones

All trees shall be suitable for growth in Ohio Zone 5a or lower (USDA Hardiness Zones). Trees should be from Ohio growers whenever practical.

900 Access Control, R/W Use Permits and Drive Design

906.3 Emerald Ash Borer Insect

Landscape designers should be aware of the infestation of ash trees throughout Ohio and the efforts of Ohio Department of Agriculture (ODA) to combat this insect, which kill ash trees within three to five years from infestation.

It is recommended to refrain from planting ash trees for the next several years. If a landscaping project is utilizing existing ash trees in the design, then trees should be monitored for Emerald Ash Borer signs, which can be found at the ODA website at www.ohioagriculture.gov/eab. (Some of the signs are "D" shaped exit holes, "S" shaped tunnels beneath the bark, dieback at the tops of the trees, sprouting around the trunk, woodpecker damage, or bark splits.) For more information about the pest, its current status, or ways to assist in early detection, call the Emerald Ash Borer hotline at 1-888-OHIO-EAB.

907 PLANTING

Planting and bracing details are shown on Roadway Standard Construction Drawing LA-1.2.

Planting trees and shrubs too deeply is a persistent problem. To address this problem, the Ohio Nursery and Landscape Association and the ODNR Division of Forestry developed a set of tree planting specifications. This effort, called "Sample Tree Planting Specifications" is included as at the end of this Guideline.

908 MAINTENANCE

908.1 General

Unless otherwise specified, all maintenance of all plants shall begin upon installation and be arranged by the project sponsor. Plants shall be maintained by the permit holder for at least five years. The Department should inspect the landscape during this time and require maintenance as needed.

Refer to the CMS 651 thru 673 for detailed roadside installation and maintenance requirements. See M&R 632 for mowing specifications.

Maintenance shall include but not be limited to:

- watering, pruning, mowing, and replacement
- weeding, fertilization, mulching
- removal
- litter pick up
- insect control (by a licensed applicator, when required)
- herbicides (by a licensed applicator)

908.2 Watering, Pruning, Mowing, and Replacement

Watering - watering of the new plant material is essential for their survivability, and is the responsibility of the project sponsor.

900 Access Control, R/W Use Permits and Drive Design

Pruning - All trees and shrubs shall be maintained and only pruned as necessary to retain their natural shape or remove deadwood. For example, water sprouts (suckers) shall be removed from the base of each species as needed.

Mowing - Trees should be spaced sufficiently far apart and shrubs should be grouped and mulched in beds shaped to avoid excessive mower maneuvering and the need for hand trimming.

Replacement - All dead, dying or diseased plants shall be removed and disposed of Construction & Material Specification 105.13. Replacement shall be left up to the project sponsor.

908.3 Planting Stakes

Trees planted with support stakes and guy wires shall have all such appurtenances removed no less than 12 months and no more than 18 months after installation.

908.4 Winter Hazards

Landscaping shall not reduce safety for the traveling public or maintenance crews. Trees and shrubs should be placed in locations and trimmed to a size that does not hinder snow and ice removal. Removal or thinning of trees that shade the pavement creating icy spots should be considered. Some sections of the roadside should be kept open to allow sunlight to aid new tree growth.

908.5 Maintenance of "NO MOW" Areas

Naturalized (No Mow) areas can have a "neat" appearance without the removal of trees or shrubs. These areas within ODOT Right-of-Ways are frequently maintained by municipalities. If a community desires to maintain ODOT's Right-of-Way, an M&R 505 permit is required. Districts offices should also receive a maintenance plan from the community. If maintenance of Right-of-Way areas is done without obtaining the permit, communities can be held liable and be made to perform restitution.

900 Access Control, R/W Use Permits and Drive Design

LIST OF FIGURES

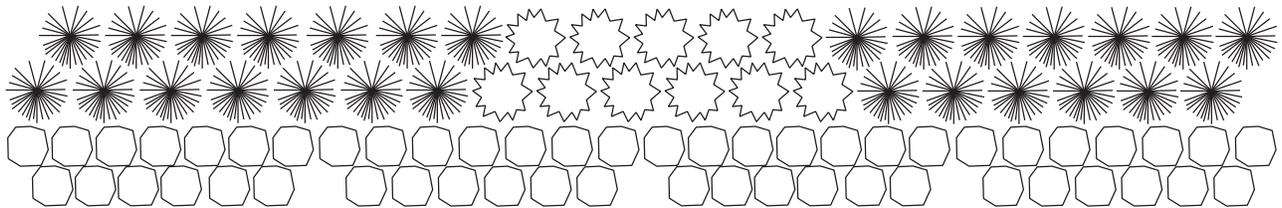
<i>Figure</i>	<i>Description</i>	<i>Reference Section</i>
904-1	Vegetative Screening in lieu of noise barrier	904.1
904-2, 904-3	Urban Setbacks, 45 mph or less	905.2
905-1	Gating guardrail end terminals offsets	905.1.5
905-2	Cloverleaf Interchange, with loop ramps (Directional ramp	905.3.1, 906.1.2
905-3	Diamond Interchange (Stop/ yield conditions on ramp terminals)	905.3.1, 906.1.2
905-4	Intersection Setbacks	905.3.2
905-5	Roundabout Central Island Grading & Landscaping	905.5

VEGETATIVE SCREENING

904-1

REFERENCE SECTIONS

904.1



VEGETATIVE SCREENING IN LIEU OF NOISE BARRIER

Vegetation in lieu of a noise barrier is intended to provide psychological relief and is not intended as a noise abatement measure. The provided drawing is an example. Alternative planting designs may be submitted for approval from the ODOT noise coordinator. All planting must provide 100% opacity year round to height of 6' within 3 years of installation.

*Place evergreen trees in an offset pattern with rows 8' apart and 8' on center. Plant trees in single species masses of a at least 15 trees. Plant minimum 5' tall evergreen trees from the following list: *Chamaecyparis Thyoides* - Atlantic White Cedar, *Juniperus Virginiana* - Eastern Red Cedar, *Picea Abies* - Norway Spruce, *Picea Pungens* - Colorado Spruce, *Pinus Nigra* - Austrian Pine.*

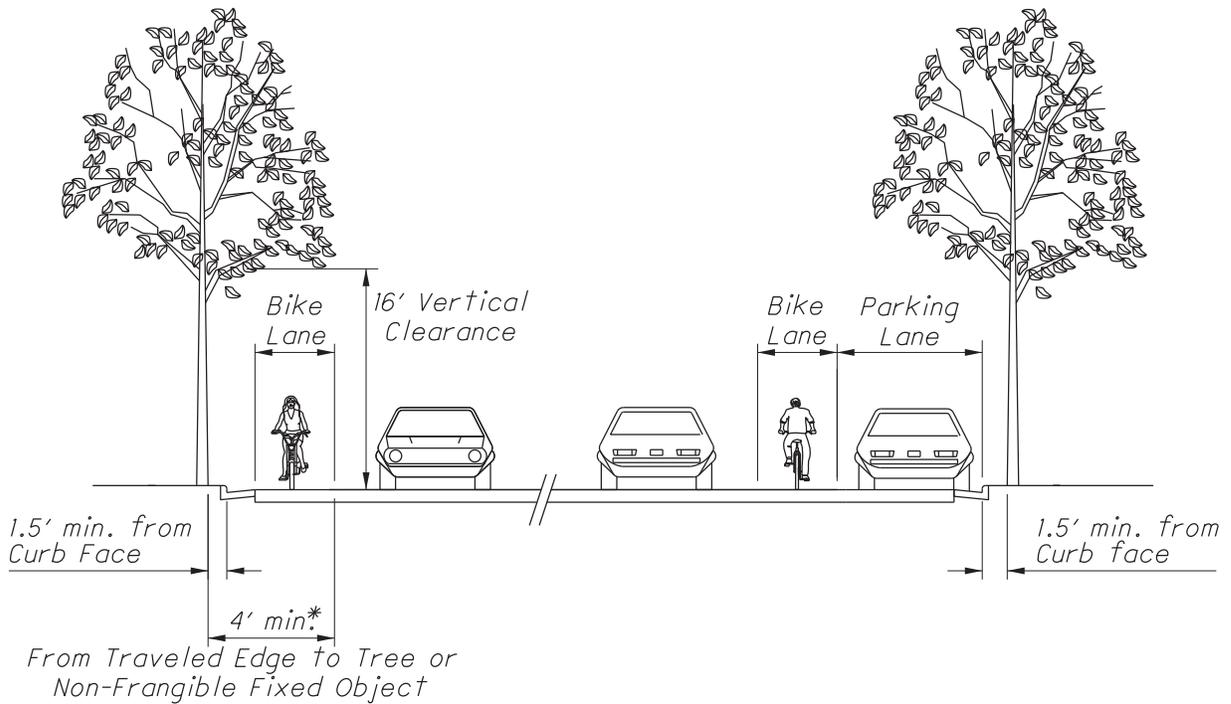
*Place shrubs in staggered alternating rows with plants 3' on center. Plant shrubs in single species masses of a minimum 25 plants. Alternate evergreen and deciduous shrub masses. Plant minimum 3' tall shrubs from the following list: *Viburnum Prunifolium* - Blackhaw Viburnum, *Aronia Melanocarpa* - Black Chokeberry, *Ceanothus Americanus* - New Jersey Tea, *Juniperus Communis* - Common Juniper (Cultivars - "Compressa", "Depressa", "Hills Vaseyi" and others with a similar habit).*

**URBAN LANDSCAPING
TYPICAL CURBED SECTION
45 MPH OR LESS**

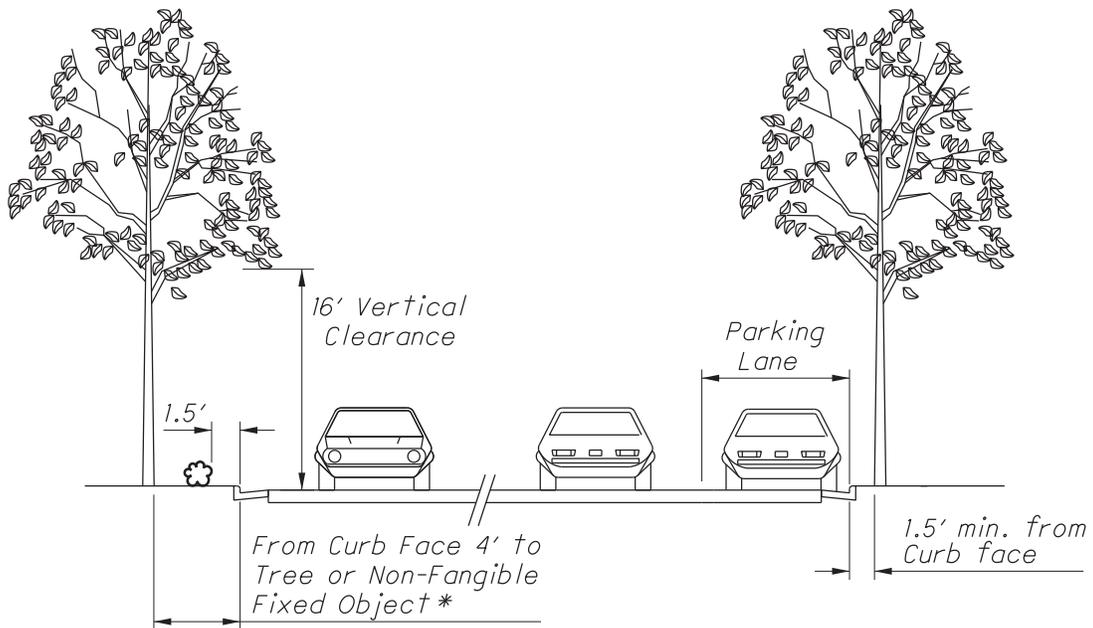
904-2

REFERENCE SECTIONS

905.2



**CURBED SECTION
WITH BIKE LANES OR ON STREET PARKING**



CURBED SECTION

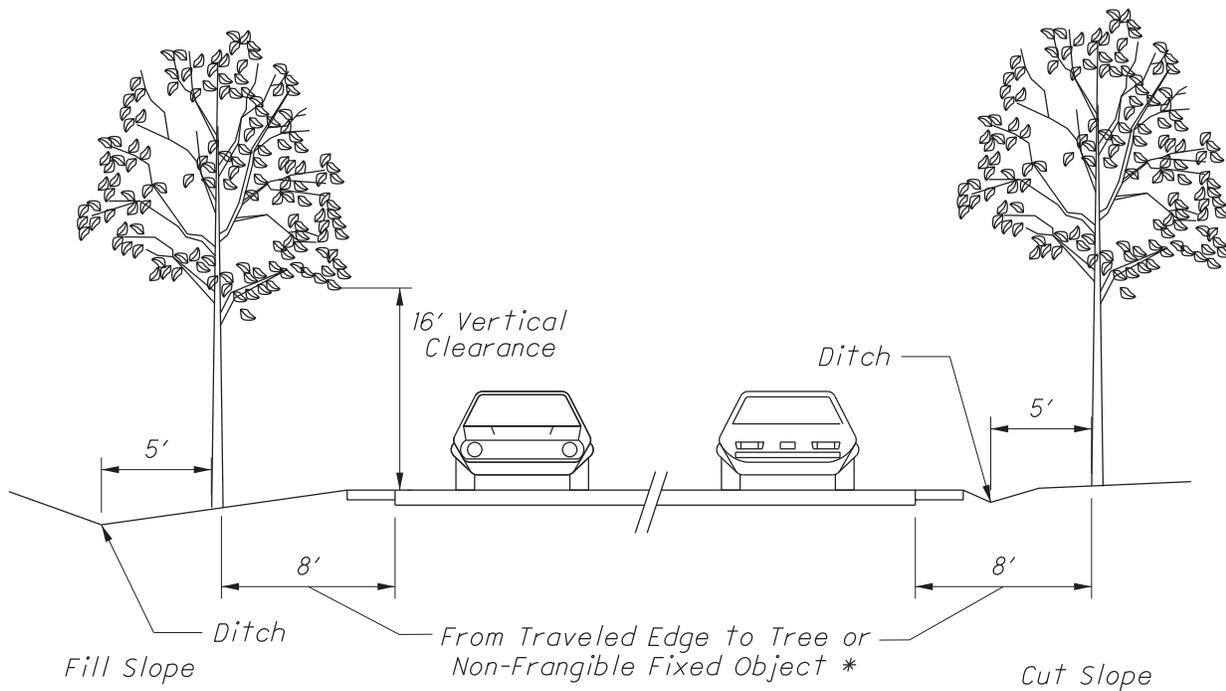
* 6' min. in High Risk Areas Such as Outside Curves

**URBAN LANDSCAPE
TYPICAL UNCURBED SECTION
45 MPH OR LESS**

904-3

REFERENCE SECTIONS

905.2



* 12' min. in high risk areas such as outside of curves

NOTE:

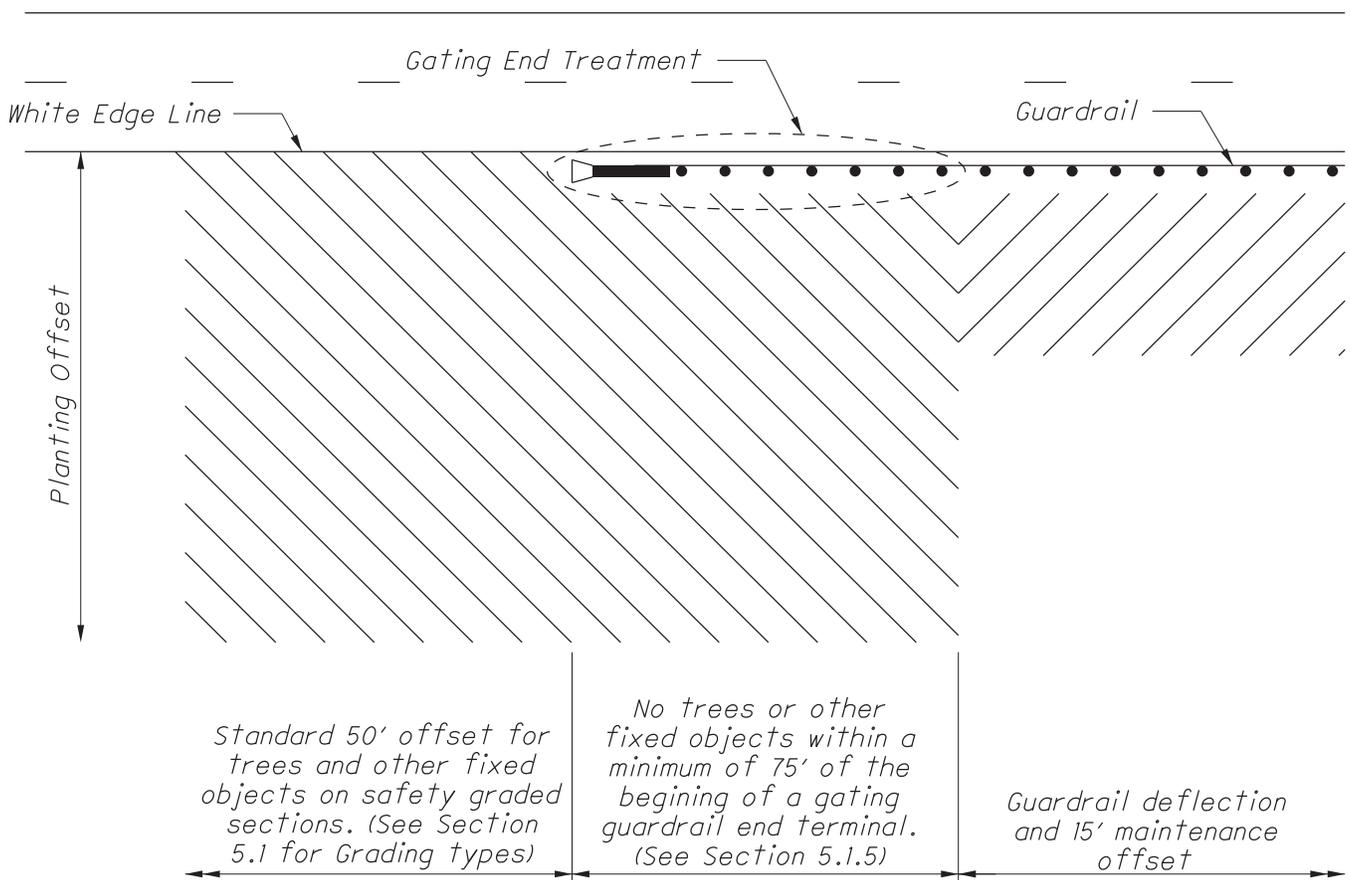
When the widths of the shoulders and ditches do not conform with these typical sections, the 2' min. distance behind the ditch and 2' min. distance outside the shoulder break shall govern.

GATING GUARDRAIL END TERMINALS OFFSETS

905-1

REFERENCE SECTIONS

905.1.5

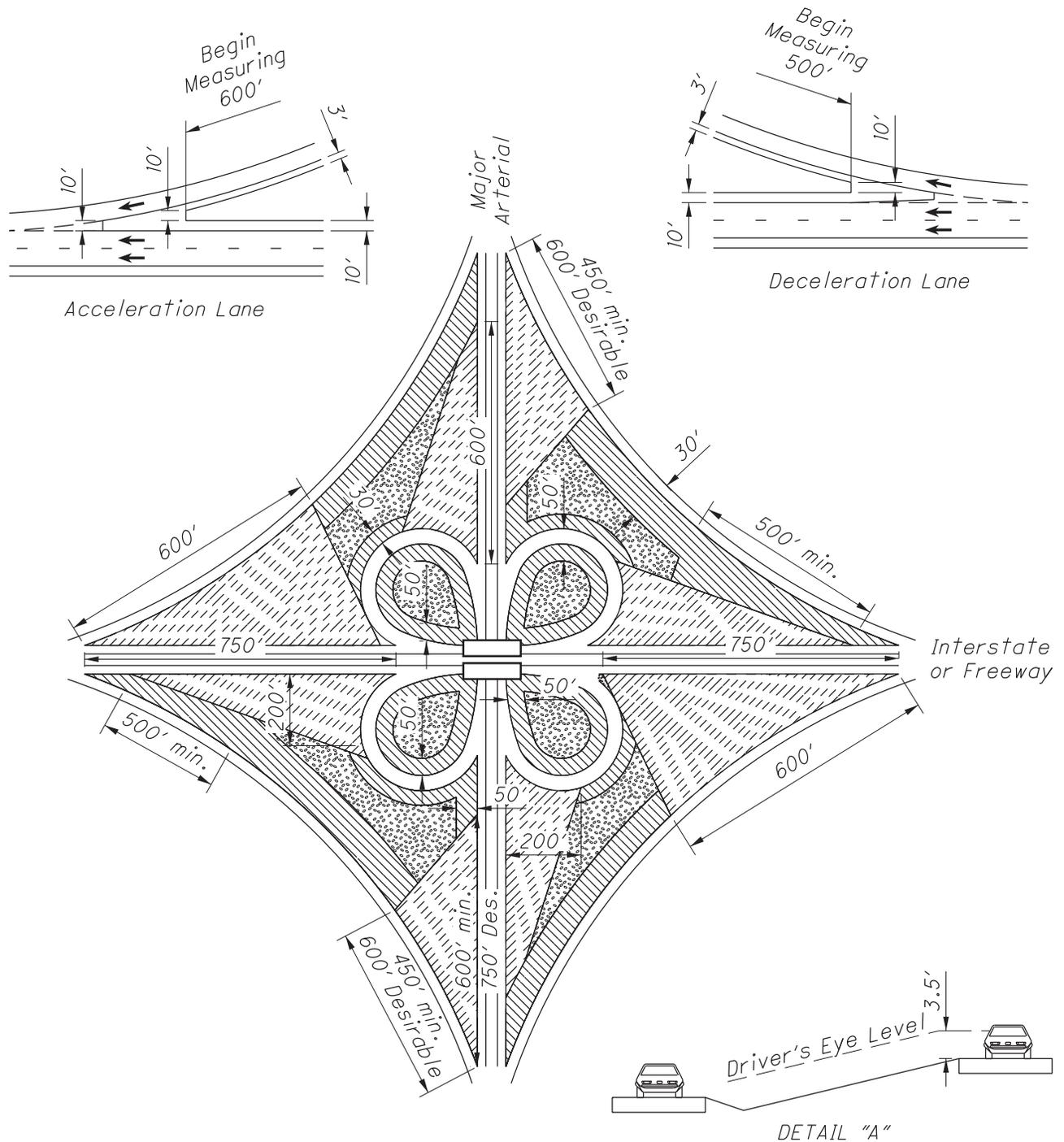


GUIDE FOR LANDSCAPE PLANTING AT CLOVERLEAF INTERCHANGES FIGURE 3

905-2

REFERENCE SECTIONS

905.3.1, 906.1.2



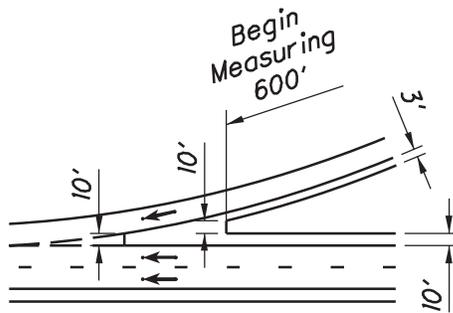
-  Tall Plantings and Trees Permitted in These Areas Where They Do Not Effect Lighting
-  Low Plantings Not to Obstruct Driver's View Permitted in These Areas, Except on Shoulders and Ditches
-  Low Plantings Not to Obstruct Driver's View of the Pavement on Shoulders and Ditches (See Detail A)

GUIDE FOR LANDSCAPE PLANTING AT DIAMOND INTERCHANGES FIGURE 4

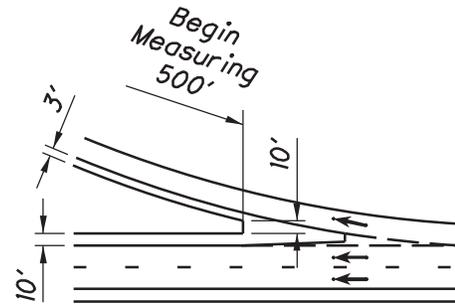
905-3

REFERENCE SECTIONS

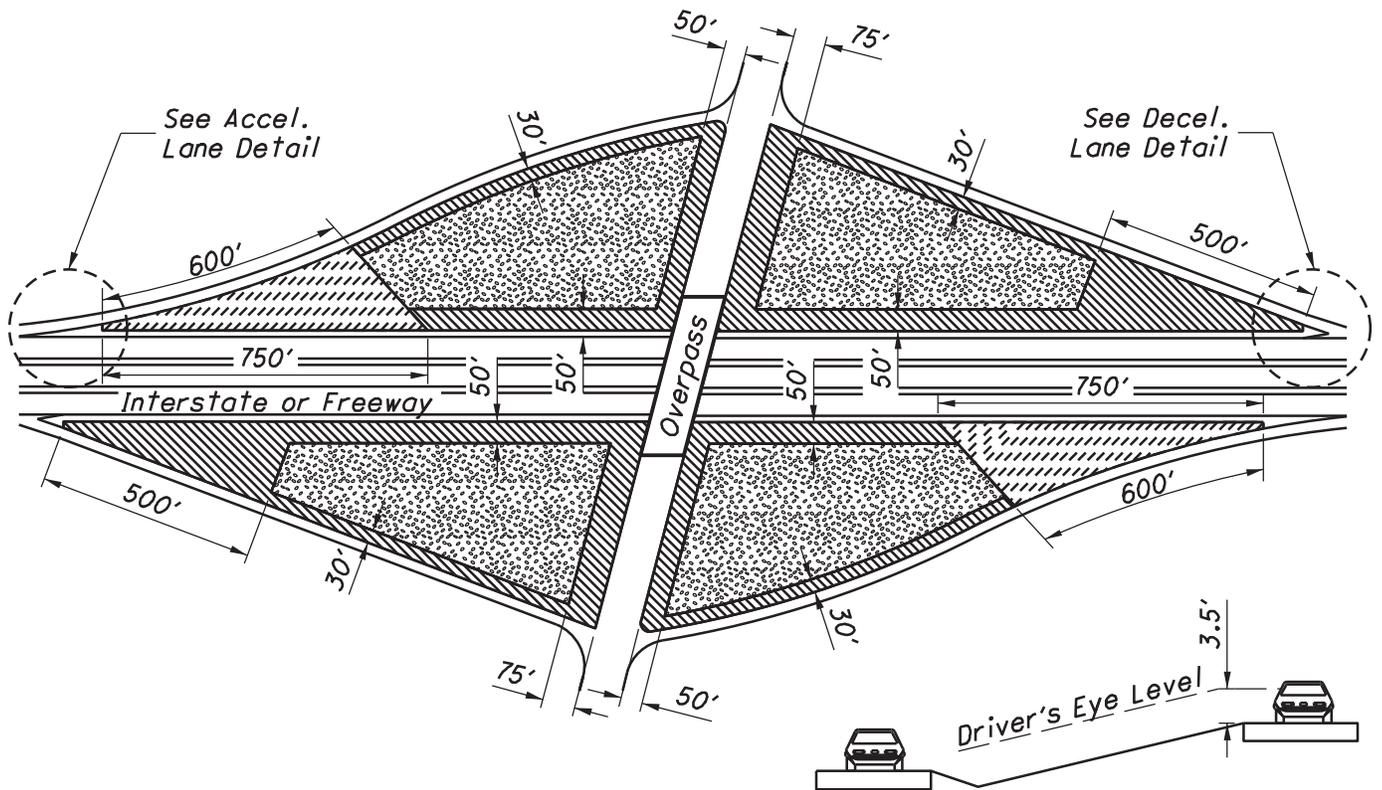
905.3.1, 906.1.2



Acceleration Lane



Deceleration Lane



DETAIL "A"

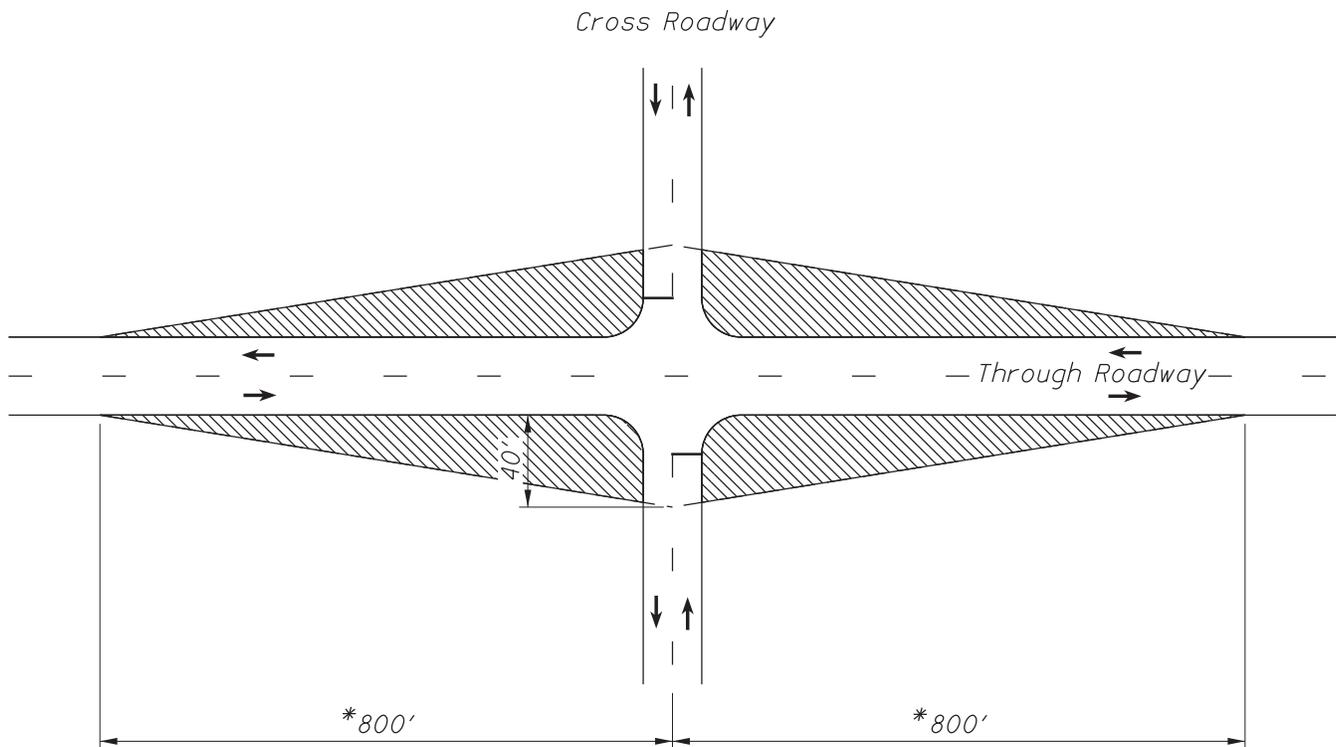
-  Tall Plantings and Trees Permitted in These Areas Where They Do Not Effect Lighting
-  Low Plantings Not to Obstruct Driver's View Permitted in These Areas, Except on Shoulders and Ditches
-  Low Plantings Not to Obstruct Driver's View of the Pavement on Shoulders and Ditches (See Detail A)

LANDSCAPING SETBACKS AT INTERSECTIONS

905-4

REFERENCE SECTIONS

905.3.2



* These distances apply where speeds do not exceed
55 MPH

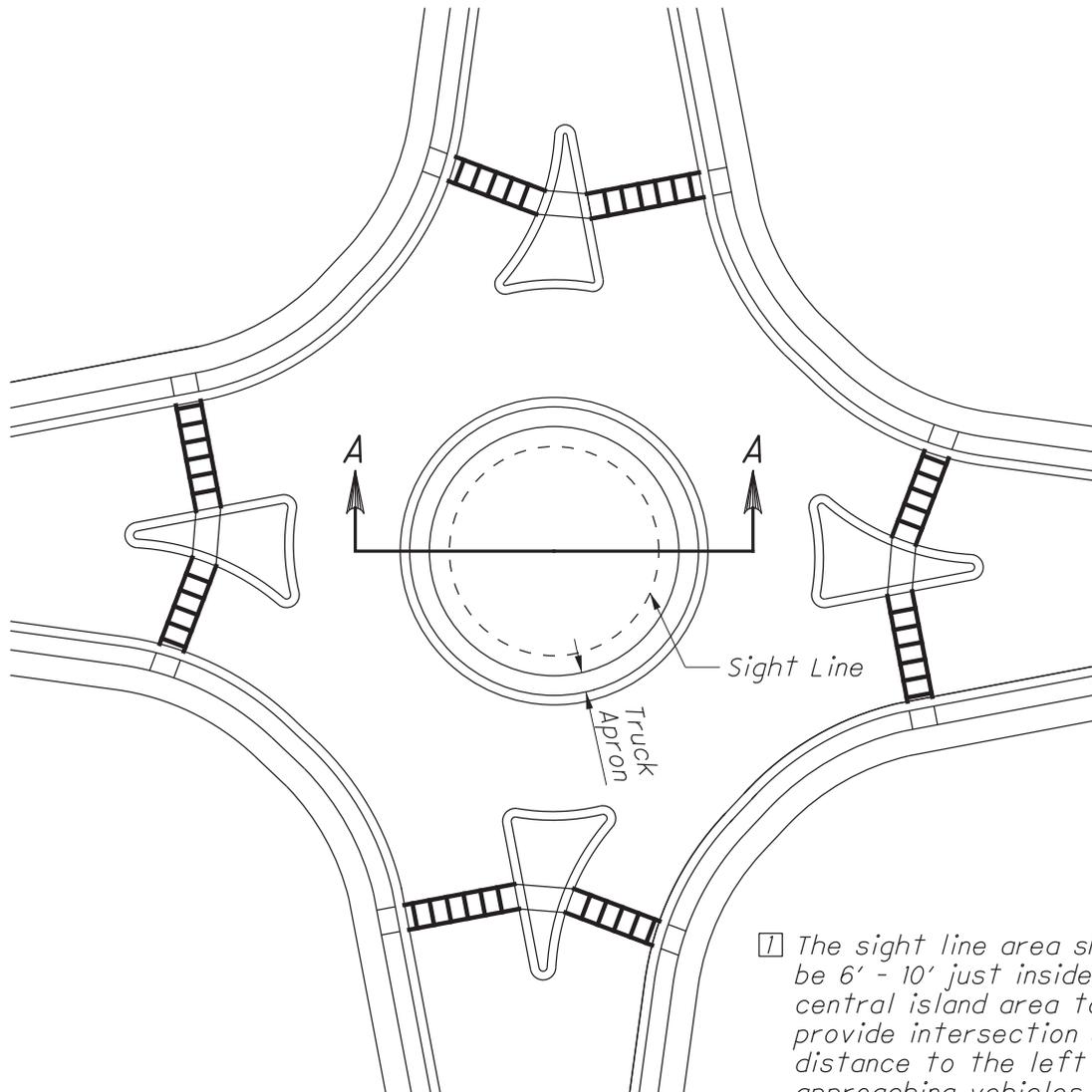
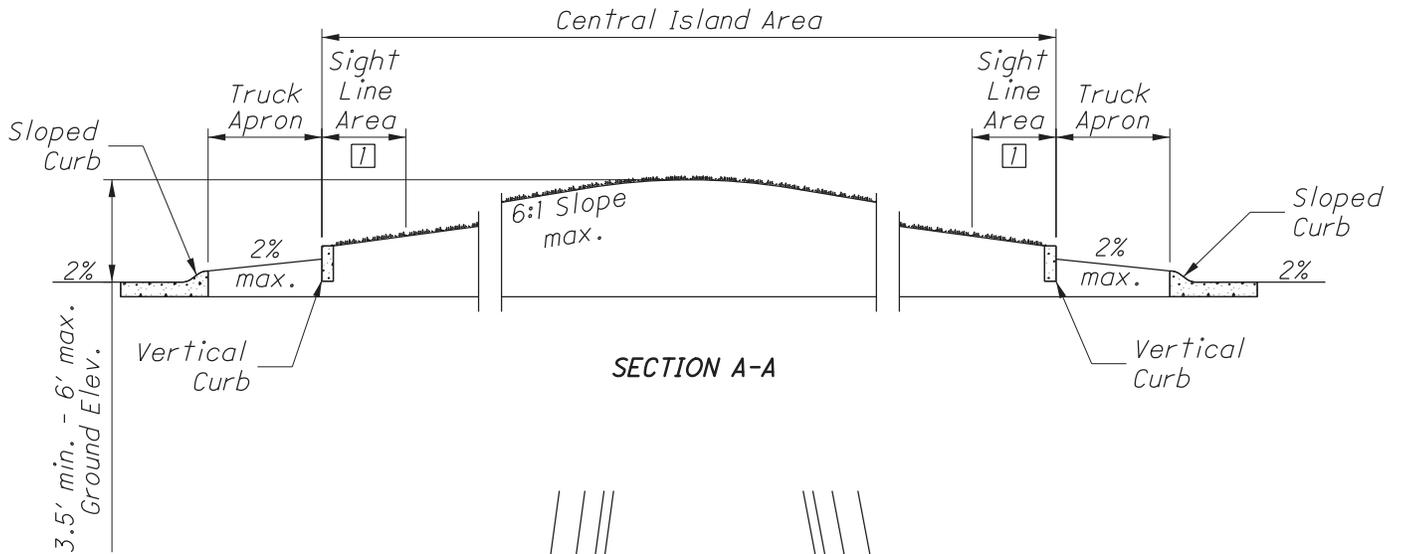
 Low plantings not to obstruct driver's view permitted
in these areas, except on shoulders and ditches

ROUNDBOUT CENTRAL ISLAND GRADING & LANDSCAPING

905-5

REFERENCE SECTIONS

905.5



□ The sight line area should be 6' - 10' just inside the central island area to provide intersection sight distance to the left for approaching vehicles.

900 Roadside Safety Landscaping Guidelines

SAMPLE TREE PLANTING SPECIFICATIONS

Endorsed by

Ohio Nursery and Landscape Association and ODNR Division of Forestry

Purpose: To increase transplanting success by providing municipalities with the most current and acceptable tree planting procedures. This information, prepared in specification format, will enable communities to convey specific requirements to contractors, developers, and/or volunteers. It contains the fundamental elements necessary to ensure transplanting success, and is intended to be a template that can be expanded to address other project issues.

Endorsement: This information is approved and endorsed by the Ohio Nursery and Landscape Association, and the Ohio Department of Natural Resources Division of Forestry.

Assumptions: All plant material complies with American Standard for Nursery Stock ANZI Z60.1. All plant material has been selected based on site conditions and constraints.

Planting Balled and Burlapped Trees:

- If not readily apparent, locate root flare by removing twine, burlap, and excess soil.
- Dig tree hole at least two times wider than the tree ball, with sides sloped to an unexcavated or firm base. Dig hole to a depth so the located root flare, at the first order lateral root, will be at finished grade.
- Lifting only from the bottom of the root ball, position tree on firm pad so that it is straight and top of root flare is level with the surrounding soil.
- Remove all twine from the root ball. If present, remove and discard at least the top one half of the wire basket. Burlap shall be removed from the top to a point halfway down the root ball and discarded.
- With clean, sharp pruning tools, prune off any secondary/adventitious, girdling, and potential girdling roots.
- Backfill planting hole with existing unamended soil, and thoroughly water.
- Mulch the entire planting surface with composted bark applied no less than two inches (2") deep and no more than three inches (3") deep, leaving three inches (3") adjacent to the tree trunk free of mulch.

Planting Containerized or Grow Bag Trees:

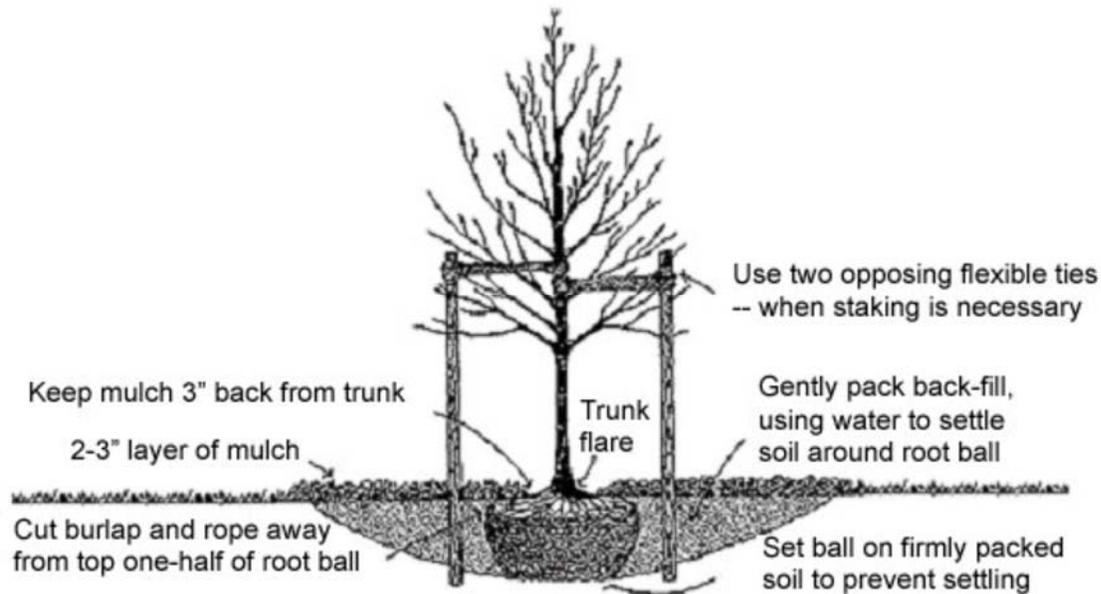
- If not readily apparent, locate root flare by removing excess soil.
- Dig tree hole at least two times wider than the tree ball with sloping sides. Dig hole to a depth so the located root flare, at the first order lateral root, will be at finished grade.
- Create a firm soil mound at the bottom of the planting hole.
- Remove tree from container or grow bag and completely tease apart root system, repositioning any girdling or potentially girdling roots.
- Spread roots over soil mound so that root flare is at finished grade and the tree is straight.
- With clean, sharp pruning tools, prune off any secondary/adventitious, girdling, and potential girdling roots.
- Backfill planting hole with existing unamended soil and thoroughly water.
- Mulch the entire planting surface with composted bark applied no less than two inches (2") deep and no more than three inches (3") deep, leaving three inches (3") adjacent to the tree trunk free of mulch.

Planting Bare Root Trees:

- Dig tree hole at least two times wider than the tree ball with sloping sides. Dig hole to a depth so the located root flare, at the first order lateral root, will be at finished grade.
- Create a firm soil mound at the bottom of the planting hole.
- Spread roots over soil mound so that root flare is at finished grade and the tree is straight.

900 Roadside Safety Landscaping Guidelines

- With clean, sharp pruning tools, prune off any secondary/adventitious, girdling, and potential girdling roots.
- Backfill planting hole with existing unamended soil and thoroughly water.
- Mulch the entire planting surface with composted bark applied no less than two inches (2") deep and no more than three inches (3") deep, leaving three inches (3") adjacent to the tree trunk free of mulch.



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