INSPECTION AND CONTRACT ADMINISTRATION MANUAL FOR MnDOT LANDSCAPE PROJECTS, 2017 EDITION

Acknowledgements

American Standard For Nursery Stock, ANSI Z60.1
City of Minneapolis and St. Paul Forestry Staff
Minnesota Department of Agriculture Plant Industries Division
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- Environmental Planning & Design Unit
- Construction Office
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- Site Development Unit
- Special Provisions Unit
- Erosion Control & Storm Water Management Unit
- Contract Administration Office

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Upon being published and made available for distribution by the Minnesota Department of Transportation, this Manual shall become effective by reference in the Contract Plans, Specifications and/or Special Provisions.

Additional manuals are availiable for $12.00 at:

Map and Manual Sales Office
MS 275, Room 19 So.
Minnesota Department of Minnesota
395 John Ireland Boulevard
St. Paul, MN 55155
Call 651-366 3017 to request an order form.

And as a free online pdf at:

http://www.dot.state.mn.us/environment/pdf/landscapeinspectmanual.pdf

I hereby certify that the Inspection and Contract Administration Manual for MnDOT Landscape Projects, 2017 Edition, was prepared under my direct supervision and that I am a duly licensed landscape architect under the laws of the State of Minnesota.

David P. Larson, PLA
david.larson@state.mn.us

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Purpose

MnDOT's Standard Specifications for Construction 2571 states that "Contractors responsible for plant installation and establishment shall comply with the current edition of the Inspection and Contract Administration Manual for MnDOT Landscape Projects, which sets the minimum and maximum criteria and standards for all operations".

Landscape project inspection and contract administration is a specialized aspect of transportation contracting. Unlike concrete and asphalt, plants are living materials that vary in size, shape, texture, color, and vigor from one location, season, and year to the next. Plants are also perishable. Whenever they are planted or transplanted they are under stress and prone to diseases, insects, and other stress-related problems.

Construction disturbed environments along roadsides are subject to conditions such as turbulent air levels, temperature variations, pollution, de-icing chemicals, and soil compaction. Most roadsides lack natural soil profiles and pH in which many plants typically thrive. Roadside plants are often subjected to concentrated water runoff and competition from weeds and turf. Plants perform multiple functions within the transportation system such as screening, slope stabilization, traffic calming, etc.. The best conceived and designed landscape projects may not produce the desired results if plant material, planting procedures, and establishment care do not meet the Project intent and specified requirements.

This Manual is written to increase the consistency and success of MnDOT landscape projects, which will result in lasting value for the environment, community, and taxpayer.

This Manual will:

* Be based on MnDOT's Standard Specifications for Construction.
* Serve as a reference for MnDOT's landscape inspection and contract administration certification class.
* Provide clear, objective, and measurable criteria for most decision-making on landscape projects.
* Provide step-by-step checklists and an illustrated approach to landscape project inspection and administration.
* Provide clear, objective, and measurable criteria for NPDES permits and activities during construction.

MnDOT Standard Specifications for Construction Used in Landscape Projects

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Whenever the following abbreviations are used in this Manual, the Specifications, plan or other Contract documents, they have the following meaning:

ADT	Average Daily Traffic
AES	Areas of Environmental Sensitivity
ASAE	American Society of Agricultural Engineers
BMP	Best Management Practice
EAB	Emerald Ash Borer
EEO	Equal Employment Opportunity
ICAMMLP	Inspection & Contract Administration Manual for MnDOT Landscape Projects
ISA	International Society of Arboriculture
MCIA	Minnesota Crop Improvement Association
MDA	Minnesota Department of Agriculture
MN MUTCD	Minnesota Manual on Uniform Traffic Control Devices
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
PEP	Plant Establishment Period
PIP	Plant Installation Period
RECP	Rolled Erosion Control Product
SOP	Season of Planting
SWPPP	Storm Water Pollution Prevention Plan
SWQ	Storm Water Quality
TH	Trunk Highway
USDA	United States Department of Agriculture

The Role of the Engineer, Inspector, Technical Advisor, and Contractor

As defined in MnDOT 1103.

The ENGINEER is:

A Department engineer authorized as the Department's representative responsible for the engineering supervision of the work and delegated with those duties and authorities defined in the contract.

The INSPECTOR is:

The Engineer's authorized representative assigned to make detailed inspections of Contract work.

Simply put,

* The Engineer will make decisions regarding all questions.
* The Inspector will be on the job overseeing the work.

The Engineer's decisions will include:

* If materials furnished and work performed are of acceptable quality. If work progress rates are acceptable.
* How to interpret the plans and Specifications.
* If any payment adjustments are to be made.
* If Contractor has fulfilled all Contract provisions.

The TECHNICAL ADVISOR'S role is to assist the Engineer and Inspector by:

* Clarifying or interpreting the intent of the plans, Specifications, and Special Provisions.
* Providing recommendations and field assistance as requested.

MnDOT Landscape Architects, Landscape Designers, Foresters, Botanists, etc. act solely as technical advisors to the Engineer and Inspector. They are not the Engineer's authorized representatives and will not provide interpretations or directions to the Contractor. They will forward any questions, along with their recommendations, to the Engineer.

The CONTRACTOR'S role:

* The Contractor must be familiar with the Project site and the Contract document before submitting a Proposal, as specified in MnDOT 1205.
* **BY SUBMITTING A PROPOSAL AND ACCEPTING AWARD OF THE CONTRACT, THE CONTRACTOR ACKNOWLEDGES INVESTIGATING THE SUPPLY OF PLANTING STOCK, OBTAINING FIRM COMMITMENTS FROM SUPPLIERS, AND ASSURING DELIVERY OF THE SPECIFIED PLANT STOCK AS REQUIRED TO COMPLETE THE CONTRACT.**
* The Contractor and the Contractor's agents will be in possession of all licenses, certificates, labels, testing documentation, notifications, and other paperwork required during the Contract period.
* The Contractor will ensure that a MnDOT Certified Landscape Specialist is on the Project site at all times to perform or directly supervise all work performed as part of the Contract.

Preconstruction Work

According to MnDOT Standard Specifications for Construction, Preconstruction Work involves attending a Preconstruction Conference, mobilization and protecting existing plants. If Preconstruction documentation is not supplied at the Preconstruction conference, MnDOT will assess $200.00 per day until acceptable documentation is supplied. (MnDOT 2571.2A.2)

Preconstruction Conference

Overview

The purpose of the Preconstruction Conference is to review general contract requirements, construction details, the work schedule, work coordination, traffic control provisions, and any items specific or pertinent to the particular project.

Information

The Project Engineer is responsible for preparing the conference agenda, for conducting the conference, and for preparing a written report documenting the conference.

The conference is scheduled and coordinated by the Project Engineer.

The attendees should include:

* Project Engineer.
* Project Inspector.
* Project Landscape Architect, Landscape Designer, Forester, or other Technical Advisor(s).
* Contractor/Subcontractor representatives, including the crew supervisor(s).
* Erosion Control Supervisor.
* Utility Companies.

Optional attendees include:

* Resident Engineer.
* Federal Highway Administration.
* Other governmental units.
* Traffic, Safety, or EEO Offices.

Agenda items may include:

Engineer and Inspector Concerns:

* Type of work.
* Identify MnDOT and Contractor representatives (list phone numbers, etc).
* Distribute Preconstruction packet—includes required report forms, labor provisions, safety requirements, technical memos, posters, and the traffic control manual.
* Payroll.

* Utility locations and marking.
* Safety and Traffic Control.
* Time and normal working hours.
* Do all parties have copies of the plan documents?
* Substitutions, overruns, underruns, change orders, supplemental agreements, etc.
* Review procedures and methods for performing required work.
* Permit Compliance Review
* Erosion prevention, sediment control and BMP's
* Does the Contractor have all required equipment? (MnDOT 2571.3A.4)
* Review Project Progress Schedule.
* Required notifications must be in writing. (MnDOT 2571.3A.2) Work performed without notice is unauthorized.
* 3 day notice prior to plant material delivery.
* 24 hour notice prior to starting or changing operations.
* Work force size, number of crews, qualifications, and experience.
* All crew supervisors must be a MnDOT Certified Landscape Specialist. (MnDOT 2571.3A.1)
* Access, staging, and storage area considerations.
* Review criteria for acceptance of work and payments.

Technical Advisor Concerns:

* Project specific considerations or field problems.
* Clarification of Technical Advisor roles.
* Substitutions.
* Clarify intent of plan, details, SWPPP, MnDOT 2571, and special provisions.
* Standard detail, special provision, or plan modifications.

Contractor Concerns:

* Project site problems and/or conditions that warrant substitutions, relocation, or deletion.
* Supply required documentation.

Required Documents from the Contractor (MnDOT 2571.2A.2)

* Preliminary MnDOT Certificate of Compliance for Plant Stock, Landscape Materials, and Equipment—completed and signed. Form available in Appendix B.
* Preliminary Progress Schedule. Sample form available in Appendix B.

Mobilization

The Contractor shall notify the engineer at least 24-hours prior to beginning work.

Mobilization involves the movement of initial planting hole and bed preparation equipment and supplies to the Project site. This includes herbicide application equipment and supplies, spading equipment, stakes for plant locations, soil additives, erosion control materials, etc.

Protecting Existing Vegetation

Existing vegetation shall be protected on the Project according to MnDOT 2572. If existing vegetation is impacted it must be reported to the engineer and watered according to MnDOT 2572.3A.3.

See MnDOT 2572 for required corrective actions.

Some standard protection methods for existing vegetation include, but are not limited to:

* Limit Access Points
* Temporary fencing
* Clean root cutting
* Woodchips placed within the drip line of trees and shrubs

Terrestrial and Aquatic Invasive Species Control, Prevention and Spread

Existing vegetation, soils and waters shall be protected from terrestrial and aquatic invasive species introduction and spread according to MnDOT 2575.3J. All materials and equipment used for the project shall be kept in an invasive species free condition prior to transport onto the project and acceptably decontaminated prior to movement within the project site. All equipment should be cleaned of invasive species prior to transport off project limits or onto public roads.

Additional requirements and decontamination protocols can be found within:

Minnesota Department of Agriculture

Minnesota Department of Natural Resources

United States Department of Agriculture

United States Fish and Wildlife Service

United States Army Corps of Engineers

Acceptance of Preconstruction Work

According to MnDOT Standard Specifications for Construction, Preconstruction Work involves attending a Preconstruction Conference, mobilization and protecting existing plants.

The Engineer will accept Preconstruction Work after the Contractor has attended a Preconstruction conference, submitted Preconstruction conference documents, secured commitments for materials, obtained approval of the progress schedule, moved equipment and supplies to the Project site, and provided protection of existing vegetation.

Preparation of planting holes and beds includes the following activities: mobilization, traffic control, layout and staking of planting beds and isolated plant locations, herbicide application / weed control, soil cultivation and incorporation of amendments, and temporary erosion control.

Start of Operations

A MnDOT Certified Landscape Specialist must be on site to perform or directly supervise all work on the project operations.

The Contractor shall notify the Engineer at least 24 hours in advance of beginning planting hole and bed preparations. The Contractor's notice must include the Project number, Engineer's name, notification date, intended operation(s), intended operation date and duration, estimated start time, and the location where work will occur. The Contractor shall provide notifications in writing, or confirmable email or facsimile transmission.

Housekeeping

All excess materials, rocks & debris must be stored in containers and disposed of off-site throughout the project. All chemicals should be kept covered with secondary containment to guard against spills that could move off-site. The contractor should develop and submit a spill management and best management practice (BMP) plan appropriate to all operations.

Traffic Control

The Contractor shall follow MnDOT 1404, the Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD) and the current Standard Signs Manual. The MN MUTCD and the Standard Sign Manual can be found online at:

www.dot.state.mn.us/trafficeng/publ/

Sediment Control

The contractor shall follow MnDOT 1717, and MnDOT 2573. The contractor shall develop a project engineer approved site management sediment control plan for project equipment and material stockpile locations, adjacent and downstream inlets, and special water treatment facilities, and any other area identified by the engineer.

Layout and Staking

MnDOT Designers take the Project site context into account when preparing the landscape plan. Design objectives include:

* Trees and shrubs, when mature, will not block sight lines at roadway intersections or merge areas. See Appendix C for sight corner setback guidance.
* Any plant attaining a caliper of 4 inches or greater is outside the safety clear zone. The clear zone is the estimated stopping distance for vehicles that run off the road pavement. See Appendix C for clear zone guidance.
* Advertising signs adjacent to the right-of-way remain visible. See Appendix C for guidance.

Plants will be staked as follows:

* Trees with mature height of greater than 25 feet offset a minimum of 35 feet from overhead power lines.
* Trees and planting beds at least 10 feet up from ditch bottoms.
* Trees and planting beds out of drainage ways or concentrated water flow. Split beds if necessary.
* Vines are planted directly adjacent to fences and walls.
* Clear sight distance of 1200 feet (highway setting) in front of all traffic signs extending 50 feet behind the signs.

The Contractor is responsible for layout and staking plant and planting bed locations.

The Contractor will:

* Contact "Gopher State One Call" to have all utilities located and marked prior to initial bed and planting hole preparation (MnDOT 2571.3D.1 & MnDOT 1507).
* Use 2-foot or 4-foot lathe, depending upon the grass height. Stakes must be visible from the highway and clearly labeled or color coded.
* Stake the exact location of individual trees and mass planting bed perimeters according to the plan. Specified dimensions will govern over scaled dimensions.
* Notify the Engineer of any conflicts to specified plan layouts, including construction debris, utility or site conflicts, or if design objectives are not met.

The Engineer will:

* Review and approve all staking prior to any herbicide application or soil cultivation to ensure that plants are installed in appropriate locations for driver safety, plant health and survival.
* Contact the Technical Advisor if plants are in questionable or problematic locations.
* The Engineer will then determine whether to:
    * Relocate plants.
    * Reconfigure the planting bed.
    * Substitute plants.
    * Delete plants.
    * Modify soil or drainage characteristics as shown in the plan.
    * Stake right-of-way lines and key station points if necessary.

Weed Control and Soil Cultivation

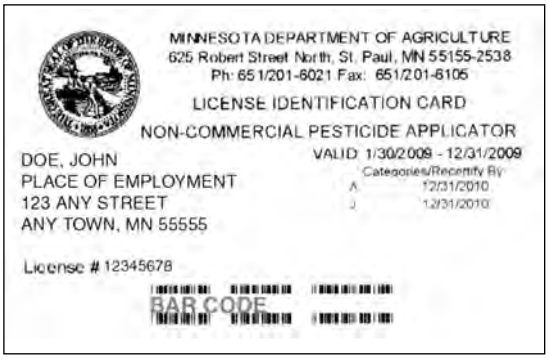
Weed control, soil cultivation, and surface water management operations are conducted, for the most part, simultaneously.

Step. 1. Mowing

Mow all turf areas to a height of 3 inches and to the dimensions or limits shown in the plan.

Mowing should be done at least a week prior to herbicide application and allowed to re-grow to a height of 4 inches.

Step 2. Paperwork


MINNESOTA DEPARTMENT OF AGRICULTURE
625 Robert Street North, St. Paul, MN 55155-2538
Ph: 651/201-6021 Fax: 651/201-6105
LICENSE IDENTIFICATION CARD
NON-COMMERCIAL PESTICIDE APPLICATOR
VALID 1/30/2009 - 12/31/2009
DOE, JOHN
PLACE OF EMPLOYMENT
123 ANY STREET
ANY TOWN, MN 55555
Categories/Recertify By:
A 12/31/2010
J 12/31/2010
License # 12345678
BAR CODE

At least three days before applying herbicide submit:

* All labels of intended herbicides.
* A copy of a valid pesticide applicator license from the Minnesota Department of Agriculture. The applicator must be licensed for both A – CORE (using hand or ground equipment) and J – Right-of-way use (on roadsides or utility rights-of-way). It is a violation of state law for a commercial applicator to apply pesticides when not licensed for that specific application type.

Step 3. Spraying

* Apply Roundup™ or equivalent with a 41% active ingredient of gylphosate according to the manufacturer's recommendations.

CAUTION: TO AVOID TANK EXPLOSIONS, DO NOT USE GYLPHOSATE IN A GALVANIZED TANK.

* In the fall, apply only when vegetation is actively growing or if fall application is not possible apply in May. Vegetation must be actively growing in order to kill it. The herbicide is ineffective before spring green-up.
* Apply to dry foliage.
* Do not apply when precipitation is expected before time of rainfastness stated on the product label. If rain falls prior to rainfastness time stated on product label, re-spray.
* Apply on calm days (wind speeds less than 12 mph,) to prevent the herbicide from drifting to non-target vegetation.
* Satisfactory kill is usually evident 7 to 14 days after application.

Step 4. Competence Testing

* After the Engineer has approved staking locations, the Contractor shall schedule and perform: a successful competency test which demonstrates acceptable removal or complete kill of existing vegetation and acceptable soil cultivation including incorporation of soil additives in one planting bed area and in one individual tree planting area.
* With approval from the Engineer that the equipment and methods are sufficient to perform the work, the Contractor may proceed with further cultivation. Work performed otherwise will be considered unauthorized work.

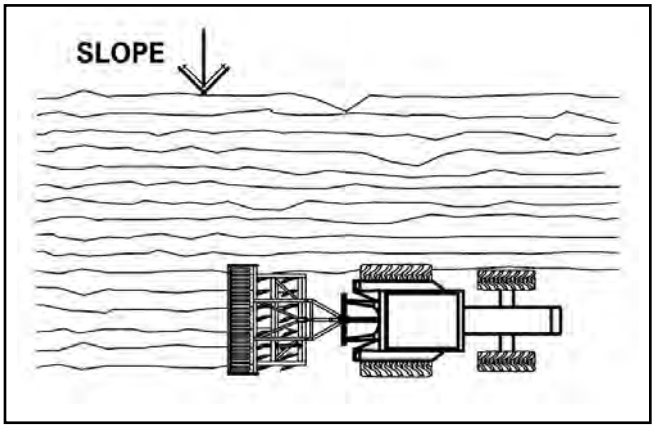
Step 5. Cultivate

* Cultivate the planting areas to at least 12 inches. The depth is measured from the existing soil grade elevation.

* Do not cultivate if soil moisture is beyond field capacity. This will compact and damage the soil structure, making plant growth difficult. Comply with the following field capacity guidelines:

	Soil moisture content acceptable for proper soil cultivation	Typical wait time required prior to cultivating soil after saturation
Loam sand	10-15%	1/2 to 1 day
Sandy loam	15-20%	1 to 2 days
Loam	20-25%	2 to 3 days
Silt loam	25-30%	3 to 4 days
Silty clay loam	30-35%	5 to 6 days
Clay	35-40%	6 plus days

Approach and cultivate slopes approximately parallel with the contours and perpendicular to the slope fall line or direction of water flow. This helps eliminate rutting and soil erosion. On steep slopes, rubber track-mounted equipment may be required. Roughen soil surfaces on slopes leaving tilling ridges (approximately 3 inches) for erosion resistance.



Step 6. Soil Additives

Add specified soil additives and thoroughly incorporate into the cultivated soil. The standard Compost Grade 2 depth is 4 inches. See page 3-5 and MnDOT 3890 for compost information.

Step 7. Compaction

Use a compaction tester to a minimum depth of 16 inches to ensure that compaction, in the planting hole and bed areas, does not exceed 200 psi (1400 kPa). If zones of hardpan or excessively compacted soil exist, the Contractor shall repeat the deep cultivation step or shall decompact the subsoil in accordance with MnDOT 2105.3.H “Finishing Operations”. This work shall be provided at no expense to the Department if caused by Contractor operations. If not specified in the plan or if specified by the Engineer due to preexisting conditions, the Contractor will be paid for subsoiling as Extra Work.

Continue once the Engineer accepts decompaction operations.

Step 8. Drainage

Ensure adequate drainage in planting hole and bed areas. When Contractor has reason to suspect a drainage problem, they shall perform a percolation test.

Percolation test: Completely fill a 16 inch deep planting hole with water. Allow water to drain from the hole. Completely re-fill the hole and measure the time it takes for the water to drain from the hole.

Rate must be equal or greater than 1/2 inch per hour. If drainage rate is inadequate, the Contractor shall be responsible for requesting approval from the Engineer to either relocate or delete affected planting locations or to proceed with Extra Work by using one or a combination of the Planting Details for Poorly Drained Soils as shown in Standard Planting Details (C).

Step 9. Temporary Erosion Control

Temporary erosion control measures shall be applied in accordance with the NPDES permit time frames, SWPPP notes, and MnDOT 2575 (Establishing Turf and Controlling Erosion), the plan, and/or special provisions. Mulch Material Type 6 (wood chip mulch) may be used at a depth of no more than 1 inch for temporary erosion control in prepared planting bed areas. Additional wood chips or other drivable mats may be needed temporarily for soil preservation within haul and staging areas. All exposed or damaged conveyance ditches or other areas of concentrated flow potential must be stabilized immediately with rolled erosion control products (typically natural nettings). All other exposed soil areas must be stabilized immediately as per NPDES permit, but in no case longer than 7 days above wetlands, impaired or special surface waters, and infiltration water treatment systems with weed free mulches, hydraulic mulches or rolled erosion control products. Stockpiles may be stabilized with any of the above or anchored plastic sheeting.

Compost (3890)

Compost Grade 2 is incorporated as a planting soil additive to:

* Serve as a low grade, slow-release fertilizer for plant nutrition and a source for increased microbial activity in the soil.
* Improve water holding capacity in sandy soils.
* Improve aeration and drainage in clay and silt soils by contributing toward a more crumb-like structure.
* Bind micronutrients in the soil and improve nutrient availability to plants.
* Replace humus in the soil.
* Support sound waste stream management in Minnesota.

The Contractor shall furnish a Certificate of Compliance from the supplier per MnDOT1601, that documents meeting the (MnDOT 3890.2) acceptable test result protocols, and current printout of listing on the Approved/Qualified Products List. This list can be found at:

http://www.dot.state.mn.us/products/index.html

If Compost Grade 2 is not from a MnDOT Certified Supplier, it must be tested and test results submitted to the Engineer prior to delivery to the project. Engineer approval is required in accordance with the following:

* Prospective compost sources should be indicated to the Engineer, allowing at least 6 weeks prior to delivery to the Project for testing and approval of the compost. Testing must be conducted by private testing laboratories. Copies of the test results shall be furnished to the Engineer, who may consult with the Technical Advisor if questions arise.
* Compost from MnDOT approved sources may be accepted on the basis of a Certificate of Compliance according to MnDOT 1603. Compost from an approved source does not require physical laboratory testing prior to delivery to the project. The Engineers' representative will perform a visual test for acceptability upon delivery and must meet the following requirements:

Visual Inspection

Upon delivery all compost must be visually inspected regardless of test results or Certificate of Compliance.

Compost Grade 2 for use as a landscape planting medium shall be humus rich type derived from the decomposition of leaves and yard wastes and must meet the following requirements:

Acceptable Compost

* The decomposition shall be ***COMPLETE*** as evidenced by the ***TOTAL BREAKDOWN OF THE RAW INGREDIENTS AND LACK OF ODOR OR HEAT GENERATION.***
* The compost shall bear no pathogenic bacteria or weed seed and shall be free of stones, sand, glass, and other extraneous matter and less than 3% plastic bag pieces.
* Compost shall be registered for sale with the Minnesota Department of Agriculture and the material shall meet the Minnesota Pollution Control Agency requirements for allowable levels for contaminants.
* Texture shall be dry and crumbly similar to shredded peat or pulverized topsoil.
* Compost Grade 2 does not permit the use of animal and poultry manure or municipal solid waste and sludge in the composting process.
* Minimum 35% moisture content when a handful of compost is squeezed the ball should stay together.
* Compost should have no recognizable leaves or pines cones.
* Compost should pass both the ammonia & CO_2 tests of the Solvita test (MnDOT 3890.2).

Unacceptable Compost

* **SLIMY TEXTURE** – compost should be relatively dry and crumbly with a dark brown color.
* **ODOR** – compost may have an earthy smell but it should not have any noticeable rank, rotten egg, ammonia, or foul order.
* **WEEDS AND WEED SEED** - compost should not have weeds sprouting from the pile or weed seeds present in the material.

* **HEAT GENERATION** - steam should not be rising from the compost pile and the compost temperature should be close to ambient (surrounding) temperature. Take the insulating and heat absorbing characteristics of a compost pile into consideration but note that if you stick your hand deep into the pile and notice the material is uncomfortably warm or hot to the touch - reject it. It is important to wear gloves to test compost in this manner due to possible contaminants.
* **EXCESS PARTICULATES** - compost should not have particulate matter such as stone, glass, and plastic of a size that would not pass through a 3/4 inch sieve in the screening process unless coarse compost is specified.

The MnDOT Certified Compost Suppliers list is regularly updated. The most current list is at:

http://www.dot.state.mn.us/products/index.html

Compost Grade 2 must meet the following test results:

Requirement	Range
Organic Matter Content	≥ 30%
C/N Ratio	6:1 - 20:1
pH	5.5 - 8.5
Moisture Content	35% - 55%
Bulk Density	700 lb per cu. yd - 1,600 lb per cu. yd [415 kg per cu. m - 890 kg per cu. m]
Inert Material [a]	< 3% at 0.15 in [4mm]
Soluble Salts	≤ 10 mmho per cm
Germination Test [¥]	80% - 100%
Screened Particle Size	≤ ¾ in [19mm]
[a] Includes plastic bag shreds. [¥] Germination test must list the species of Cress or lettuce seed used.	

Additional Soil Additives

Other types of fertilizer or soil additives are typically not required. In some cases the following soil additives may be specified or used as determined by the Contractor and approved by the Engineer on the basis of soil test analysis to help assure successful plant establishment. Soil additives shall be thoroughly mixed with the in place soil by cultivating during planting hole and bed cultivation.

* Topsoil Material specifications differ in the intended function, and as identified in the plan (MnDOT 3877.2).
  - A. Common Topsoil Borrow for general use as turf growing media, soil repairs
  - B. Loam Topsoil Borrow for landscape beds and raised medians.
  - C. Sandy Clay Loam Topsoil Borrow for structural slope reinforcement, turf reinforcement mats.

D. Rooting Topsoil Borrow for infiltration ponds, deep rooting plants and water filtration.

E. Boulevard Topsoil Borrow for structural support and plant rooting where compaction could occur.

F. Filter Topsoil Borrow for water quality treatment filtration systems.

G. Organic Topsoil Borrow for slope repairs or to enhance existing damaged soils.

* Iron sulphate and ammonium sulphate (MnDOT 3896) incorporated into the in place soil neutralizes soil alkalinity (lower soil pH) and raise soil nitrate levels.
* Fertilizer (MnDOT 3881) improves soil fertility and availability of nutrients needed for plant vigor. When fertilizer is used for seeding operations, fertilizer application and other soil amendments must be uniformly applied and incorporated followed by the seeding operation, no later than 48 hours after application of fertilizer and or soil amendments (MnDOT 2574.3.D).
* Agricultural lime (MnDOT 3879) incorporated into the in place soil neutralizes soil acidity (raise soil pH).
* Peat moss (by special provision) as organic matter incorporated into the in place soil improves soil structural properties when soil fertility is sufficient and to lower pH. Locally available peat moss is preferred.
* Activated charcoal (MnDOT 3896.2E) incorporated into the in place soil neutralizes or deactivates residual organic pesticide, petroleum, or chemical contamination within the soil.
* “Biochar” (by Special Provision) enhances soil function by increasing abstraction and retention of nutrients and is obtained from the carbonization of woody biomass. Biochar also has appreciable carbon sequestration value.
* Hydrophilic polymers (MnDOT 3896.2B) incorporated into the in place soil modifies the physical characteristics of poor soils by balancing or managing water and oxygen in the soil.
* Biological soil, root hormones, and inoculants are used to modify the biological characteristics of poor soils by balancing or managing the rhizosphere. Apply based on information provided by product label and manufacturer’s recommendation or as called for in the plan or Special Provisions.
* Compost Tea (MnDOT 3896.2G) stimulates nutrient exchange, availability, balances the soil rhizosphere rooting, and controls disease depending on composition of the brew.

Engineered and Structural Soils

Engineered and/or structural soils may be included in the project. The following is a broad overview of each soil. Refer to the plan for specific details.

Engineered Soils

Engineered soils are typically blends of two or three MnDOT specified materials to create and enhance certain physical, chemical and biological characteristics to facilitate amphibian and reptile nesting requirements, maximize vegetative rooting, storm water infiltration and partial retention, heavy metal trapping, nutrient capture, and/or other chemical transformation and sequestration. The

common materials of topsoil (MnDOT 3877), sand (MnDOT 3149) and compost (MnDOT 3890) are typically blended by volume in different ratios, depending on goals of the design and environmental commitments. The following table provides examples of blended engineered soils:

	% Topsoil	% sand	% Compost	Intended
Organic Topsoil Borrow	50	0	50	BioSlopes, bioswales, rooting soils
Boulevard Topsoil Borrow	33	33	33	Median planters
Rooting Topsoil Borrow	20	60	20	Infiltration swales and ponds
Filter Topsil Borrow	0	80	20	Moderate flow sand filter rain garden
Compost Grade 2	0	0	100	Lightweight media for steep slopes, slope repair, erosion control, and turf growth

Structural Soils

Structural soils are engineered soils with specific axle load bearing properties of pavements that can be vegetated or otherwise rooted. There are many engineered structural soil systems, and range from angular aggregate to aggregate interconnections to plastic bridging, geogrids and cellular confinement frictional systems. It is possible to pave structural soil surfaces. All structural soils have two things in common:

(1) the ability to limit and control compaction;

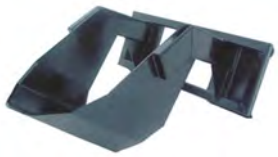
(2) allow nutrients, air and water movement in the profile.

These abilities allow trees and shrubs to be planted in compromised locations including roads, medians, parking lots, and sidewalks typical to urban environments.

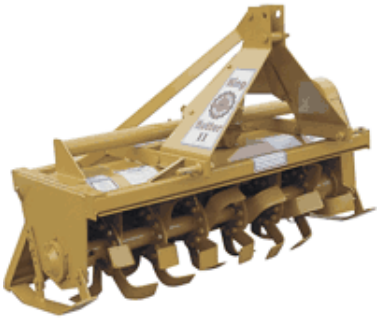
Examples of structural soils and systems include Comel University (CU) Structural SoilTM (CU-SoilTM), Amsterdam soils, Stockholm soils, suspended pavements, structural cells, vaults and pits, and pervious pavement systems.

Equipment

The Contractor will use a spading machine to prepare planting holes and beds. Other equipment may be used for purposes other than bed and planting hole preparation. The following are tables of equipment, their function, and their approximate maximum soil-loosening depth capability.

Equipment	Function	Approx Max. Depth	Image
Acceptable Equipment for Planting Hole and Bed Preparation			
Spading Machine	* Uniformly loosens soil and mixes amendments. * Has adjustable depth ranges. * Leaves no hardpan. * Suggested speed (.3-2 mph) to ensure adequate depth. * Available in variable widths. * Horsepower needed 10-23 hp per foot equipment width	12 inches	
Acceptable Equipment for Work Other than Planting Hole and Bed Preparation			
U-Blade	* Lifts and turns. * Unearths buried debris. * Smears soil, hardpan is possible. * Decompaction.	20 inches	
Chisel Plow	* Tines loosen soil, but do not thoroughly incorporate amendments. Best if soils have been previously loosened or recently placed. * Leaves vegetation residue, which reduces chances for erosion. * A 3-chisel version on a 3-point hitch is best for roadside work. * Horsepower needed 10-15 hp per foot equipment width * Suggested speed 5-6 mph.	18 inches	
Disc	* Breaks the surface crust. * Available in variable widths. * 18-24 inch coulters. * Horsepower needed 10-15 hp per foot equipment width * Suggested speed 5-6 mph.	4-8 inches	

Equipment	Function	Approx Max. Depth	Image
Paraplow	* Fractures soil with little noticeable disturbance, but does not thoroughly incorporate amendments. Single bottom versions work well on roadsides. * Horsepower needed 16-20 hp per foot equipment width * Suggested speed 3-4 mph.	14 inches +	
Harrow	* Used for broadcast seeding. * Drags over the soil surface to improve seed/soil contact. * Enhances seed/sod bed preparation as it aids in clod dispersal. * Horsepower needed 2 hp per foot equipment width * Suggested speed 6-10 mph.	Surface contact	
Clod Buster	* Follows first loosening and further loosens soil. * May need multiple passes. * Horsepower needed 2 hp per foot equipment width * Suggested speed 5-6 mph.	2 inches	
Ripper / Sub-soiler	* Decompacts soil. * Works well in extremely compacted soil where a chisel plow, paraplow, or field cultivator won't work. * When excavator-mounted, articulating arm allows for flexibility (digging around utilities). * Horsepower needed 40 hp/shank. * Suggested speed 4-5 mph.	20-30 inches deep, 12-36 inches apart	

Equipment	Function	Approx Max. Depth	Image
Dimpled Roller	* Creates dimples as it harrows (gently packs soil). Dimples aid in water retention. * Improves seed/soil contact. * Smooth rollers are not acceptable. * Horsepower needed 2 hp per foot equipment width * Suggested speed 3-4 mph.	Surface contact	
Unacceptable Equipment			
Agricultural Rototiller or Rotovator	* Breaks the surface. Possible to reach 12 inches if “bearing down”. * Hydraulic is the most powerful. * Depth is a function of the tine length. * Tine angle influences compaction. A 90-degree tine angle is not acceptable. * Horsepower needed 8-10 hp per foot equipment width * Suggested speed 2-3 mph.	8-12 inches	
Conventional Rototiller	* Requires multiple steps – remove several inches of soil, incorporate some amendments, then replace soil and add remaining amendments. * Actual incorporation depth is 2 inches less than the tine length. * May cause soil compaction. * Horsepower needed 10-15 hp per foot equipment width * Suggested speed 1-3 mph.	6-8 inches	

Equipment	Function	Approx Max. Depth	Image
Moldboard Plow	* Turns and flips soil. Forms a hardpan layer. * Is a negative carbon builder. * Can lead to anaerobic soil conditions * Does not mix soil. * Horsepower needed 16-20 hp/ bottom. * Suggested speed 3.5 to 4 mph.	16-24 inches	

Storm Water Pollution Prevention Implementation

This work consists of managing storm water runoff and protecting related water discharges in order to minimize sediment pollution during the life of the Contract as set forth in the National Pollution Discharge Elimination System (NPDES) permit and Storm Water Pollution Prevention plan (SWPPP) documentation in the plan. This work includes furnishing, installing, utilizing, maintaining and removal of erosion and sediment control measures required in the NPDES Permit, as called for in the plan, the Standard Specifications, (MnDOT 1717, MnDOT 2573, MnDOT 2574, and MnDOT 2575), by the Engineer, or as agreed upon for specific site concerns.

NPDES Permit and SWPPP: The law requires that the Contractor obtain, prior to starting work, an NPDES Permit (Appendix B-25) when Owners and operators of construction activities are disturbing:

* One acre or more of soil.
* Less than one acre of soil if that activity is part of a larger common plan of development or that is greater than one acre.
* Less than one acre of soil, but the Minnesota Pollution Control Agency determines that the activity poses a risk to water resources.

As a part of the NPDES Permit, the Owner must develop a SWPPP that defines measures to be taken to protect Waters of the State. The Contractor must fulfill the requirements set forth in the NPDES Permit by following and amending the SWPPP. MnDOT and the Contractor are Co-Permittees in landscape projects.

The Technical Advisor/Designer prepares the SWPPP, describing the erosion control devices/methods for each specific Contract by designating them in the plan details, SWPPP notes, special provisions or directly on specific pages of the plan. The Contractor and the Engineer may also determine the need, in the field, upon review, for erosion control devices that may not have been adequately designed. When changes become necessary, due to weather, field conditions, or BMP's not performing as intended, they must be documented as amendments to the SWPPP.

Erosion control devices/methods to be used are determined by considering soil types, depth to groundwater, movement and flow design, soil stability, slope, proximity to Waters of the State and/or special and impaired waters, and any other site conditions or design characteristics that may contribute to effective storm water management.

Quality Control (1717.2B)

The Contractor shall maintain and implement a quality control program for erosion prevention and sediment control that includes understanding and following the permit requirements related to each work activity, conducting appropriate inspections for best management practices performance and functionality in a written format, and incorporates erosion prevention, sediment control and good housekeeping practices in a timely manner. When temporary devices are no longer needed due to restoration of vegetative covers, sediment control devices are appropriately removed.

Erosion and Sediment Control Schedule (1717.2C)

In order to deliver a quality control program, the Contractor shall prepare and submit a weekly schedule of proposed erosion and sediment control activities, findings, recommendations and corrective actions taken to prevent sediment discharges, areas ready for permanent restoration or establishment. In addition, work that goes through winter must incorporate erosion prevention, sediment control and good housekeeping during work suspension.

Site Management Plans (1717.2D)

The Engineer may require the Contractor to submit a site management plan detailing proposed erosion control and sediment control measures and a schedule indicating starting and completion times for construction operations working in water bodies and/or in direct proximity to waters of the state.

Contractor shall not start work in the affected areas until the schedule and site plan have been accepted by the Engineer.

Erosion Control Supervisor (2573.3A.1)

The Erosion Control Supervisor shall be a responsible employee of the prime Contractor and/or duly authorized by the prime Contractor to represent the prime Contractor on all matters pertaining to the NPDES Permit compliance. The Erosion Control Supervisor shall have a valid Construction Site NPDES Permit Management certification obtained from the University of Minnesota or other approved organization. The Erosion Control Supervisor shall have authority over all Contractor operations which influence NPDES Permit compliance including grading, excavation, clearing/grubbing, landscaping, and any other operation that increases the erosion potential on the Project. The Contractor shall schedule and conduct construction activities in a manner that will minimize soil erosion and the resulting siltation and turbidity of surface waters. The Contractor shall comply by the requirements herein regardless of whether or not an NPDES Permit for the work is required. In addition, the Erosion Control Supervisor shall implement the Contractor's quality control program, as described above, and other provisions in accordance with MnDOT 1717 and be available to be on the Project within 24 hours at all times from initial disturbance to final stabilization and perform the duties listed in MnDOT 2573.3A.1.

Workmanship and Quality Control

If the Contractor or subcontractor(s) fails to provide the required Certified Installer(s) as per MnDOT 2573.3A.2, the Erosion Control Supervisor shall notify the Engineer. If either the Erosion Control Supervisor or the Engineer determines that one or more required certified installers have not been

provided, the Contractor shall respond to the Engineer's notification within 2 days with the appropriately certified or provisionally certified person(s).

Workmanship Rework Schedule

Performance of the work shall be controlled by the Contractor so that the materials installed and the workmanship practices are of good quality and functioning as required. When the quality falls below the threshold level defined in Tables 2573-1 and 2575-4, the Contractor shall take immediate action to correct the situation and prevent it from recurring. As indicated in the table, the Contractor shall correct unacceptable workmanship to qualify for payment. Incidental items related to other work shown in the plans unacceptably performed will be required to be removed and replaced as per MnDOT 1512.1 and MnDOT 1512.3.

Critical Resources

All Waters of the State must be protected, but additional measures must be taken to protect critical resources. Critical resources include but are not limited to, protected wetlands, surface waters, trout streams, Special Waters, impaired waters, rivers, and endangered species habitat. Special Waters are referenced in the NPDES Permit and on the MPCA web site:

http://www.pca.state.mn.us/water/stormwater/stormwater-c.html

Measures for protection of critical resources may include hand clearing and grubbing, prevention of turf damage, very limited duration for exposed soil, and immediate final re-establishment of turf. The plan or Special Provisions will call for these measures where necessary.

Storm Water Management Issues for Landscape Operations

Access

Contractor, Engineer, and Technical Advisor will work together to determine where access to the site will create the least damage to established cover or water conveyance systems. The Contractor will avoid creating ruts, driving in ditch bottoms, pond bottoms, or pond corners.

Exposed Soil

All exposed soil due to landscape operations with a continuous positive slope within 200 feet of surface waters, including pond sides, slopes, curb and gutter systems, storm sewer inlets, drainage ditches or other storm water conveyance shall have temporary erosion protection (MnDOT 2575.3M) or permanent cover (MnDOT 2575.3A) for the exposed soil areas within the following time frames.

Type of Slope		Time*
Steeper than 1 vertical : 3 horizontal		14 days
Between 1:3 and 1:10		14 days
Flatter than 1 vertical : 10 horizontal		14 days
Type of exposed soils with sheet flow**	**Adjacent Resource**	**Timeframe**
All	Impaired Water	7 days
All	Special Water	7 days
All	Wetland	24 hours
All	Areas of Environmental Sensitivity (AES)	24 hours
All	Infiltration Storm Water Quality (SWQ) Facility	24 hours
All	Not as above	14 days
Type of Ditch		**Time***
Last 200 feet from discharge off project limits	Any ***	24 hours
Last 200 feet from discharge to outlet of right of way	SWQ ponds, treatment systems, infiltration/filtration systems	24 hours
Remaining portion of ditch conveyance	AES, Wetlands, Special/Impaired Waters	7 days
Remaining portion of ditch conveyance	Other than above types	14 days
Culvert outfall end treatment	Any	24 hours

*The maximum time an area can remain un-worked by the Contractor without temporary or permanent erosion control measures implemented.
** Includes topsoil borrows, and compost stockpiles
*** Includes curb and gutters

Ditches and Conveyance Systems

All damaged or rutted ditch or culvert end scour controls must be repaired and restored within 24 hours of exposure.

Bioengineering

The Technical Advisor may choose to include bioengineering in the plan for stabilization in erosion prone areas adjacent to rivers, lakes, streams and other waters of the state. This may include brush layering, live stakes, willow wattles, etc.. For Bioengineering standard detail plans, choose Standard Plan Number (PDF) 5-297.407 on the following web site (in search box type "407"):

http://standardplans.dot.state.mn.us/stdplan.aspx

Soil Compaction

Post-construction soil is often compacted. If compaction is greater than 200 psi (1400 kPa), percolation rates will be affected and moisture will not be absorbed. This can cause erosion issues and is negative to plant health. Subsoiling/ripping is the best method to correct compacted soils (MnDOT 2574.3A.5).

Perimeter Control

The Contractor must keep sediment from moving off the right-of-way, onto paved surfaces, or into Waters of the State or their conveyances. These perimeter control measures must be installed prior to or concurrent with land disturbance activities. Landscape projects may need down gradient perimeter control installed prior to land disturbance activities. This may include compost logs, wood fiber logs, mulch berms or other BMP's.

Rapid Stabilization (2575.3M)

To prevent off site sedimentation and/or to comply with permit requirements, when field conditions create urgent need to protect public safety and Waters of the State, the Contractor shall use effective erosion control devices to rapidly stabilize critical areas within 200 feet of Surface Waters. Examples include quick cover seed with a soil cover like hydro or straw mulch and/or erosion control blankets. Examples of Materials for Rapid Stabilization is in Table 2575-3 "Rapid Stabilization" of the MnDOT Standard Specification for Construction.

Vehicle Tracking

The Contractor shall minimize vehicle tracking of sediment or soil onto paved surfaces at all exit locations. BMP's may include MnDOT 3882, Type 5 Mulch and/or geotextile mats, as well as plywood and other driveable mats. Under certain circumstances, a pressure washer may be required capable of washing the tires prior to entry on paved roads or to prevent the spread of invasive species. Tracked sediment must be removed from paved surfaces within 24 hours of discovery using appropriate dust controlled hand or mechanical sweeping methods.

Chemical Management

The Contractor must have a spill kit and appropriate secondary containment systems on site at all times as well as a plan for spill management and proper disposals for chemicals such as oil, fuel, fertilizer, etc. All chemicals must be stored under a cover that prevents exposure to stormwater.

Restoration

The Contractor is responsible for restoring the site, over the life of the Contract, to pre-existing conditions with regard to level of compaction, permanent vegetative cover and stabilization of discharge to surface water. This includes sod, roadside turf grass, forbs and native plantings plant communities.

Erosion Control Devices/Methods

Subsoiling/Ripping

Subsoiling is a tool for erosion control that will reduce soil compaction allowing for better percolation rates in compacted soil (MnDOT 2574.3A.5). Subsoiled areas shall be loosened to less than 200 psi to a depth of 20 inches of the inplace soil. When directed by the Engineer, the Contractor shall verify that the subsoiling work conforms to the specified depth. To test for conformance, the Contractor shall use a cone penetrometer that meets standard ASAE Soil Testing Specifications of a 13/16 inch insertion rate per second.

Channels shall be created by a commercially available, multi-shanked, parallelogram implement attached to track-type equipment capable of exerting a penetration force necessary for the site. No disc cultivators, chisel plows, or spring-loaded equipment will be allowed. The grid channels shall be spaced a minimum of 12 inches to a maximum of 36 inches apart, depending on equipment, site conditions, and the plan. The channel depth shall be a minimum of 20 inches or as specified in the plan. If soils are saturated, Contractor shall delay operations until the soil dries to field capacity or less.

Seeding

Temporary, restorative and/or permanent seeding may be called for in the Contract. Seed requirements are defined in MnDOT 3876 “Seed”. Preparation, installation and maintenance for seeding are defined in MnDOT 2574.3. MnDOT 3882 Type 3 (certified weed free) mulch shall be disc anchored for all seeding types. There are several other acceptable choices for temporary soil stabilization including hydraulically applied mulches and rolled erosion control blankets. Disturbed areas may not remain open longer than allowable based on the time table provided in the Exposed Soil heading of this section.

Seed mixture 22-111 shall be used when Temporary Stabilization Seeding or MnDOT 2575.3M “Rapid Stabilization” Methods 1 through 4 is specified or ordered by the engineer. Depending on location

and time of year, alternative temporary seed mixtures may be proposed if documented in writing and approved by the project engineer.

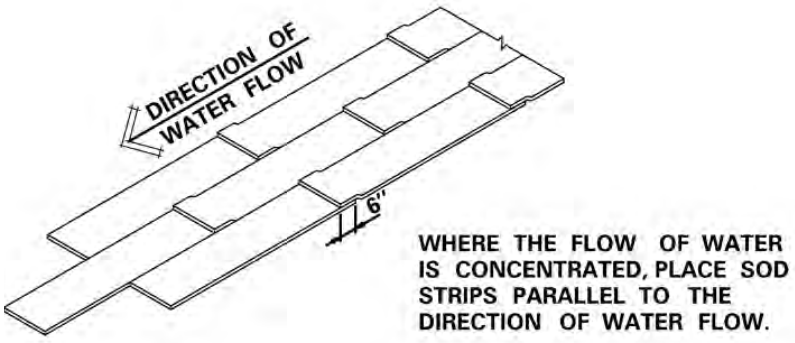
When turf is disturbed by the Contractor operations, restorative seeding is required. Seeding mixture shall be the same as pre-existing turf unless otherwise specified. Seed mixtures for permanent and restorative seeding will be as specified in the plan, Special Provisions or as directed by the Engineer.

Acceptance of seeded areas desired by the Engineer will not be made until it is evident that the seed has germinated and 70% or more perennial cover is established. In the event of seeding failures, the Contractor will be required to correct and reseed such areas at no expense to the Department until it is acceptable.

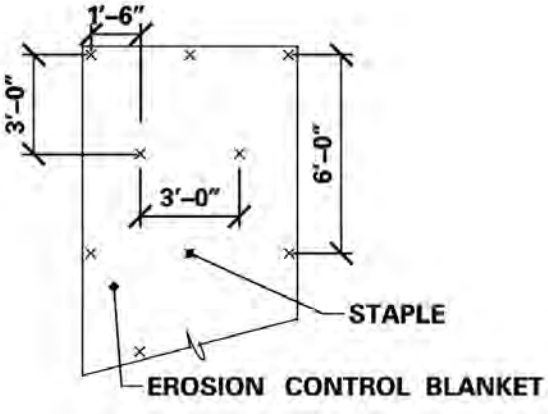
Soil Stabilization / Erosion Prevention (2575.3)

Applying Mulch (MnDOT 2575.3C)

Temporary soil stabilization methods may be used as an erosion control method when provisions for rapid stabilization (critical areas within 200 feet of surface waters) do not apply. Various soil stabilization practices differ in shear performance, longevity, soil type and slope gradient. In areas where temporary mulch is placed, the Contractor shall shape the area, loosen the soil as necessary, mulch and anchor the mulch. This method will most often be used for larger areas that have been tilled and will be left open longer than allowable based on the erosion control time table provided in the Exposed Soil heading of this section. Blanket stabilization practices will be required in ditches and slopes steeper than 3:1. Reinforced Fiber Matrix hydraulic mulches can be used on all soil types (without concentrated flows) up to 1:1 slope steepness. Type 5 Mulch (MnDOT 3882.2E) can be used for stabilization and traction for accessing slopes or as an access pad for site access as it is biodegradable and, as such, will not need to be removed but will need to be incorporated.



Special Sod Placement Techniques: Overlapping Sod



Standard 6.5ft Blanket Stapling Pattern:

Slopes flatter than 1:2 (1.2 Staples per Sq, Yd)

Sod (3878)

There are four types of sod; lawn, salt tolerant, mineral and native. The appropriate sod must meet MnDOT 3878.2 with regard to type, texture, and

installation. Installation of sod may require shingling, pinning, and netting as per MnDOT 2575.3F on steep slopes and ditches. Sodding will most often be used to replace existing sod or to restore established turf damaged by Contractor operations in ditches or other flow areas, especially urban areas. Typical locations for sod are within urban and residential edge areas. Note that sod must be maintained until rooted back into the soil profile, typically 30 days under a watering system.

Hydraulic Erosion Control Products (3884)

Hydraulic erosion control products are designed to control erosion and aid germination until vegetation is established. They are available in many formulations and varying by task, length of service and slope steepness. A listing of the various types can be found within MnDOT 3884 and application requirements within MnDOT 2575.3E.

All hydraulic mulches are defined as weed-free and may last for as little as three rain events and up to nine months. Restorations performed during spring season (ending as June 15) may be successful using various soil tackifiers, hydraulic compost matrix, and Hydraulic mulch. For any other time of year, and especially over winter, use Bonded Fiber Matrix or Reinforced Fiber Matrix hydraulic mulches (longest lasting and strongly recommended).

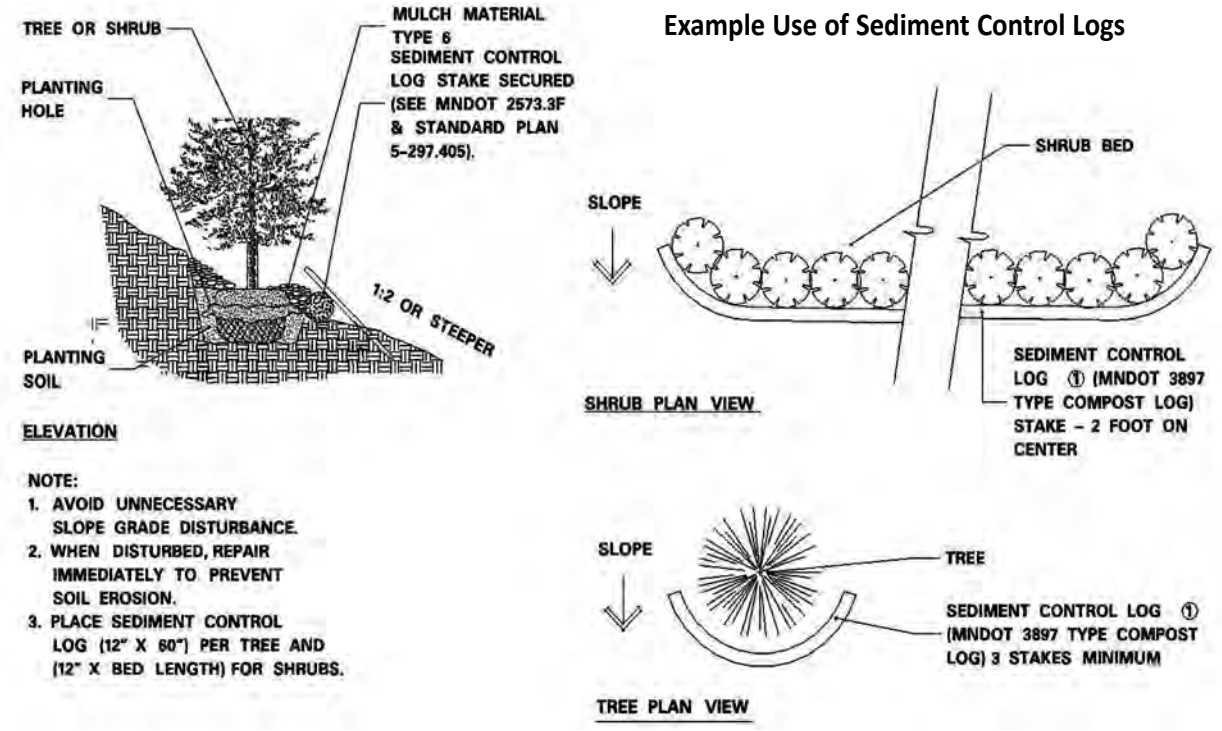
Rolled Erosion Control Products (3885)

Common rolled erosion control products are a biodegradable product designed to reduce erosion until vegetation is established. They are available in increasing performance categories based on service life and slope or ditch steepness. Rolled Erosion Control Products (RECP) are suitable for site conditions with slopes less than or equal to 0.5:1 and shears less than 10 pounds per square foot (long term, non-degradable). In order to perform to manufacturers specifications, RECP must be properly installed, per the requirements of MnDOT 2575.3G. “Rolled Erosion Control Products” Table 3885-1 defines RECP categories. These products can be used to temporarily stabilize tilled beds, rut repairs, stockpile locations, and aid in turf establishment or restoration in combination with seeding. If nothing is specified in the plan, a common RECP for typical restoration activities is Category 3. All erosion control blanket must be natural net/stitching to prevent mower damage and critter catching.

Sediment Control Log (3897)

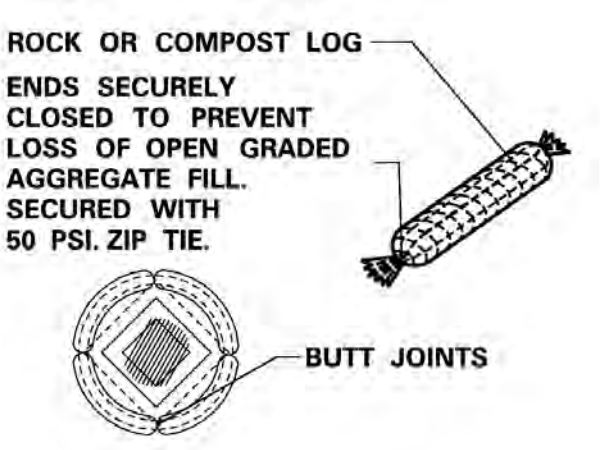
A Sediment Control Log is intended to filter stormwater and retain the collected sediments during short term land disturbance activities. It can be re-mobilized multiple times based on activity. A Sediment Control Log is effective for plant bed perimeter, stockpile perimeter, ditch or gutter filter check, urban edges and down gradient exit checks. There are several types of Sediment Control Log (MnDOT 3897) filter media from straw, wood fiber, wood chips, compost and or rock. Installation descriptions can be found in MnDOT 2573.3F, but use common sense during installation to maximize performance flexibility and reuse. Typical Sediment Control Logs used for landscape operations are logs composed of wood chips or compost. Except for those used in mow areas, the logs are allowed to remain in place.

Example Use of Sediment Control Logs



Storm Drain Inlet Protection (2573.3M)

The Contractor must protect storm drain inlets from soil disturbing activities that would result in sediment laden storm water runoff entering the inlet storm drain. Inlet protection applies to manholes, catch basins, curb inlets and other drop type inlets. MnDOT no longer specifies the material, only the process as per MnDOT 2573.3M. Typical inlet defense measures vary by location and function. Typical field inlets maybe defended with Sediment Control Logs in a ring configuration to geotextile diaper-like bag insert with emergency overflows (prevent flooding). In urban areas with the potential for flooding and road safety, typical inlet defense is a diaper-like bag insert with curb box backer with emergency overflow ports. Except for single day use of material hauling, no inlet defense shall consist of a geotextile fabric held in place by the grate. Devices must be regularly cleaned out and sediment removed from the site or re-incorporated into exposed soils ready for stabilization. Erosion control practices may include filter logs directly above curbs adjacent to planting beds or at bottom edges of beds on steep slopes. Inlets must be protected from all land disturbance activities for the life of the Contract. If sediment leaves the site, the Contractor shall retrieve and restore off site area at no cost to the Department.



Silt Fence

Due to issues of safety, over winter, and of timely removals of the geotextile and stakes, it is no longer recommended to use silt fence for landscape projects. Use Sediment Control Logs as described above (filter media of wood chips or compost). The exception to this is when working above surface waters on slopes steeper than 2:1 where turbidity barrier, superduty (water-filled barrier style) silt fence and silt curtain may be specified.

Ditch Check

Ditch checks are now specified as Sediment Control Log (MnDOT 3897). If landscaping operations result in a stabilized ditch being opened and exposed/damaged, ditch checks shall be used in combination with rolled erosion control products or vegetated buffers to slow water velocity and temporarily contain sediment within ditch bottom until ditch has been permanently stabilized with 70% or more perennial cover.

Flotation Silt Curtain (MnDOT 3887)

Flotation silt curtain is an impermeable barrier used to isolate the work area while working in, or adjacent to, surface waters. It is for short-term activities of shore or bank landscaping (live stakes and riprap) used for containing suspended sediment and allow resettling prior to removal of flotation silt curtain. It may also be specified as a form of perimeter control where rapid changes in water elevation would inundate standard perimeter controls in storm water treatment systems, wetlands and rivers. Speed of work (lowers risk of sediment discharge) is the best BMP for working near waters. Another solution for water edge work and wave reduction is a branch energy wall composed of stacked branches held between two lines of tethered stakes (brush mattress wall). Install Flotation Silt Curtain per MnDOT 2573.31.

Maintaining Erosion Control Devices

The Contractor and the Erosion Control Supervisor are responsible for maintaining quality control on all work performed. When erosion or sediment control devices are installed, the work must be supervised by a Certified Installer.

The Contractor shall remove sediment observed on pavements, within inlets, against perimeter controls and in sediment traps. Typically this work must be performed within 24 hours of discovery or when site conditions allow access. The contractor shall re-install erosion prevention practices within 24 hours of observed failures, or not performing as intended. Maintenance of the BMPs is typically part of the original cost of the BMP.

If the Engineer determines that the Contractor has not followed adequate erosion control practices that results in sedimentation outside the right-of-way, the Contractor shall retrieve all sediment that has left the right-of-way and restore the property to preexisting condition, to the fullest extent possible, at the Contractor's expense. This must occur within 7 days of discovery and may require additional regulatory permits.

Removal of Erosion Control Devices

The Contractor shall remove all sediment control devices upon completion of the Contract work unless otherwise specified in the Contract or directed by the Engineer. All removed materials become the property

of the Contractor. Sediment control devices that are biodegradable will not need to be removed as long as they do not create a mowing problem.

Notice of Termination (NOT)

NPDES General Stormwater Permit for Construction Activity Notice of Termination form (sample in Appendix B) must be completed by both Owners and submitted to MPCA at the end of the Plant Establishment Period.

Payment

Erosion control measures are called for in the plan and/or in the special provisions both as incidental work and with pay items based on the extent of expected need for erosion control measures.

Additional Storm Water Management Tools and Info

See Standard Plans 5-297.404, 5-297.405, 5-297.406, 5-297.407, 5-297.408 at

http://standardplans.dot.state.mn.us/stdplan.aspx

See MnDOT's Standard Specifications for Construction

1601 Source of Supply And Quality
1701 Laws To Be Observed
1710 Traffic Control Devices
1716 Contractor's Responsibility For Work
1717 Air, Land, and Water Pollution
1803 Progress Schedules
2101 Clearing and Grubbing
2105 Excavation and Embankment
2123 Equipment Rental
2511 Riprap
2571 Plant Installation and Establishment
2572 Protection and Restoration of Vegetation
2573 Storm Water Management
2574 Soil Preparation
2575 Establishing Turf and Controlling Erosion
2577 Soil Bioengineered Systems
3149 Granular Material
3601 Riprap Material
3733 Geotextiles
3874 Filter Berm
3876 Seed
3877 Topsoil Material
3878 Sod
3879 Agricultural Lime
3881 Fertilizer
3882 Mulch Material
3884 Hydraulic Erosion Control Products
3885 Rolled Erosion Control Products
3886 Silt Fence
3887 Flotation Silt Curtain
3890 Compost
3893 Sandbags
3896 Soil & Root Additives
3897 Sediment Control Logs
3898 Flocculants

Acceptance of Planting Bed and Hole Preparation

The Engineer will accept preparations of planting holes and beds, after the Contractor has successfully staked, and completed initial weed control, soil cultivation and storm water management and erosion prevention operations.

Initial planting operations include activities such as: traffic control, providing required plant stock, materials and equipment, digging planting holes, installing plants, additives, initial watering, placing mulch, protecting plants, clean up and restoration, and temporary erosion control. The Plant Installation Period (PIP) is defined in the Special Provisions.

Start of Operations

The Contractor shall not start planting operations or delivery of planting stock to the Project until the weather and soil conditions are suitable for such work and are in accordance with the dates shown in the Special Provisions and Standard Planting Detail Sheets. A MnDOT Certified Landscape Specialist must be on site to perform or directly supervise all planting operations. In addition to documentation requirements, the Contractor must obtain Engineer approval of plant stock. Work performed otherwise will be considered unauthorized work.

The Contractor shall notify the Engineer at least 3 days prior to the planned delivery date of planting stock and replacement planting stock to the Project site to allow for inspection scheduling.

The Contractor shall notify the Engineer at least 24 hours in advance of beginning and of changing plant installation operations.

The Contractor's notices must include the Project number, Engineer's name, notification date, intended operation(s), intended operation date and duration, estimated start time, and the location where work will occur. The Contractor shall provide the notifications in writing, a confirmable email, or a facsimile transmission.

Housekeeping

All excess materials, rocks, and debris must be stored in containers and disposed of off-site throughout the project.

Traffic Control

The Contractor shall follow the MnDOT 1404, the Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD), and the current Standard Signs Manual regarding all traffic control on the Project. The MN MUTCD Standard Sign Manual can be found online at

http://www.dot.state.mn.us/trafficeng/publ/mutcd/index.html

Plant Stock Documentation

Specified plant species must be furnished in the variety, grade, and size or age indicated in the plan. By submitting a proposal and accepting award of the contract in accordance with MnDOT 1205, "Examination of Proposal Package and Site of Work," the Contractor assures familiarity with the project site and contract documents, commitments from suppliers, and delivery of the plant stock and materials required to complete the contract (MnDOT 2571.2A.1).

At least 1 week prior to plant stock delivery to the project, the Contractor will provide the Engineer with the following

1) A copy of a valid nursery stock, dealer or grower certificate, registered with the Minnesota Department of Agriculture (MDA), a current nursery certificate or license from a state or provincial Department of Agriculture for each plant stock supplier, or both.

   A Contractor or Supplier operating without a current Nursery Stock Dealer or Grower's Certificate is in violation of State law and MnDOT exposes itself to liability and punitive action by permitting them to perform work.

2) An updated MnDOT Certificate of Compliance (Appendix B; page B-19)

   A document required to determine if the plant is in compliance with MnDOT Specifications. Uncertified plants will not be accepted.

   Substitutions

   The Contractor must make every reasonable effort to obtain the specified plants. If the Contractor is unable to locate plants, written documentation must be supplied to the Engineer that plants are unavailable. The Contractor must submit a list of possible substitutions for approval. The Engineer will then work with the Technical Advisor to determine if the substitution is acceptable. They may accept the substitute or request a different substitution. This retains design intent and provides fairness to unsuccessful bidders who may have added extra costs for materials that are more expensive due to limited availability. (See MnDOT 2571.2A.3)

3) Out-of-State Nursery Vendors

   If plant material is shipped from out-of-state nursery vendors that are subject to quarantines (including but not limited to emerald ash borer and gypsy moth), it must be accompanied by current documentation certifying that all plants shipped are free from regulated pests. To determine if Minnesota vendors are subject to quarantines, call the MDA Supervisor of Nursery Inspection and Export Certification at (651) 201-6388.

Upon delivery of plant stock and materials to the project, the contractor will provide the Engineer with the following:

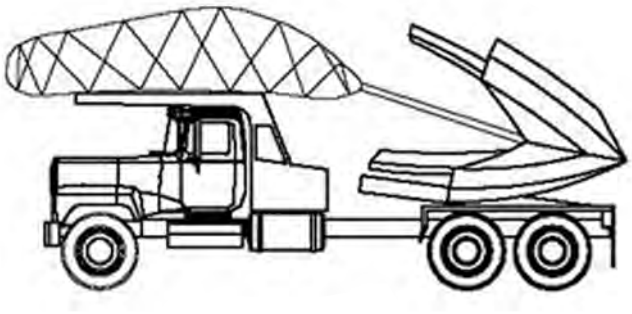
- Bills of lading or shipping documents for plant stock and landscape materials delivered to the project, and
- * An updated ***Certificate of Compliance*****,** if necessary, signed by the Contractor's authorized representative to reflect deviations from the original Certificate of Compliance documentation submitted at or before the preconstruction conference.

Plant Stock Delivery and Storage

If all the plant stock documentation is acceptable, examine the plant stock for proper storage, transport, and handling in the truck before it is unloaded. Plant stock must arrive in good condition. Although a Contractor may be capable of bringing unhealthy, undersized, poorly formed, or otherwise substandard plants into compliance by the end of the Plant Establishment Period (PEP), these plants must be rejected and removed from the Project.

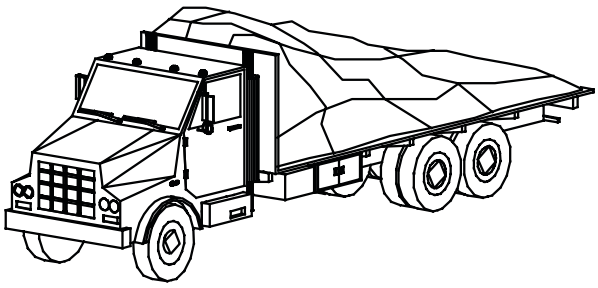
Transport/Handling

According to the Minnesota Nursery Law/ Plant Pest Act; nursery stock held, shipped, and stored for sale, until subsequently being planted, must be watered and protected so the roots are moist at all times. Plants are perishable and an acceptable plant can become unacceptable in a short time through improper care.



Protection During Transport Spade

* Plants transported in an open vehicle must have protective covering over them. Larger trees; balled and burlapped or machine moved, that have broken dormancy must be wrapped to prevent foliage from drying out.
* Plants transported in closed vehicles must have adequate ventilation and/or refrigeration to prevent overheating damage or sweating, which prematurely breaks dormancy.
* Deciduous plants must arrive in a dormant condition unless specified otherwise in the plan. (Example – If extended planting season is approved, container grown or balled and burlapped plants, which have broken dormancy, may be planted).



Protection During Transport

To determine if the bare root material was protected against drying out during transport and storage, feel the roots and scrape some with a fingernail to ensure that the woody tissue is pliable and whitish colored, rather than dried out and dark colored. Roots must be kept moist to remain viable and healthy. Keep the roots covered with a suitable moisture holding material (moist mulch, straw, soil, etc.), or refrigerated (34° to 38° F) and humidified (90-95% relative humidity).

Sweating of Nursery Stock

Some bare root trees or shrubs must be “sweated” prior to spring installation in order to break dormancy. These species must be forced into breaking bud before they are planted, or they will remain dormant in the ground, and eventually die. Sweating involves creating a greenhouse-like atmosphere of humidity and temperature to speed up the bud breaking process. If buds have begun to swell upon arrival, plant dormancy is broken and further sweating is not required. The following bare root plants require “sweating” before planting:

Barberry	Kentucky Coffeetree	Hawthorn
Beech	Amur Corktree	Ironwood
Birch	Hackberry	Oak

Plant Stock Inspection

If transport and handling of plant stock are acceptable, inspect plants for compliance and acceptance either in the delivery truck or as they are unloaded. Accept only plants specified in the plan or pre-approved substitutions that meet the health and vigor criteria for acceptance.

Plant stock type and form are specified for each landscape project in two locations in the plan (see Appendix H):

1. Estimated Quantity Sheet specifies the Pay Item, Plant Type and Size, Unit, and Pay Item Quantity.
2. Plant Stock Tabulation Sheet specifies the Key name, Species name (Scientific and Common), Size, Type, Required minimum size, individual plant type quantities and spacing.

Acceptance requirements for each plant stock type and form are described in this Manual beginning on page 4-4 and continuing through page 4-38.

Plant Stock Labels

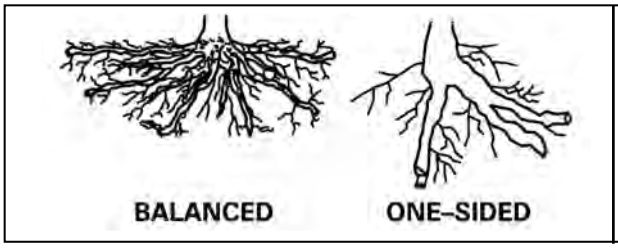
Reject plant stock without identification labels on all individually shipped plants and on all bundles, bales, flats, or boxes of plants. Plants are labeled by either a common or botanical name (or sometimes both), size, and quantity contained in the bale, flat, box, etc.

Identification Label

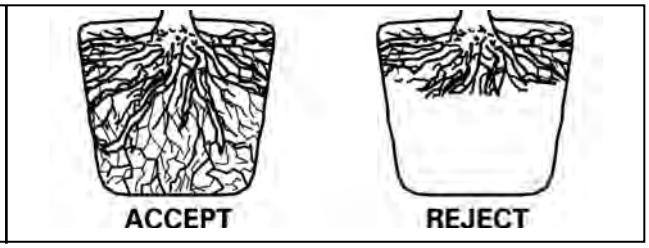
Inspecting Roots

Healthy plants begin with healthy roots.
A combination of woody and fibrous roots throughout a well-balanced root structure is necessary for proper water and nutrient uptake. A balanced root system spreads out and uniformly anchors the plant in an upright position. In the nursery, plant stock should receive consistent care and be periodically transplanted or root pruned to promote healthy and absorbing roots. The proper root depth is when the first order root is at or slightly above the soil line.

* Reject plants with undersized, insufficient, unbalanced, damaged, or improperly stored, transported or handled root systems. Dysfunctional root systems result in plants that are prone to being tipped or blown over and have restricted uptake of moisture and nutrients.
* Reject plants with encircling roots that cannot be properly repositioned during installation. Stem encircling roots over time may result in stem-girdling roots that cause lack of vigor, uneven growth, failure during high winds or decline as nutrient uptake is cut off.

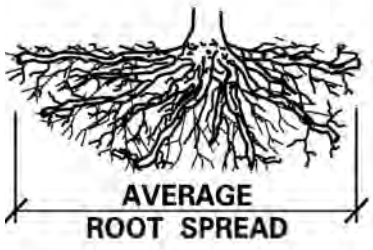
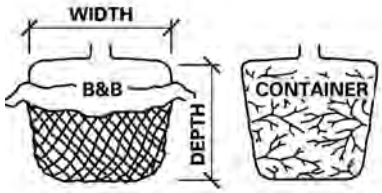
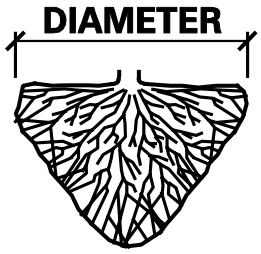


Balanced and One-Sided Roots



Accept and Reject Roots

Plants for MnDOT landscape projects are specified in one of four root systems that have the following specific acceptance criteria:

Root Measurement		
Root Type	**Measurement**	**Image**
Bare Root	Average root spread (in inches)	
Container B&B	Width and depth of ball or container (in inches)	
Machine Moved	Spade diameter (in inches)	

Bare Root (BR)

Bare root plants have been dug while dormant and the soil has been removed from the roots. They are stored in cold storage at high humidity and can only be planted during the spring and fall dormancy periods. Bare root plants should have tight buds and no leaves prior to planting.

Fall planting is not allowed for the bare root form of the species listed below. However, if the Contractor requests conditional authorization from the Engineer to install the bare root form of these species during the Fall Installation Period, it will be at the Contractor's risk and establishment period will not begin until the following spring, after proof of survival and replacement of dead stock.

Birch	Poplar	Oak	Honeylocust	Crabapple	Maple
Mountain Ash	Hackberry	Russian Olive	Willow	Ironwood	Linden
Plum/Cherry	Dogwood	Hawthorn	Sumac		

Visually compare bare root stock to the following root form categories:

* The photographs represent acceptable root systems for the species and root form.
* The minimum acceptance standard will be 25% less root mass than the photographs.

Non-Fibrous Fine

More than 10% fibrous roots. Primary woody roots are small and numerous. Plants with Non-Fibrous Fine rooting include:

Hawthorn	Honeysuckle	Black Locust	Mugo Pine
Boston Ivy	Serviceberry	Buffaloberry	Quaking Aspen
Catalpa	Redmond Linden	Crabapple	Roses
Elder	Russian Olive	Elm	Plum
Swamp White Oak			

Non-Fibrous Coarse

Less than 10% fibrous roots. Primary woody roots are larger and less numerous than Non-Fibrous Fine.

Plants with Non-Fibrous Coarse rooting include:

American Linden	Bur Oak	Chokecherry	Fir
Kentucky Coffeetree	Ginkgo	Pine	Sumac
Red Oak	Poplar (hybrids)		

Fibrous Fine

More than 50% fibrous roots. Primary woody roots are small and numerous, with a mop-like appearance.

Plants with Fibrous Fine rooting include:

Birch	Euonymus	Grape Vine	Hydrangea	Mockorange
Potentilla	Spirea	Viburnum	Weigela	Yew
Bittersweet (vine)				

Fibrous Coarse

More than 10% fibrous roots. Primary woody roots are larger and less numerous than the Fibrous Fine form.

Plants with Fibrous Coarse rooting include:

Amur maple	Arborvitae	Ash
Cherry	Currant	Cotoneaster
Dogwood	Honeysuckle	Englemann Ivy
Hackberry	Hazelnut	Honeylocust
Juniper	Larch	Lilac
Maple	Ninebark	Peashrub
Pin Oak	Snowberry	Spruce
Willow	Woodbine	Dwarf-bush Honeysuckle

Balled and Burlapped (B&B) and Container Grown

B&B plants are dug with soil remaining around the roots and the soil ball wrapped with burlap and usually a wire basket.

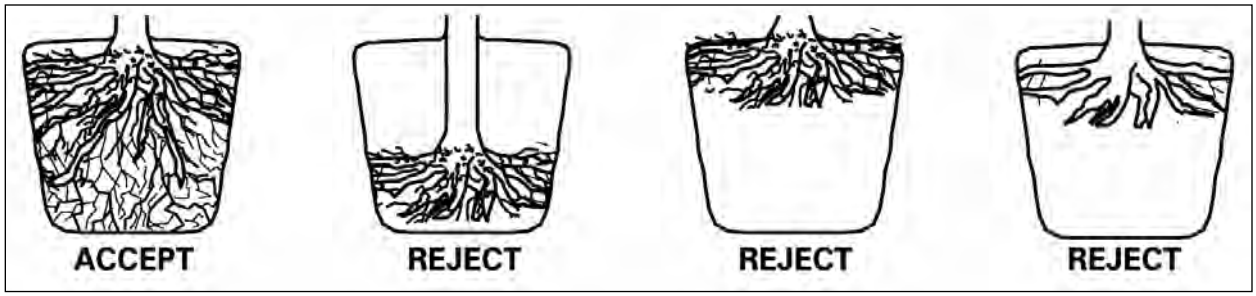
Containerized plants have been grown, for a period prior to sale, in a container.

* Reject plants with root flairs more than 4 inches below the soil line. Plants that are too deep in the ball or container may be deprived of adequate oxygen. MnDOT 2571.3E.2 allow acceptance of B&B and containerized plants with less than 4 inches of soil over the root flare only if the excess soil can be removed and all other plant and installation requirements are met.

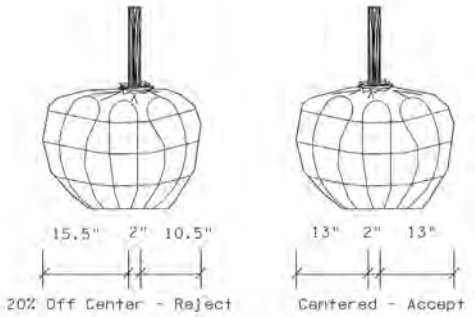
Container Grown

Balled and Burlapped

Accept & Reject



When acceptance of B&B or Container material is in question, MnDOT may open soil balls or remove the container to inspect for root condition, size, balance, and trunk location within the ball. Reasons to open a ball include poor roots, lack of a root flare, roots on top of the ball or out of the container, or old decaying burlap. This inspection can take place in conjunction with the competency test, adjacent to a prepared planting hole so that if the plant does meet requirements, and is still intact, it can be planted.



Root Ball Inspection

Root ball inspection shall verify that:

* The root flare is at the soil line or no more than 4 inches below the top of the soil line if the excess soil can be removed without damaging the plant.
* Roots extend no more than 4 inches beyond the burlap or container.

* Numerous larger diameter root stubs are not present.
* Roots fill the soil ball.
* The plant is no more than 10% off center in the soil ball, unless the ball is oversized allowing a centered plant within the minimum radius spread for the root types specified.
* At the time of installation, vertically slice through any remaining treated burlap at 6 inch intervals around the ball in a manner that does not damage the roots.
* Containerized plants are not “potted”. Potted plants have not been grown in the container long enough to produce adequate new fibrous root growth to hold the soil ball intact when removed from container.
* Soil balls are not broken or loose . Test by pulling on the stem or crown of the ball. If the stem or crown moves and the ball does not, the ball is broken. A broken soil ball indicates torn fine woody and fibrous absorbing roots which are necessary for proper water and nutrient uptake.
* All plants are handled by the soil ball, not by the branches or trunk to avoid damaging the root ball and trunk.
* Paper-fiber pots are slit vertically at six equidistant locations around the circumference and the top is removed to no less than 1 inch below the soil line at the time of installation.

Machine Moved (MM)

Machine Moved trees are those that have been dug, transported, and transplanted with a hydraulic tree spade. MnDOT will specify machine moved transplanting to allow installation of large or salvaged trees and shrubs.

Machine Moved

The minimum spade size requirement for machine moved transplants varies according to the plant size and species.

Minimum Spade Size (Diameter)	Deciduous Trees (Caliper)	Oak Trees (Caliper)	Conifer Trees (Height)
42”	2”-3”	1”-1½ ”	5’-7’
60”	3”-4”	1½”-2½ ”	7’-9’
78”	4”-6”	2½”-3½ ”	9’-14’
85”	6”-8”	3½”-5 ”	14’-18’

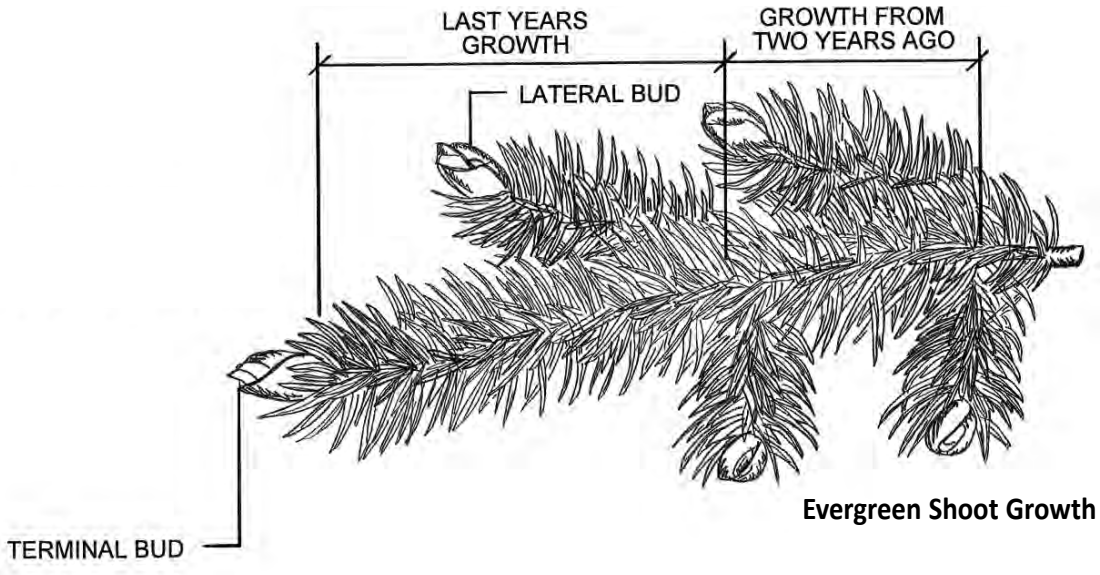
Inspecting Top Growth

Shoots

Deciduous trees have bud scale scars marking nodes created by the terminal bud. Conifers develop them also and they are located at twig or branch whorls. Typically, in northern climates, spaces between (internode) each bud scale scar or branch whorl (node) indicates one year’s growth.

In a year under moisture and temperature conditions which are very favorable for growth, plants which have a tendency to exhibit “free growth” (paper birch, poplar, apple, woodbine ivy, ginkgo, several types of maple & larch) may put on more than one flush of new shoot growth.

* Expect at least 4 inches of shoot growth for plants that have received good nursery care. For fast growing trees such as poplar, you may see 8-inches or more of growth.
* Short spaces between nodes (bud scale scars/ whorls) indicate years when the plant was stressed. Short or stunted needles or smaller leaves also indicate stress.
* Reject plants with shoots that are limp or wilted.



Evergreen Shoot Growth

Buds

Check bud vitality on deciduous trees by splitting open one or two buds. Look for green tissue, which are the unopened leaves and/or flowers.

* Reject plants with shriveled, dried out, or dead buds. Dead buds may fall off when touched, brushed, or split.
* Reject plants with new buds or candles that are limp or wilted.

Most healthy buds are plump. **EXCEPTIONS** -do not expect plump buds on hackberry, willow, or some of the smaller shrubs like spirea or potentilla. Kentucky coffeetree, and honeylocust buds are depressed or hidden in the twig and are not visible.

Spruce Candling Growth

Conifers should have tight buds and should not be candling (sending out new growth) prior to digging. Plants dug while candling or leafing-out are put under stress and the reduced root system that is dug and transplanted may not be able to support the new growth that began to elongate before digging.

Wounds

Examine the trunk, stem, and branches for wounds or bruises. These can provide an avenue for diseases and insects to enter and may increase the chance of sunscald and frost crack formation. Wounds are identified by discoloration or scraping of the bark.

Trees are sometimes delivered with a protective sleeve of cardboard or plastic around the trunk and with the branches tied together. The sleeves and tied branches limit wounds to the trunk and branches during transport but they can also hide existing wounds. Remove the sleeves prior to inspection, acceptance and planting. Sleeves must be removed with a method that does not injure the tree.

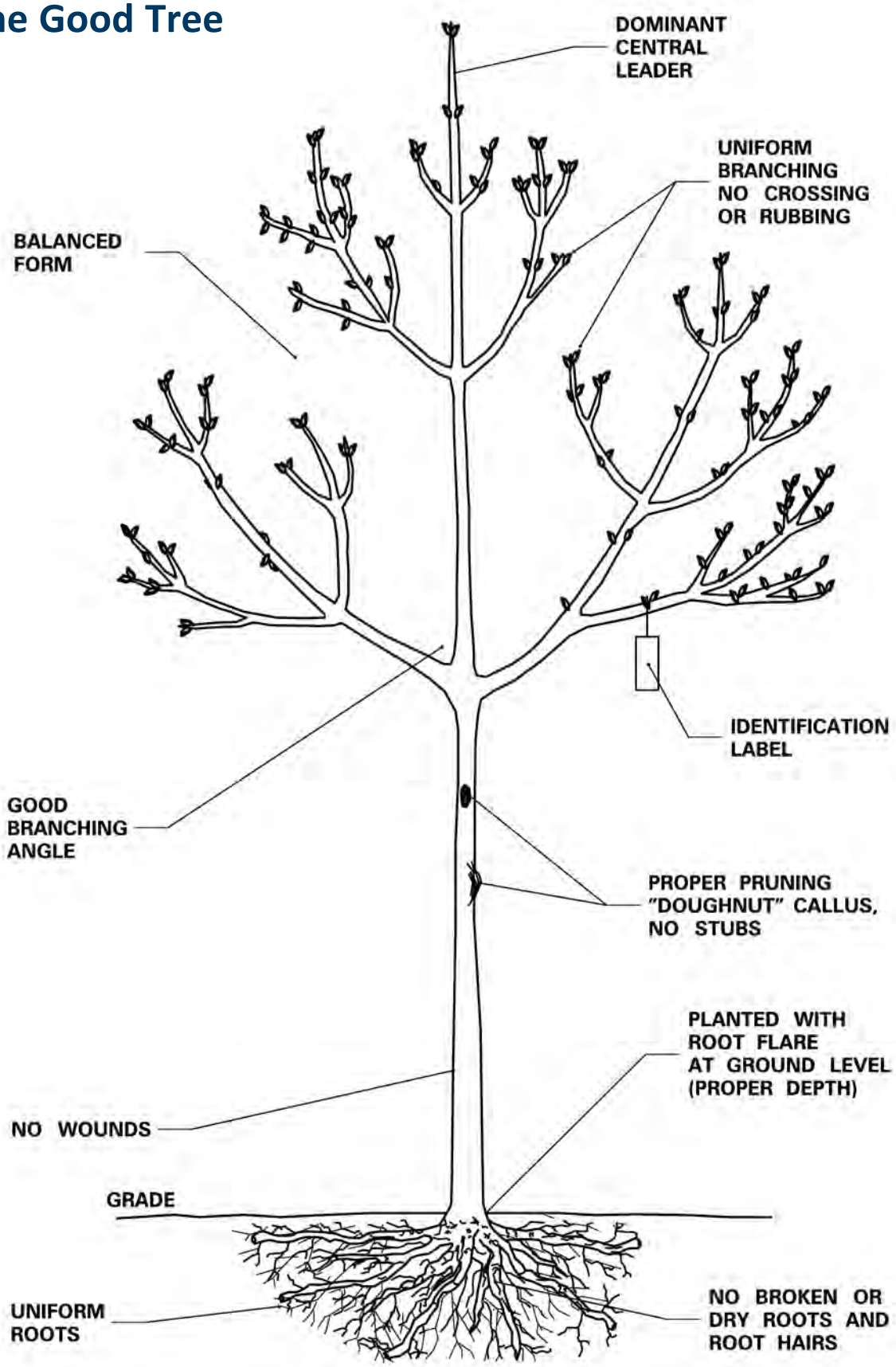
* Reject plants with cankers; localized sunken, raised and discolored dead areas. Cankers usually form around a dead bud, branch, stub, or a stem wound.
* Reject plants with frost cracks. Frost cracks are vertical cracks in the bark which occur in winter.
* Reject plants with cracks or wounds caused by weed whips or mowers in the nursery.
* Reject plants wounded through the outer bark during installation unless pruning (Shigo method) can remedy the problem.

Cankers

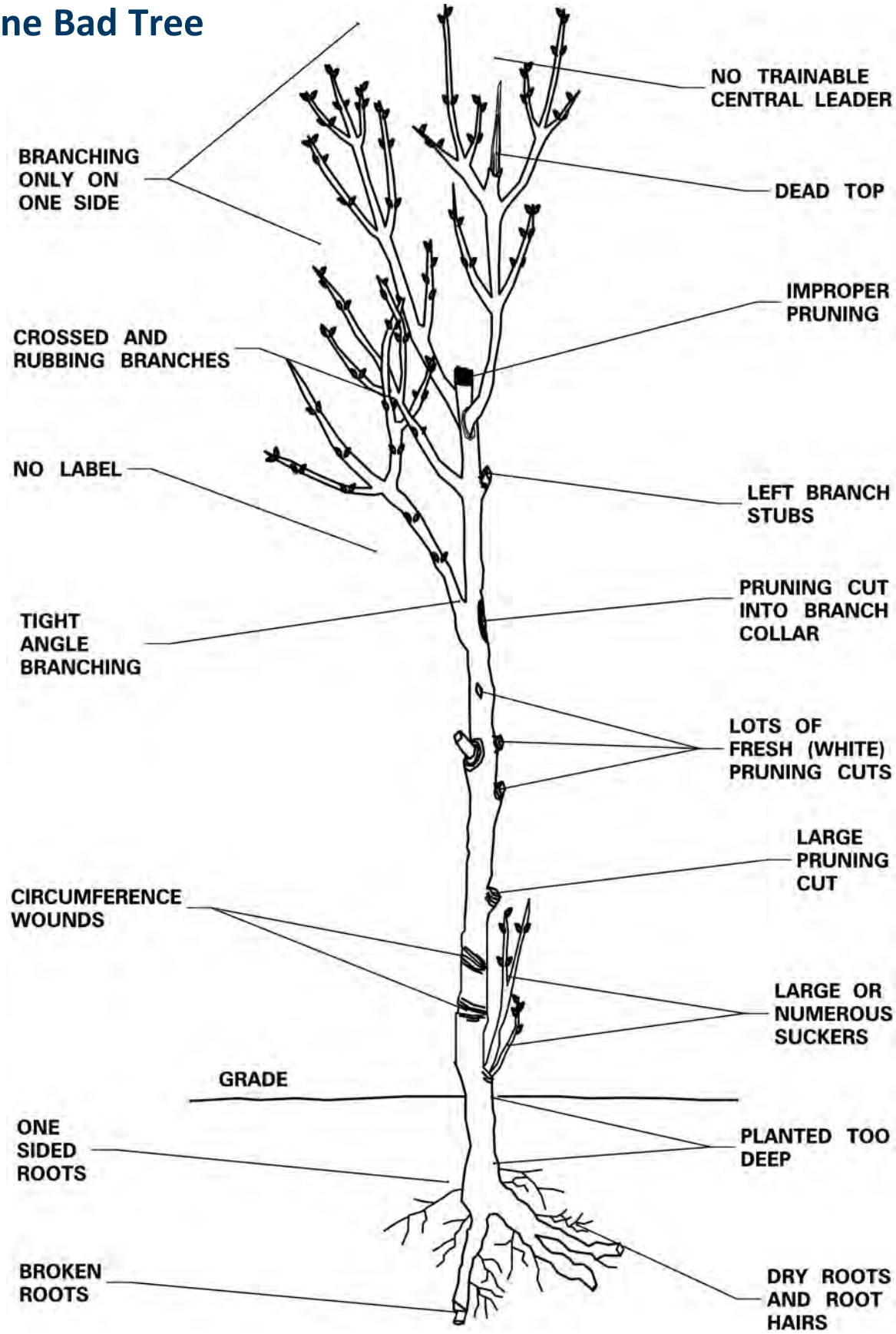
Wound

Frost Cracks

One Good Tree

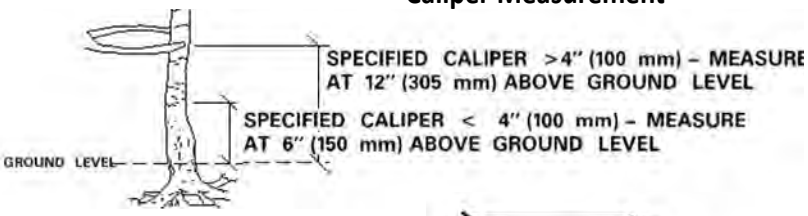


One Bad Tree


NO TRAINABLE CENTRAL LEADER
BRANCHING ONLY ON ONE SIDE
DEAD TOP
IMPROPER PRUNING
CROSSED AND RUBBING BRANCHES
NO LABEL
LEFT BRANCH STUBS
PRUNING CUT INTO BRANCH COLLAR
TIGHT ANGLE BRANCHING
LOTS OF FRESH (WHITE) PRUNING CUTS
LARGE PRUNING CUT
CIRCUMFERENCE WOUNDS
LARGE OR NUMEROUS SUCKERS
GRADE
ONE SIDED ROOTS
PLANTED TOO DEEP
BROKEN ROOTS
DRY ROOTS AND ROOT HAIRS

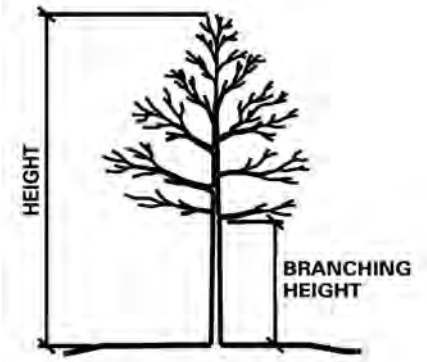
Deciduous Tree Measurement

Caliper Measurement



Top Growth

* For trees up to 8 feet in height, measure from root flare to the central leader tip.
* For trees greater than 8 feet in height, measure caliper. The Contractor shall have at least one tree caliper available on the project at all times.



Deciduous Tree Type 1 & 2

What to reject

* Top growth that is not in balance with root system (See following tables).
* Plants that do not meet minimum plant size criteria.

Deciduous Tree – Type 1 & 2 Large Shade Trees

Branching height shall not be less than 1/3 or more than 1/2 of the height of the tree, unless otherwise specified in the plan.

Trees shall be rejected if a central leader is absent or damaged; or if a central leader cannot be trained after cutting back competing multiple leaders.

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
2'-3' Height	2+ Branches
4'-5' Height	3+ Branches
6'-7' Height	4+ Branches
8' Height	5+ Branches
3/4" – 1 1/4" Caliper	6+ Branches
1 1/2" – 1 3/4" Caliper	7+ Branches
2" – 2 1/2" Caliper	8+ Branches
3" – 3 1/2" Caliper	9+ Branches
4" or greater Caliper	10+ Branches

Minimum Branching Requirements (First Order Branches)

Note: The following species have sparse branching. They may be accepted if they do not meet the minimum first order branching requirements only if they meet all other plant stock acceptance requirements:

Kentucky Coffeetree Black Walnut Ohio Buckeye Amur Corktree Honeylocust Catalpa

Type 1 Tree Examples (Large Shade Trees)			
Common Name / Varieties		**Botanical Names**	
Freeman maple Norway maple Silver maple Sugar maple		Acer	*freemanii* 'Celebration' *platanoides* – all *rubrum* – all *saccharinum* *saccharum* - all
Paper birch Cut leaf weeping birch River birch Whitespire birch		Betula	*papyrifera* *pendula* 'Dalecarlica' *nigra* *platyphylla* 'Whitespire'
Ginkgo		Ginkgo	*biloba* *biloba* 'Autumn Gold'
Honeylocust	Imperial Shademaster Skyline Sunburst	Gleditsia	triacanthos inermis – all varieties
Black walnut		Juglans	nigra
Amur corktree		Phellondendron	amurense
Poplars		Populus	Spp. – all varieties
Bur oak Pin oak Northern pin oak Red oak Swamp white oak		Quercus	macrocarpa palustris ellipsoidalis rubra bicolor
Black locust	Purple Robe	Robinia	*pseudoacacia* 'Purple robe'
White willow	Golden or Niobe Weeping Prairie Cascade	Salix	*alba* 'Tristis' *pentandra* 'Prairie Cascade'
American basswood or linden	All varieties Redmond	Tilia	*americana* – all varieties *americana 'Redmond'*
Elm	All varieties	Ulmus	Spp. - all varieties

Type 2 Tree Examples (Slower Growing Large Shade Trees)			
Common Name / Varieties		**Botanical Names**	
Ohio Buckeye		Aesculus	glabra
Northern Catalpa		Catalpa	speciosa
Hackberry		Celtis	occidentalis
Kentucky Coffeetree		Gymnocladus	dioicus
White Oak		Quercus	alba
Laurel (Bay Leaf) Willow		Salix	pentandra
European mountain ash Showy mountain ash		Sorbus	aucuparia decora
Littleleaf Linden	Greenspire	Tilia	cordata 'Greenspire'

Deciduous Tree – Type 1 & 2 Multi-Stem Large Shade Tree

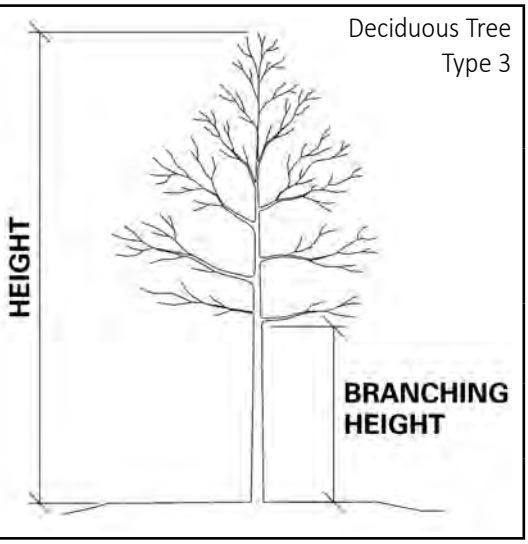
Multi-stem trees are not acceptable unless specified in the plan. Minimum number of stems will be specified in the plan. The central main stem shall have branching that meets the minimum criteria for Types 1 & 2 Deciduous Trees.

Deciduous Tree – Type 3 Small Upright Tree

Minimum branching height shall not be less than 1/3 or more than 1/2 of the tree height.

Minimum Branching Requirements (first order branches)

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
2' Height	3+ Branches
3' Height	4+ Branches
4' Height	5+ Branches
5' Height	6+ Branches
¾" Caliper or More	7+ Branches



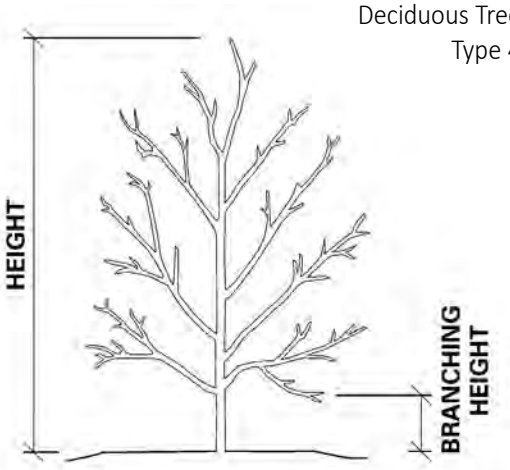
Type 3 Tree Examples (Small Upright Trees)			
Common Name / Varieties		**Botanical Names**	
Amur maple		*Acer*	*ginnala*
Serviceberry	All varieties	*Amelanchier*	Spp.
Pagoda dogwood		*Cornus*	*alternifolia*
Hawthorn	All varieties	*Crateagus*	Spp.
Crabapple	All varieties	*Malus*	Spp.
Eastern redbud		*Cercis*	*canadensis*
Russian olive		*Elaeagnus*	*angustifolia*
Magnolia	Merrill	*Magnolia*	*x loebneri* 'Merrill'
Ironwood		*Oystrya*	*virginiana*
Cherry/plum	All varieties	*Prunus*	Spp.
Japanese tree lilac	Ivory Silk	*Syringa*	*reticulata* 'Ivory Silk'

Deciduous Tree – Type 4 Small Spreading Tree

Minimum Branching Requirements (First Order Branches)

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
2' Height	4+ Branches
3' Height	5+ Branches
4' Height	7+ Branches
5' Height	8+ Branches
¾" Caliper or More	8+ Branches

Deciduous Tree
Type 4



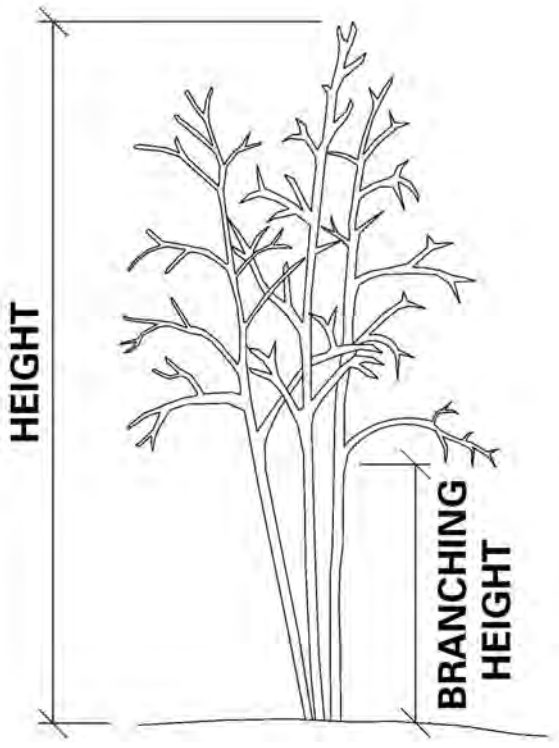
Type 4 Tree Examples (Small Spreading Trees)			
Common Name / Varieties		**Botanical Names**	
Amur maple		*Acer*	*ginnala*
Serviceberry	All varieties	*Amelanchier*	*Spp.*
Pagoda dogwood		*Cornus*	*alternifolia*
Hawthorn	All varieties	*Crateagus*	Spp.
Russian olive		*Elaeagnus*	*angustifolia*
Magnolia	All varieties	*Magnolia*	Spp.
Cherry/plum	All varieties	*Prunus*	Spp.
Japanese tree lilac	'Ivory Silk'	*Syringa*	*reticulata* 'Ivory Silk'

Deciduous Tree – Type 3 & 4 Multi-Stem Small Spreading Trees & Small Upright

Multi-stem trees are not acceptable unless specified in the plan. If multi-stem trees are specified, the acceptable minimum number of stems will be stated.

The central main stem shall have branching height and branching requirements that meet the minimum criteria for single stem Type 3 Deciduous trees.

Multi-Stem Trees



Criteria For Accepting Plant Size – Deciduous Trees					
Specified Size and Root Type	**Initial, Replacement, or Final* Acceptance Minimum**				
	Height	**Caliper**	**Root Spread or Width**	**Root Length/ Depth**	**Container Size**
6” Ht. Seedling BR	4.5”	1/16”		8”	
12” Ht. Seedling BR	9”	1/8”		10”	
18” Ht. Seedling BR	15”	3/16”		10”	
2’ Ht. Seedling BR	21”	1/4”		12”	
2.5’ Ht. Seedling BR	27”	5/16”		12”	
3’ Ht. Seedling BR	33”		14”		
4’ Ht. Seedling BR	3.5’		14”		
5’ Ht. Seedling BR	4.5’		16”		
6’ Ht. Seedling BR	5.5’		18”		
7’ Ht. Seedling BR	6.5’		20”		
8’ Ht. BR	7.5’		22”		
.75” Cal. BR	4’	0.60”	16”		
1” Cal. BR	5.5’	0.85”	18”		
1.25” Cal. BR	5.5’	1.10”	20”		
1.5” Cal. BR	5.5’	1.35”	22”		
1.75” Cal. BR	6.5’	1.60”	24”		
2” Cal. BR	8’	1.85”	28”		
6” Ht. Seedling Cont.	4.5”	1/16”			No. 1
12” Ht. Seedling Cont.	9”	1/16”			No. 2
18” Ht. Cont. Seedling	15”				No. 2
2’ Ht. Seedling Cont.	21”	1/16”			No. 3
2.5’ Ht. Seedling Cont.	27”	1/16”			No. 3
3’ Ht. Cont.	33”	1/16”			No. 7
4’ Ht. Cont.	3.5’	1/16”			No. 7
5’ Ht. Cont.	4.5’	1/16”			No. 10
6’ Ht. Cont.	5.5’				No. 15
7’ Ht. Cont.	6.5’				No. 20

* For final acceptance, measure top growth only.

Criteria For Accepting Plant Size – Deciduous Trees - Continued					
Specified Size and Root Type	Initial, Replacement, or Final* Acceptance Minimum				
	Height	Caliper	Root Spread or width	Root Length/ Depth	Container Size
8’ Ht. Cont.	7.5’				No. 20
.75” Cal. Cont.	4’	0.60”			No. 15
1” Cal. Cont.	5.5’	0.85”			No. 15
1.25” Cal. Cont.	5.5’	1.10”			No. 20
1.5” Cal. Cont.	6.5’	1.35”			No. 20
1.75” Cal. Cont.	6.5’	1.60”			No. 20
2” Cal. Cont.	8’	1.85”			No. 25
4’ Ht. B&B	3.5’		16”	12”	
5’ Ht. B&B	4.5’		18”	13.5”	
6’ Ht. B&B	5.5’		20”	13.5”	
7’ Ht. B&B	6.5’		22”	14.5”	
8’ Ht. B&B	7.5’		24”	16”	
10’ Ht. B&B	9’		28”	18.5”	
12’ Ht. B&B	11’		32”	19.5”	
.75” Cal. B&B	4’	0.60”	14”	10.5”	
1” Cal. B&B	5.5’	0.85”	16”	12”	
1.25” Cal. B&B	5.5’	1.10”	18”	13.5”	
1.5” Cal. B&B	6.5’	1.35”	20”	13.5”	
1.75” Cal. B&B	6.5’	1.60”	22”	14.5”	
2” Cal. B&B	8’	1.85”	24”	16”	
2.5” Cal. B&B	8’	2.25”	28”	18.5”	
3” Cal. B&B	9.5’	2.75”	32”	19.5”	
3.5” Cal. B&B	9.5’	3.25”	38”	22.5”	
4” Cal. B&B	10.5’	3.75”	42”	25.5”	
4.5” Cal. B&B	10.5’	4.25”	48”	29”	
5” Cal. B&B	12’	4.75”	54”	32.5”	
5.5” Cal. B&B	12’	5.25”	57”	34.5”	
6” Cal. B&B	12’	5.75”	60”	36”	

* For final acceptance, measure top growth only.

Deciduous Shrubs Measurement

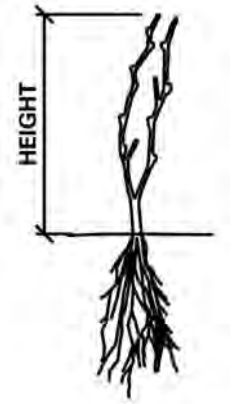
Top Growth Measurement

* By the average spread
* By the average height from the root flare to the top of the canes

Deciduous Shrub – Type 0 TENDER Shrubs- Plants have a tendency not to produce top growth that is fully winter hardy.

It is accepted practice to prune the top growth of these shrubs back to live wood prior to measuring for criteria compliance.

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
12” Height	3 canes
15” Height	3 canes
18” Height	4 canes
2” Height	4 canes



Deciduous Shrub Type 0 Measurement

Type 0 Deciduous Shrub Examples (Immature Top Growth Shrubs)			
Common Name / Varieties		**Botanical Name**	
Hydrangea	‘Annabelle’, ‘Grandiflora’	*Hydrangea*	*arborescens*
Hydrangea	‘Endless Summer’	*Hydrangea*	*macrophylla*

Deciduous Shrub – Type 1 Small or Dwarf Shrubs - Typical maximum height 3 feet

It is accepted to prune the top growth of these shrubs back to live wood prior to measuring for criteria compliance.

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
12” Height	4 canes
15” Height	4 canes
18” Height	5 canes
2’ Height	5 canes
30” Height	6 canes

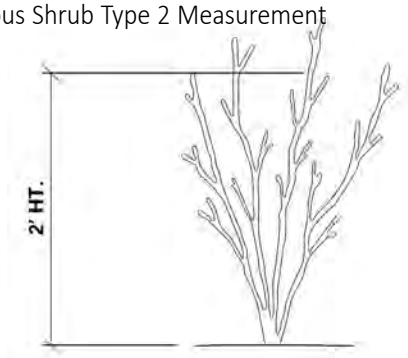
Type 1 Deciduous Shrub Examples (Small or Dwarf Shrubs)			
Common Name / Varieties		**Botanical Name**	
Barberry	Crimson Pygmy	*Berberis*	*thunbergii* 'crimson pygmy'
Alpine Currant		*Ribes*	*alpinum*
Potentilla	All Varieties	*Potentilla*	Spp.
Spirea	All Varieties	*Spiraea*	Spp.
Fragrant sumac	Gro-Low	*Rhus*	*aromatica* 'Gro-Low'

Deciduous Shrub – Type 2 (Intermediate Shrubs)- Plants that typically mature at a height or spread of 3 to 7 feet.

It is accepted practice to prune the top growth of these shrubs back to live wood prior to measuring for criteria compliance.

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
18" Height	4 canes
2' Height	4 canes
3' Height	5 canes
4' Height	5 canes

Deciduous Shrub Type 2 Measurement



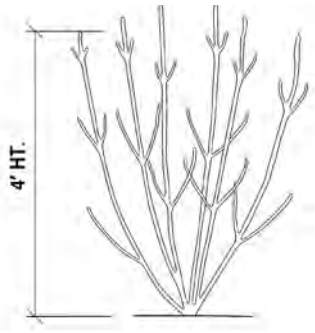
Type 2 Deciduous Shrub Examples (Intermediate Shrubs)			
Common Name / Varieties		**Botanical Name**	
Buffaloberry	All Varieties	*Shepherdia*	Spp.
Azalea	All Varieties	*Rhododendron*	X 'golden lights', X 'orchid lights', X 'rosy lights'
Glossy Black Chokeberry		*Aronia*	melanocarpa
Alpine Current		*Ribes*	alpinum
Dogwood	All varieties	*Cornus*	Spp.
Serviceberry	Regent	*Amelanchier*	*alnifola* 'Regent'
Ninebark	All varieties	*Physocarpus*	*opulifolius* – all varieties
Spiraea	Vanhoutte	*Spiraea*	*X vanhouttei*

Deciduous Shrub – Type 3 Coarse Branched (Large or Tall Shrubs)- Plants that grow to a mature height exceeding 7 feet.

It is accepted practice to prune the top growth of these shrubs back to live wood prior to measuring for compliance.

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
18" Height	4 canes
2' Height	5 canes
3' Height	5 canes
4' Height	6 canes

Deciduous Shrub Type 3 Measurement



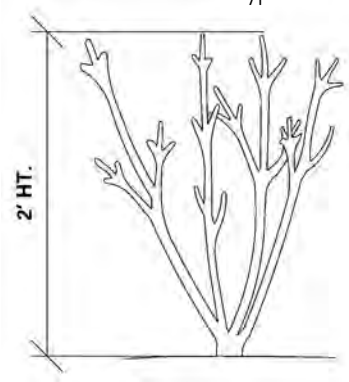
Type 3 Deciduous Shrub Examples (Coarse Branched Large or Tall Shrubs)			
Common Name / Varieties		**Botanical Name**	
Cherry	Canada red	*Prunus*	*virginiana* 'Canada Red'
Cotoneaster	Hedge	*Cotoneaster*	All Varieties
American Elder		*Sambucus*	*canadensis*
Winged Euonymus		*Euonymus*	*alatus*
American Hazelnut		*Corylus*	*americana*
Honeysuckle	All varieties	*Lonicera*	Spp.
Lilac	Chinese Dwarf Korean 'Palibin' James MacFarlane Miss Kim	*Syringa*	*chinensis* – all varieties, *meyeri* 'Palibin' *x prestoniae* 'James Mcfarlane' *patula* 'Miss Kim'
Amur Maple	compact	*Acer*	*ginnala 'Bailey Compact'*
Nimebark		*Physocarpus*	*opulifolius*
False spirea	Ash Leaf	*Sorbaria*	*sorbifolia*
Fragrant Sumac		Rhus	`aromatica
Nannyberry Viburnum		Viburnum	lentago
Old Fashioned Weigela		Weigela	florida

Deciduous Shrub – Type 4 (Fine to Medium Branched Large or Tall Shrubs)

It is accepted practice to prune the top growth of these shrubs back to live wood prior to measuring for compliance.

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
18" Height	3 canes
2' Height	4 canes
3' Height	5 canes
4' Height	6 canes

Deciduous Shrub Type 4 Measurement

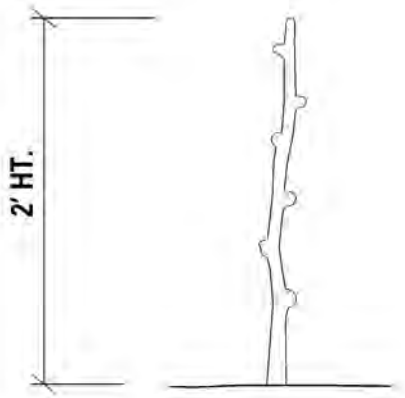


Type 4 Deciduous Shrub Examples (Fine to Medium Branched Large or Tall Shrubs)			
Common Name / Varieties		**Botanical Name**	
Downy Arrowwood	-	Viburnum	rafinesquianum
Buffaloberry	All varieties	Shepherdia	Spp.
American Cranberrybush		Viburnum	trilobum
Gray Dogwood		Cornus	racemosa
Red Berried Elder		Sambucus	racemosa
Lilac	Common Purple Common White Donald Wyman Pocahontas	Syringa	vulgaris vulgaris – All varieties x prestoniae 'Donald Wyman' x hyacynthiflora 'Pocahontas'
False Spiraea	Ash Leaf	Sorbaria	sorbifolia
Bridal Wreath Spiraea		Spiraea	prunifolia
Fragrant Sumac		Rhus	aromatia
Willow	Flame	Salix	Spp. 'flame' *caprea* 'flame'

Deciduous Shrub – Type 5 (Single Cane Shrubs)

Size	Minimum Criteria for Initial, Replacement, or Final Acceptance
18” Height	1 cane
2’ Height	1 cane
3’ Height	1 cane
4’ Height	1 cane

Deciduous Shrub Type 5 Measurement



Type 5 Deciduous Shrub Examples (Single Cane Shrubs)			
Common Name / Varieties		Botanical Name	
Sumac	Smooth Staghorn	*Rhus*	*glabra* – All Varieties *typhina* – All Varieties

Criteria For Accepting Plant Size – Deciduous Shrubs					
Specified Size and Root Type Height	Initial, Replacement, or Final* Acceptance Minimum				
	Height	Caliper	Root Spread or width	Root Length/ Depth	Container Size
6” Ht. Seedling	4.5”	1/16”		8”	
12” Ht. Seedling	9”	1/8”		10”	
18” Ht. Seedling	15”	3/16”		10”	
2’ Ht. Seedling	21”	1/4”		12”	
12” Ht. BR	10.5”		8”		
15” Ht. BR	13.5”		9”		
18” Ht. BR	16.5”		10”		
2’ Ht. BR	21”		11”		
2.5’ Ht. BR	27”		12”		
3’ Ht. BR	33”		14”		
4’ Ht. BR	3.5’		16”		
5’ Ht. BR	4.5’		18”		
12” Ht. Cont.	10.5”				No. 2
15” Ht. Cont.	13.5”				No. 3
18” Ht. Cont.	16.5”				No. 3
2’ Ht. Cont.	21”				No. 5
2.5’ Ht. Cont.	27”				No. 5
3’ Ht. Cont.	33”				No. 5
4’ Ht. Cont.	3.5’				No. 7
5’ Ht. Cont’	4.5’				No. 7
12” Ht. B&B	10.5”		8”	6”	
15” Ht. B&B	13.5”		9”	6.5”	
18” Ht. B&B	16.5”		9”	6.5”	
2’ Ht. B&B	21”		10”	7.5”	
2.5’ Ht. B&B	27”		12”	9”	
3’ Ht. B&B	33”		12”	9”	
4’ Ht. B&B	3.5’		14”	10.5”	
5’ Ht. B&B	4.5’		16”	12”	

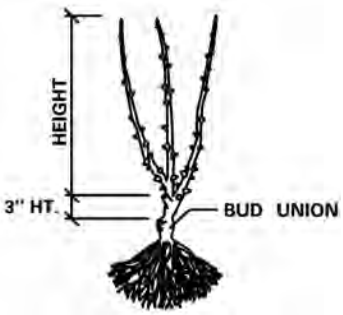
* For final acceptance, measure top growth only.

Rose Grade

All rose grades must have canes ¼ inch or larger in caliper branched not higher that 3 inches from the bud union.* For final acceptance, measure top growth only.

Criteria For Accepting Plant Size – Deciduous Shrubs				
Specified Size and Root Type	Initial, Replacement, or Final* Acceptance Minimum			
	No. of Canes	Height	Root Spread	Container Size
16" Ht. Grade 1 BR	3	16"	11"	
15" Ht. Grade 1.5 BR	2	15"	10"	
12" Ht. Grade 2 BR	2	12"	9"	
16" Ht. Grade 1 Cont.	3	16"		No. 2
15" Ht. Grade 1.5 Cont.	2	15"		No. 1
12" Ht. Grade 2 Cont.	2	12"		No. 1

Deciduous Shrub Rose Measurement



* For final acceptance, measure top growth only.

Coniferous Trees Measurement

Top Growth

* Measure all coniferous trees, except cedar, from the root flare to the midpoint of the top unbranched terminal leader.
* Measure cedar from root flare to the top of the plant.
* The spread is the average spread of all branches.
* Although acceptable, lightly pruned conifer trees have had their growth impeded which may result in a larger trunk caliper than normal for its height.

Root

Accept only

* The minimum root ball size for previously sheared or de-budded coniferous trees will be subject to the minimum trunk caliper to root ball size relationship for deciduous trees as described in "Criteria for Accepting Plant Size – Deciduous Trees" previously in this chapter.

Reject if

* Width is less than 3/5 of the height.
* Central leader is absent or damaged and cannot be trained by cutting back competing multiple leaders.
* Central leader exceeds 18 inches in length and cannot be pruned back acceptably to a side bud leaving leader less than 18 inches, while still meeting minimum height requirements.

Reject if . . . (Continue)

* Pine tree leader is longer than 18 inches. Pine tree leaders cannot be pruned back to a lateral bud.
* Large open areas due to missing branches (not fully branched from top to bottom).
* Routinely sheared, which would result in and be identified by:
    * Densely grown and uniformly pyramidal "Christmas tree" appearance.
    * New growth removed with a machete or power shear.
    * Terminal leader and terminal buds are missing.
    * Trunk caliper is large relative to tree height and width.
    * "Finger-like" or thick whorl development is at the branch tips.
    * Tree-on-a-tree developing with the new growth that has not been debudded.

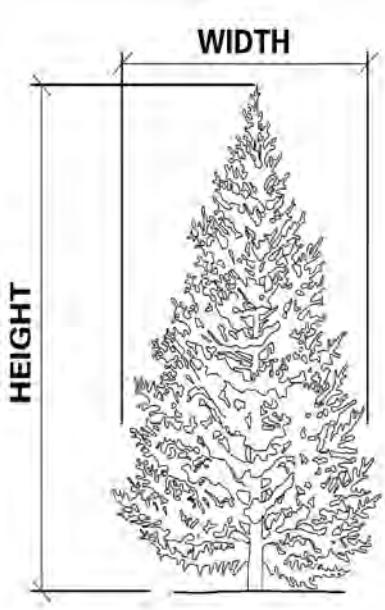
Tree on Tree

Coniferous Tree – Type 4 Cone Type Pyramidal

Width should be no less than 3/5 of the height.

Type 4 Coniferous Tree Examples: (Pyramidal)		
Common Name / Varieties	**Botanical Name**	
Balsam Fir Fraiser Fir	*Abies*	*balsamea* *fraseri*
Douglas Fir	*Pseudotsuga*	*menziesii*
Eastern Red Cedar	*Juniperus*	*virginiana* – all varieties
American and Japanese Larch	*Larix*	*laricina* *kaempferi*
Austrian Pine	*Pinus*	*nigra*
Scotch Pine	*Pinus*	*sylvestris*
Black Hills Spruce	*Picea*	*glauca* 'Densata'
Colorado Blue Spruce	*Picea*	*pungens* 'Glauca'

Coniferous Type 4

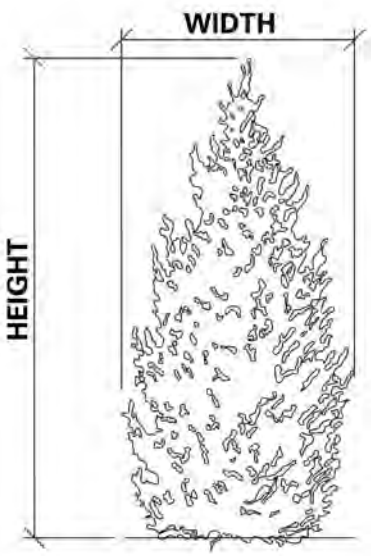


Coniferous Tree – Type 5 Broad Upright

Width should be no than ½ of the height

Type 5 Coniferous Tree Examples (Broad Upright)			
Common Name / Varieties		**Botanical Name**	
Arborvitae	'Techny'	*Thuja*	*occidentalis*
Rocky Mountain Juniper	'Sutherland' 'Welch'	*Juniperus*	*scopulorum scopulorum*
Rocky Mountain Juniper		Juniperius	scopulorum
Eastern White Pine		*Pinus*	*strobus*

Coniferous Tree Type 5

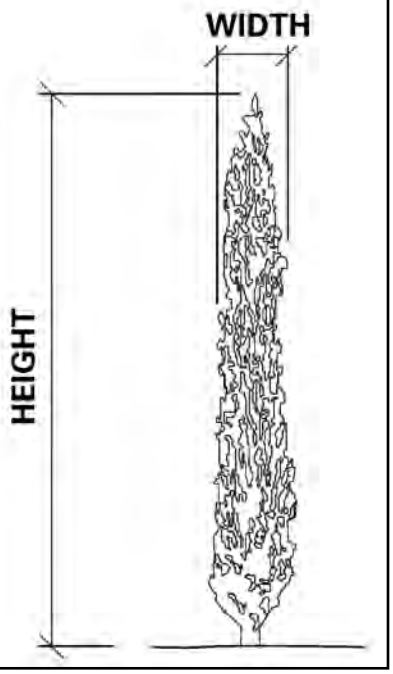


Coniferous Tree – Type 6 Columnar

Width should be no less than 1/5 of the height.

Type 6 Coniferous Tree Examples (Columnar Conifer Trees)			
Common Name / Varieties		**Botanical Name**	
Arborvitaev	'Pyramidal'	*Thuja*	*occidentalis*
Eastern Red Cedar	'Taylor'	*Juniperus*	*virginiana*
Rocky Mountain Juniper	'Blue Trail' 'Medora'v	*Juniperus*	*scopulorum*

Coniferous Tree Type 6



* For final acceptance, measure top growth only.

CRITERIA FOR ACCEPTING PLANT SIZE – CONIFEROUS (EVERGREEN) TREES

EXCEPTION – Type 6 Columnar Trees – Use the minimum dimensions for height and roots from the table below and a minimum spread of no less than 1/5th the height for.

Specified Size and Root Type	Initial, Replacement, or Final* Acceptance Minimum					
	Height	Top Growth Spread	Caliper	Root Spread or Width	Root Length/ Depth	Container Size
6” Ht. Seedling	4.5”	2.5”	1/16”		8”	
9” Ht. Seedling	7.5”	4.5”	1/8”		8”	
12” Ht. Seedling	10.5”	6”	3/16”		10”	
6” Ht. Cont.	4.5”	2.5”				No. 1
9” Ht. Cont.	7.5”	4.5”				No. 1
12” Ht. Cont.	10.5”	6”				No. 2
15” Ht. Cont.	13.5”	8”				No. 2
18” Ht. Cont.	16.5”	10”				No. 3
2’ Ht. Cont.	21”	12”				No. 3
2.5’ Ht. Cont.	27”	16”				No. 5
3’ Ht. Cont.	33”	19”				No. 7
3.5’ Ht. Cont.	39”	23”				No. 15
4’ Ht. Cont.	45”	27”				No. 15
5’ Ht. Cont.	57”	35”				No. 20
2’ Ht. B&B	21”	12”		12”	9”	
3’ Ht. B&B	2.5’	18”		14”	10.5”	
4’ Ht. B&B	3.5’	24”		16”	12”	
5’ Ht. B&B	4.5’	30”		20”	13.5”	
6’ Ht. B&B	5.5’	36”		22”	14.5”	
7’ Ht. B&B	6.5’	42”		24”	16”	
8’ Ht. B&B	7.5’	54”		27”	18”	
9’ Ht. B&B	8.5’	60”		30”	18.5”	
10’ Ht. B&B	9.5’	66”		34”	20”	
12’ Ht. B&B	11.5’	78”		42”	22”	

* For final acceptance, measure top growth only.

Coniferous Shrub Measurement

Top Growth Measurement

Measure average spread - Plants should measure approximately the same in average spread in any direction. If a plant is unbalanced (deviations in measurement exceeding 1/3 in one direction compared to another direction), the plant shall be pruned to average spread. Reject the plant if minimum form and size criteria cannot be met.

Coniferous Shrub – Type 1 Creeping or Prostrate

Type 1 Coniferous Shrub Examples (Creeping or Prostrate)			
Common Name / Varieties		**Botanical Name**	
Russian Cypress		*Microbiota*	*decussate*
Savin Juniper	Skandia	*Juniperus*	*sabina* 'skandia'
Creeping Juniper	Blue Rug	*Juniperus*	*horizontalis* 'Wiltonii'
Single Seed Juniper	Blue Star	*Juniperus*	*squamaty* 'Blue Star'

Coniferous Shrub Type 1

ELEVATION

Coniferous Shrub – Type 2 Semi-Spreading

Type 2 Coniferous Shrub Examples (Semi-Spreading)			
Common Name / Varieties		**Botanical Name**	
Chinese juniper	Old Gold & Maney	*Juniperus*	*chinensis*
Savin Juniper	Arcadia Broadmoor	*Juniperus*	*sabina*
Mugo Pine	Dwarf	*Pinus*	*mugo*
Rhododendron	All Varieties	*Rhododendron*	Spp.
Yew	Dense spreading, Taunton spreading	*Taxus*	x media 'Densiformis' x media 'tauntonii'

Coniferous Shrub Type 2

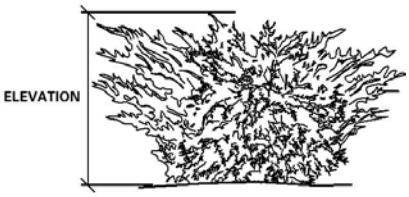
ELEVATION

Coniferous Shrub – Type 3 Broad

Up to 12 inches height, spread should be approximately equal to height. Plants with height of greater than 12 inches, spread may exceed height.

Type 3 Coniferous Shrub Examples (Broad Spreading, Globe and Compact Upright)			
Common Names / Varieties		**Botanical Name**	
Arborvitae	Globe 'Techny Globe', 'Woodwardii'	*Thuja*	*occidentalis*
Boxwood	'Saskatoon'	*Buxus*	spp.
Chinese Juniper	'Sea Green'	*Juniperus*	*chinensus*
Mugo Pine		*Pinus*	*mugo*
Norway Spruce	Birds Nest Dwarf	*Picea*	*abies* 'Nidiformis' *abies* 'Pumila'

Coniferous Shrub Type 3



Criteria For Accepting Plant Size – Coniferous (Evergreen) Shrubs					
Specified Size and Root Type	Initial, Replacement, or Final* Acceptance Minimum				
	Top Growth Height	Top Growth Spread	Root Spread or Width	Root Depth	Container Size
12” Spread Cont.	10.5”	10.5”			No. 2
15” Spread Cont.	13.5”	13.5”			No. 2
18” Spread Cont.	16.5”	16.5”			No. 3
2’ Spread Cont.	21”	21”			No. 3
2.5’ Spread Cont.	27”	27”			No. 5
12” Spread B&B	10.5”	10.5”	8”	6”	
15” Spread B&B	13.5”	13.5”	10”	7.5”	
18” Spread B&B	16.5”	16.5”	10”	7.5”	
24” Spread B&B	21”	21”	12”	9”	
30” Spread B&B	27”	27”	14”	10.5”	
36” Spread B&B	33”	33”	16”	12”	
12” Ht. Cont.	10.5”	9”			No. 2
15” Ht. Cont.	13.5”	10”			No. 2
18” Ht. Cont.	16.5”	13”			No. 3
2’ Ht. Cont.	21”	16”			No. 3
2.5’ Ht. Cont.	27”	19”			No. 5
3’ Ht. Cont.	33”	22”			No. 7
12” Ht. B&B	10.5”	9”	8”	6”	
15” Ht. B&B	13.5”	10”	10”	7.5”	
18” Ht. B&B	16.5”	13”	10”	7.5”	
2’ Ht. B&B	21”	16”	12”	9”	
2.5’ Ht. B&B	27”	19”	14”	10.5”	
3’ Ht. B&B	33”	22”	16”	12”	

* For final acceptance, measure top growth only.

Vine Grades

Criteria For Accepting Plant Size – Vine Grades	
Specified Size and Root Type	**Initial, Replacement, or Final* Acceptance Minimum**
2 Yr. No. 1 BR	12” long canes (2 or more) and 1/8” diam. primary roots (10 or more)
2 Yr. Med. BR	12” long cane (1 or more) and 1/8” diam. primary roots (5 or more)
1 Yr. No. 1 BR	6” long canes (2 or more) and 1/16” diam. primary roots (10 or more)
1 Yr. Med. BR	6” long cane (1 or more) and 1/16” diam. primary roots (5 or more)
Note – expect reduced root and top growth for Boston Ivy	

*For Final acceptance, measure top growth only

Herbaceous Groundcovers and Perennials

Herbaceous plants are generally specified by container or bare root size. Plant height, spread, and the number of stems or stolons are variable depending on species of plant and the season. While the top growth size and form are variable, generally the diameter of the top growth should fully cover or exceed the top diameter of the container. An exception is native wildflowers which have little, or no, visible top growth in the spring.

The root system must be evident throughout the width and depth of the container soil ball. Root systems (fine or coarse texture) vary greatly within plant types.

Bare Root Perennials

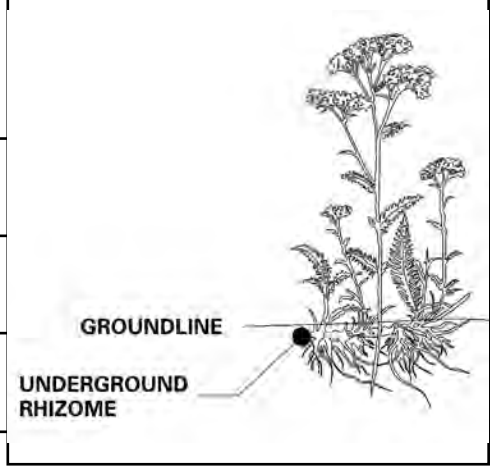
Reject plants if:

* Roots are soft and/or moldy;
* Roots are not live. Scrape roots if flesh is white or green, root is alive.
* Collected stock is unacceptable unless specified.

Herbaceous Plant Type 1 (Shoot Form)

Type 1 Herbaceous Plant Examples			
Common Name	**Varieties**	**Botanical Name**	**Species**
Yarrow	All Varieties	*Achillea*	*millefolium*- All varieties

Herbaceous Plant Type 1



Herbaceous Plant Type 2 (Runner Form)

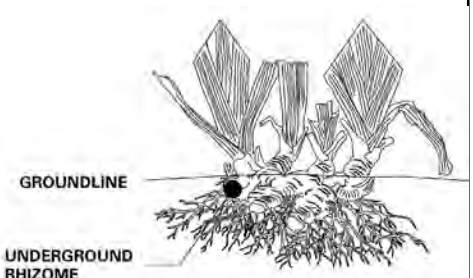
Type 2 Herbaceous Plant Examples			
Common Name	**Varieties**	**Botanical Name**	**Species**
Moneywort	-	*Lysimachia*	*nummularia*
Sedum	All Varieties	*Sedum*	All Species

Herbaceous Plant Type 2

Herbaceous Plant Type 3 (Fan Form)

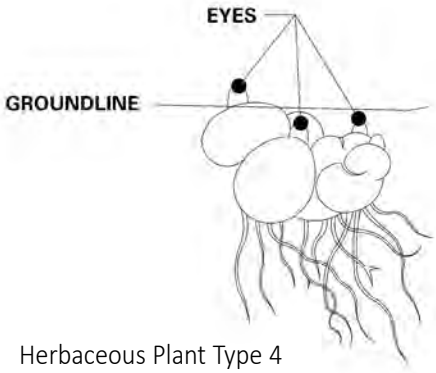
Type 3 Herbaceous Plant Examples			
Common Name	**Varieties**	**Botanical Name**	**Species**
Daylily	All Varieties	*Hemerocallis*	All Species
Iris	All Varieties	*Iris*	All Species

Herbaceous Plant Type 3



Herbaceous Plant Type 4 (Eye Form)

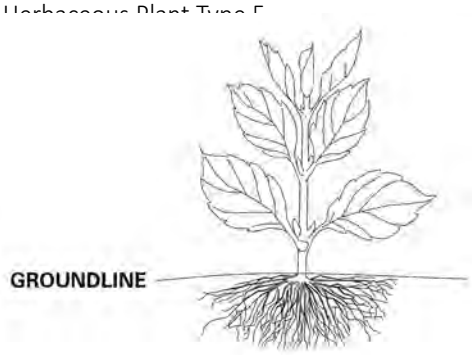
Type 4 Herbaceous Plant Examples			
Common Name	**Varieties**	**Botanical Name**	**Species**
Hosta	All Varieties	*Hosta*	All Species



Herbaceous Plant Type 4

Herbaceous Plant Type 5 (Plant Form)

Type 5 Herbaceous Plant Examples			
Common Name	**Varieties**	**Botanical Name**	**Species**
Purple Prairie Clover		*Petalostemum*	*purpureum*



Container Grown Plants

The following are minimum dimensions for standard size nursery stock containers.

Criteria For Accepting Plant Size – Herbaceous Plants		
Container Class	**Minimum Vertical Height**	**Minimum Inside Top Diameter**
Cell Packs	2.75”	Varies
2 ¼”	2.80”	2.10”
3 ½”	3.30”	3.30”
4”	3.75”	3.75”
4 ½”	4.25”	4.25”
Quart	5.5”	5”
No. 1	6”	6”
No. 2	7.5”	7.5”
No. 3	8.5”	9.5”
No. 5	11”	9.75”
No. 7	11”	12.25”
No. 10	13.75”	14.5”
No. 15	15”	15”
No. 20	17”	20”
No. 25	16”	24”

Note: The industry commonly uses containers specified and measured in gallons rather than by a number which conforms with the American Standard for Nursery Stock classification. For practical purposes, the two containers correlate closely and can be used interchangeably. For Example:

* A No. 1 container approximates the size of a 1 gallon container
* A No. 15 container approximates the size of a 15 gallon container
* Etc.

Container Stock

On-Site Storage

All nursery stock (seedling, bare root, container, or B&B) must be kept secure, cool, and moist while being stored. If storing bare root and B&B plants on site, store in either a refrigerated truck or heeled into soil or mulch.

Healing In

Plant Installation

Plants shall be installed according to the Contract Documents including the plan, Special Provisions, Standard Planting Details, MnDOT's Specifications for Construction , and this Manual.

Competency Test

Prior to proceeding with plant installation work and to the satisfaction of the Engineer, the Contractor shall schedule and perform a "Competency Test" demonstrating acceptable plant installation methods (in accordance with the plan and Standard Planting Details) for each plant pay item and root category applicable to the project.

The test shall include handling plants, digging holes and beds, installing plants, initial watering, installing applicable protection materials, and mulching.

Drainage

The Contractor shall be responsible for ensuring adequate drainage in the planting hole and bed areas. When the Contractor has reason to suspect a drainage problem, they shall perform a percolation test by filling a 16 inch deep planting hole with water and measuring the time it takes for the water to drain from the hole. Adequate drainage will be considered equal to or greater than a percolation rate of 1/2 inch per hour. In the case of inadequate drainage, the Contractor shall be responsible for requesting approval from the Engineer to either relocate, delete affected planting locations, or to proceed with Extra Work by using one or a combination of the Planting Details for Poorly Drained Soils as shown in the plan.

Stem Girdling Roots

Container grown and balled & burlapped plant stock with more than 4 inches of soil depth above the root flare shall be rejected. Excess soil above the root flare can in time result in stem encircling roots, which can then lead to stem girdling roots. Plant stock may be accepted provided the excess soil is less than 4 inches and can be removed without damaging the root system of the plant.

Stem Encircling Roots / Stem Girdling Roots

Balled and Burlapped Stock

As described in the planting detail, the Contractor must:

* Remove the top 1/3 or the top two horizontal rings of the wire basket.
* Remove the burlap and nails to expose the top 1/3 of the soil ball.
* Remove all rope/twine and dispose of off site.
* Cut vertical slits at 6 inch intervals into treated burlap.

Reject broken soil balls. Staking and guying plants with broken soils balls are not acceptable.

It may be determined that staking and guying is necessary for support of the tree. This will be done in accordance with MnDOT 2571.3I.1 and the Standard Planting Details. Rope or twine will not be retied to the remaining wire basket for support.

Container Stock

Container grown material is a plant that has grown in a container for at least 1 year (through the winter).

Reject “potted” material. Potted material is bare root stock placed in a container in the current growing season. “Potted” material roots will not hold soil intact and in the shape of the container when removed from container.

Install containerized plants immediately after removing from the container and as described in the planting detail.

Score or prune the outside of the soil ball to redirect circling roots at 6 inch intervals.

Paper fiber pots need not be removed but must be vertically slit at 6 inch intervals to allow faster degradation of the pot. The top of the pot must be removed to a depth of 1 inch below the soil line.

Soaking Bare Root

Bare Root Stock

Soak plant roots for 1-24 hours prior to planting.

The Contractor must install bare root stock as described in the Standard Planting Details. The root must be spread in a natural position and at the proper depth before back filing around the roots. Planting hole should be wide enough to fit the natural root spread. Do not prune roots to fit the hole.

Machine Moved Stock

Trees, except MnDOT supplied stock, must be inspected and found free of pests and disease by the Minnesota Department of Agriculture (MDA), before installation. Install machine moved stock as described in the Standard Planting Details. Planting hole must be scarified and tree shall be installed according to Standard Planting Details.

Seedling Stock

Seedling stock is plant material that is usually 12 inches or less in height. It can be either bare root or containerized (Cell Pack) material.

Vines

Plant vines in a linear bed 2 feet wide extending 5 feet beyond the terminal vine as described in the Standard Planting Details.

Initial Watering (2571.3G)

At all times during the PIP, the Contractor shall have sufficient watering equipment and forces available to completely water all plants as often as necessary to maintain adequate but not excessive soil moisture in the root zones.

Within 2 hours of installation, each plant's backfill soil will be thoroughly saturated with water. After settling, the Contractor will provide additional backfill as needed to fill in the voids.

Mulch Placement (2571.3H)

Before placing mulch, planting beds shall be graded and leveled with hand tools, to prevent puddling and mulch depth irregularities.

Do not place mulch if soil moisture is excessive. Delayed placement of mulch may be requested by the Contractor, but must meet erosion control guidelines shown in the SWPPP.

Staking and Guying (2571.3I.1)

Staking and Guying may be necessary or specified in the plan to keep the plant material in plumb condition. It must be installed according to the Standard Planting Detail.

Staking and Guying must be removed after 1 year.

Rodent Protection (2571.3I.2)

All deciduous, pine, and larch trees will have rodent protection installed according to the Standard Planting Details.

Tree Painting (2571.3I.3)

To help prevent the bark from splitting in the winter (frost cracks), trees will be painted with undiluted exterior white latex paint from the ground line to the first major branch. The Contractor will paint trees in accordance with the Standard Planting Details in the plan.

Cleanup and Restoration Work (2571.3J)

All clean up and restoration work will be done to the satisfaction of the Project Engineer and in accordance with MnDOT 2571.3J. All excess materials, rocks, and debris must be stored in containers and disposed of off-site throughout the project.

Turf Establishment and Restoration

Seeding will be required for restoration or erosion control work or as a separate bid item in the plan. All seed will follow MnDOT 3876 Inspection and Acceptance Guidelines. Repair turf in disturbed areas with seed mixes as shown in the plans, special provisions or to match in-place turf. Preparation, installation and maintenance for seeding are defined in MnDOT 2575.3. MnDOT 3882.2C Type 3 mulch shall be disk anchored for all seeding types.

If sod is used to repair or restore turf areas, use sod type specified in the plans and in accordance with MnDOT 3878.

Applying Fertilizer and Conditioners

Before placing seed or sod, apply fertilizer or other amendments (compost, liming materials, other additives) using mechanical spreading devices for uniform application. Till the soil at least once within 24 hours of placing any soil amendments. Perform seeding no later than 48 hours after fertilizing.

Seed Storage

The Contractor will store seed in a cool, dry location. Reject wet or moldy seed.

Seeding Rates

Seed will be planted at 1.5 times the rate specified in a Table 3876-1 ”State Seed Mixes” in MnDOT’s Standard Specifications for Construction or as specified in the plan or special provisions.

Seed Planting Dates

The Contractor shall use Table 2575-1 “Season of Planting” in MnDOT’s Standard Specifications for Construction to determine when the seed shall be planted. The Engineer may adjust a specified date by up to 10 days depending on prevailing weather conditions.

Wind

Do not seed when winds exceed 24 Km/h (15 mph).

Seeding Native Mixes

Native seed mixes will be planted using a seed drill to accurately meter varied seed sizes uniformly.

Interseeding

Interseeding is used when existing vegetation is to remain. The seed drill will cut through the existing vegetation and plant the seed at a specified depth.

Seeding Turf Mixtures

Seed Mixes shall use either broadcast, drop seed, or hydroseed for introduction. If a seed drill is used, it shall be at right angles to the direction of surface drainage.

Hydroseeding shall be uniform in coverage. The results can be verified by uniform wetness of the soil.

Seedbed Firming

Seedbed firming shall be done with approved equipment. On steep slopes, hand raking shall be used to cover seed.

Mulch

On areas within 10 feet of the shoulder, the Contractor shall seed and mulch in a continuous operation.

On areas outside 10 feet of the shoulder, the Contractor shall seed no more than can be mulched within 24 hours of seeding.

All seeding shall be covered with mulch. See the plan and MnDOT 3882 for mulch types.

Disc Anchoring

Disc Anchoring is the process of punching the mulch into the soil and is used with Type 1, 3, 7 and 8 mulches.

Placing Hydraulic Erosion Control Products

Hydraulic erosion control products will be sprayed as specified in the plan and in accordance with MnDOT 2575.3E.

Placing Sod

Before placing sod, the Contractor will have all areas smoothed out and prepared for the sod installation. Sod will be installed in accordance with MnDOT 2575.3A.2b, MnDOT 2575.3F and MnDOT 3878.

Acceptance of Initial Planting Operations

The Engineer will provisionally accept initial operations based upon satisfactory completion of

* Plant stock acceptance,
* Competency test,
* Installation of all individual plants,
* All incidental material and work items (initial watering, tree protection materials, mulching, proper drainage, pruning, staking & guying, tree painting, fertilizing, erosion control, seeding and clean up) required as part of the initial planting operation.

The Plant Establishment Period (PEP) is defined as the period beginning after the Initial Planting Operations through the end of the Contract (usually 2 years). The PEP involves the following activities: scouting and reporting, watering, incidental item maintenance, disease and insect control, plant replacement, maintaining plumb plants, weed control, pruning, storm water management, and debris removal.

The PEP begins when all work under the Initial Planting Operations is satisfactorily completed and continues until final acceptance of the Project.

Scouting & Reporting

The Contractor shall scout to assess the condition of the plants and the planting site and any factors that may influence a plant's health, vigor, and establishment success. The Contractor shall scout these conditions a minimum of every 2 weeks during the growing season and a minimum of once a month during the dormant season.

The Contractor shall submit a written scouting report to the Engineer, via e-mail, on the 1st and 15th of each month during the growing season (April through October) and by the 1st of each month during the dormant season (November through March). The report must contain the Engineer's name, name of Contractor's responsible scout or representative, date(s) any work was performed, work location(s); work completed; prevailing weather conditions; soil moisture assessments, insect, animal, vehicular, weather or other damage; disease problems; treatment plans, and assessment of overall plant conditions including weed competition and control. The report may include scanned copies of the plan sheets with the Contractor's notes, photos, and/or copies of the ***"MnDOT Landscape Contractor Scouting Report"*** found in Appendix B.

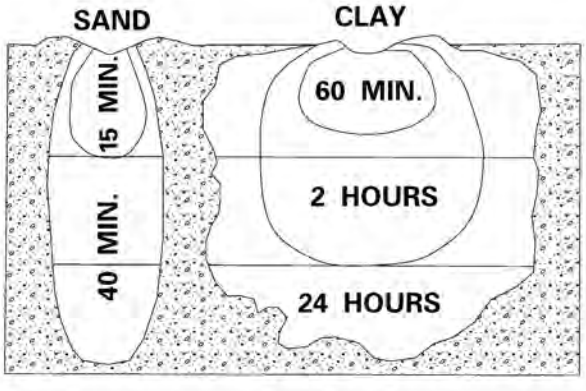
The report frequency and content will be used by the Engineer to assess plant establishment compliance for payment.

If reports are not submitted as required, the Contractor will be considered non-compliant. The Engineer may assess a daily charge of $200.00 for non-compliance on a calendar day basis until compliance is achieved.

Soil Moisture (Watering)

The Contractor is responsible for maintaining adequate, but not excessive, soil moisture for plants installed by Contractor.

Watering must respond to varying seasonal conditions, soil types, and drainage. The watering guidelines in the Standard Planting Details assume average soils with adequate, but not excessive, drainage. Large spade-moved trees and B&B plants typically need more water than small or bare root plants.



Percolation Rates Vary by Soil Type

Wilting plants can be a sign of either overly dry or overly wet soil conditions. The Contractor will check soil moisture by pulling back the mulch from around the plants and inserting a soil recovery probe to a 12 inch depth. The Contractor will record the soil moisture on the Scouting Report.

Watering Methods

Watering must thoroughly soak the entire root area rather than merely dampen the soil surface. The application rate should be slow enough to allow the water to soak into the ground and not run off.

Watering probe

A probe is used to inject water into the ground. Pressure must be low enough to assure that voids are not created by the force of the water. If soil washes out of the probe entry hole, the pressure is too high.

Watering Probes

Surface watering

A hand-held hose or temporary above ground sprinklers may be used. Pressure must be low enough to avoid washing away any wood chip mulch or soil.

Rainfall

Generally rainfall of 1 inch or more per week can support most plant growth under average soil and temperature conditions. Rainfall amounts may vary widely within just a few miles. Contractors are advised to place rain gauges on roadside landscape projects to verify rainfall amounts and frequency by project area.

Surface Watering

Painting

White latex paint provides reflective properties to minimize heat build up and sudden changes in temperature which can cause frost cracks within the tree trunk during winter. If paint applied to smooth bark trees begins to flake or peel off or if tree caliper expands exposing smooth bark through cracks in the paint, reapply undiluted exterior grade white latex base paint.

Housekeeping and Restoration

Cleanup and restoration of the Project site shall be satisfactorily completed throughout the establishment period. The Contractor shall replace pre-existing plants and restore turf areas damaged by the Contractor's operations. Soil compacted by the Contractor's operations shall be de-compacted to no

more than 200 psi (1400 kPa). The Contractor can request, in writing, that restoration work for damages that occurred beyond the Contractor's control, be compensated as Extra Work. Restoration work, when the damages were a result of the Contractor's operations or were within the Contractor's control, are incidental. All excess material, rocks and debris must be stored in containers and disposed of properly off site.

Disease, Insect, and Pest Control

The Contractor will maintain plants in a healthy condition and provide insecticides (without the use of systemic insecticides such as neonicotinoides), fungicides and other cultural procedures as necessary. The Contractor must note any disease, insect, or pest problems and actions taken to control on the "MnDOT Landscape Contractor Scouting Report". See Appendix D for additional information on identification and control.

All pesticide applications require a license from Minnesota Department of Agriculture (MDA) in the category applicable to the pesticide being applied.

Rodent Protection / Seedling Shelters

Replace, repair, or adjust rodent protection or seedling shelters as needed. Trees with missing or improperly installed rodent protection or seedling shelters can be girdled and killed by feeding rabbits, mice, or voles. Mice and voles can crawl under rodent protection that is not correctly imbedded in the soil. Tipped rodent protection or tipped trees in windy roadside locations, can cause the rodent protection to saw through bark damaging or killing trees. See also: ***Maintaining Plumb Plants-Straightening Plants***.

Rodent protection and seedling shelters are ineffective in preventing pocket gopher damage. Where pocket gophers are destroying root systems by tunneling and feeding, the Contractor may have to place traps or poison in tunnels or flood tunnels. If a rodenticide is used, the applicator must possess a MDA Category P license.

Rodent-damaged shrubs may be pruned back to the ground and rejuvenated, however; the plants are still required to meet minimum specifications at final inspection. (See criteria for accepting plants in Chapter 4).

Maintaining Plumb Plants

Plants must be maintained in a plumb condition.

Staking and Guying

If desired or specified, staking and guying may be used to provide additional support between the stem and the root ball.

Staking and guying must be installed in accordance with MnDOT 2571.3I.1. See Standard Planting Detail.

Approved Staking

Reject staking and guying if:

* Rubber hose and wire are used.
* Plants have broken root ball- see Plant Stock Inspection Chapter 4- B & B and Container.
* Tipped trees are staked without repositioning roots.
* Straps are not positioned half way between first branch and root collar.
* Too loose.
* Too tight.

Staking and guying is incidental unless specified otherwise in the plan.

The Contractor must visually inspect and adjust the staking and guying continuously during the first year of the PEP to ensure the staking and guying remains acceptable.

The staking and guying shall be removed by the Contractor within one year of initial installation.

Straightening Plants

Trees that have been blown sideways in the wind or have settled with a tilt can probably be straightened in the first year after planting.

To straighten plants:

* Thoroughly saturate the soil around the roots of the plant.
* Place shovel under root system and reposition until plant is plumb.
* Grab low on the trunk and gently push or pull the trunk back to a plumb position. The tree should slowly come back to a vertical position.
* Staking and guying may be required to provide additional support.
* To straighten machine moved plants, a spade larger than the one used to install the tree must be used.

Weed Control

Weed control contributes to successful plant establishment and survival by reducing competition for water, soil nutrients, and sunlight, and by reducing rodent habitat. The Contractor shall keep all planting areas in a weed-free condition.

Noxious weeds regulated under Minnesota Rules 1505.0750 through 1505.0830 by the State and County shall be removed to 5 feet beyond the mulch limits.

Prohibited noxious weeds must be controlled or eradicated as required in Minnesota statutes, section 18.78. Verify with the County Weed Inspector which plant species have been added by petition to county noxious weed lists. Lists of State Listed Noxious Weeds and County Weed Inspectors is available at

http://www.mda.state.mn.us

For detailed information and images of noxious weeds go to:

http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf

Remove all weeds (top growth and roots) within the mulch limits by hand pulling (pre-watering is advised). All weed parts should be disposed of off site to avoid spreading weed seed.

A non-selective, non-residual post-emergent herbicide containing 41 percent glyphosate, as the active ingredient, may be applied with a surfactant on a spot treatment basis with a brush or wick applicator. A broad-spectrum dichlobenil based granular (pre-emergent) herbicide may also be applied, in conformance with product labeling and manufacturer's recommendations to further control residual weeds. Other herbicides may be used if the Contractor receives prior approval from the Engineer. Spray application of chemicals for weed control in the mulched planting areas will not be permitted during the PEP unless the Contractor receives prior approval from the Engineer as recommended by the Technical Advisor.

Weed whipping and weed clipping will not be accepted as weed control.

The herbicide applicator must be licensed by the Minnesota Department of Agriculture as commercial pesticide applicator. Both A and J must appear on the license certifying the applicator for right-of-way use.

At least 3 days prior to herbicide application, the Contractor must supply the Engineer with a copy of the label(s) from the intended herbicide(s) and copy of a valid MN Pesticide applicators license with Categories A and J.

In addition, the Contractor must keep accurate, daily application records and submit, with the scouting report, a list of materials used, rates, area, and locations treated. All pesticides must be applied in accordance with all pertinent laws and rules of the State of Minnesota, and in accordance with the label.

READ, UNDERSTAND, AND OBSERVE THE PESTICIDE LABEL

Table 5.1 Partial List of Suggested Herbicide Control Methods* for Weed Control in the Landscape- Pre-Emergent

Situation	Possible Products, Active Ingredient / Trade Name	Comments
Control germinating weeds in mulched beds	Dichlobenil such as Dyclomec™	Overdose kills woody plants.
Control germinating weeds in bare ground or rock mulch beds	Oryzalin such as Surflan™	Good safety factor. Questionable in wood chip. Mulch beds.
Evergreen plantings and Conifer release from competition with other plants	Hexazinone such as Velpar™	DO NOT apply to areas where roots of desirable deciduous plants may extend.
Control germinating weeds in bare ground	Oxyfluorfen such as Goal™	Can injure leafed-out deciduous plants, poor on grasses

*Note – mention of trade names does not constitute endorsement of a product.

Table 5.1 Partial List of Suggested Herbicide Control Methods* for Weed Control in the Landscape-Post-Emergent

Situation	Possible Products, Active Ingredient / Trade Name	Comments
Kill grasses and forbs prior to tree hole or shrub planting bed preparation	Glyphosate such as Roundup™, Add Transline™/Clopyralid if Canada Thistle or Crown Vetch are present	Boom or band sprayer.
Crown Vetch Kill weeds in planting beds	Transline with Surfactant Glyphosate such as Roundup™	Wiper or wick applicator recommended for safety factor. Do not blanket spray as many absorbing woody roots are in the wood chip mulch.
Kill Canada Thistle in planting beds	Clopyralid such as Transline™	Very selective spot spraying when thistle are 6 inches -12 inches high. Spraying rosettes in the fall is very effective. **DO NOT** use Transline™ within the dripline of Honeylocust, or other woody legumes or Tilia or Rhus species. **DO NOT** spray over the top of woody landscape plants.
Kill Canada Thistle in turf prior to native prairie restoration	Clopyralid such as Transline™	Apply Transline™ in the fall to kill thistle in preparation for spring seeding of native prairie species. Transline™ applied during the season of prairie seeding will kill newly germinating prairie plants. Roundup™ can be applied during the same season as prairie seeding.
Kill grass in planting beds and holes.	Fluazifop such as Fusilade™	Can injure Juniper and Potentilla when sprayed over the top. Timing is critical.

*Note – mention of trade names does not constitute endorsement of a product.

Maintenance of Turf Areas

Unless specified, mowing is incidental to the Project.

The Contractor shall continuously maintain turf to between a mow height of 4 inches and 9 inches to a distance 5 feet beyond mulch line.

In areas of Contractor–installed turf, the Contractor shall maintain turf to between a mow height of 6 inches and 18 inches.

See plan or special provisions for additional maintenance requirements for Contractor-installed native seed mixes.

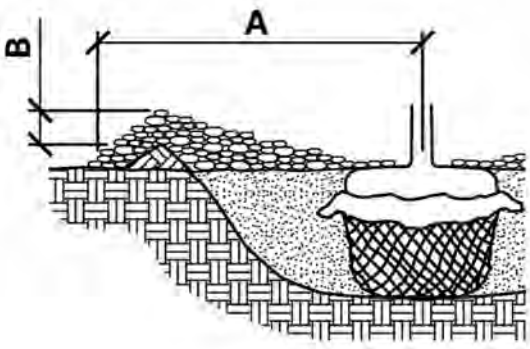
Maintenance of Turf

Mulching

Mulch must be applied at depths specified in the table below and in the plan details. Due to settling and decomposition, mulch must be uniformly maintained in a clean and weed-free condition at a minimum depth of 3 inches. Mulch reduces weed growth, maintains soil moisture, helps moderate soil temperature, and reduces mechanical and animal damage.

Mulch contaminated with soil as a result of the Contractor's operations shall be removed from the Project site.

Type of Plant	A = Center of Plant to Mulch Line	B = Depth of Mulch
Coniferous Trees	3' min.	4"-6"
Deciduous Trees	3' min.	4"-6"
Coniferous Shrubs	3' min.	4"-6"
Deciduous Shrubs	3' min.	4"-6"
Vines	2' min.	4"-6"
Perennials	2' min.	3"-4"
Machine-Transplanted Trees	12" Beyond Edge of Hole	4"-6"



Pruning

The Contractor shall prune dead, rubbing, damaged or diseased branches, and unwanted suckers and remove debris from the Project site. Following removal of diseased branches, disinfect pruning tool before making next cut.

Dead branches and stubs or crossed and rubbing branches create wounds that cannot completely close and seal off. Flush pruning cuts (too close) also make it impossible for the wound to completely close. Wounds provide entry points for decay, insects, and disease.

No more than 25% of the live canopy may be removed during one growing season.

Pruning must produce clean cuts using the Shigo method and must not tear or crush branches. Scissor-type bypass pruners and pruning saws shall be used. A bypass pole pruner may be used only during the PEP. Misuse of pole pruners may cause the central leader and/or branches to tear and cause rejection of the plant. Anvil pruners and hedge shears, which tear bark while crushing and bruising branches at the site of the cut, are not acceptable.

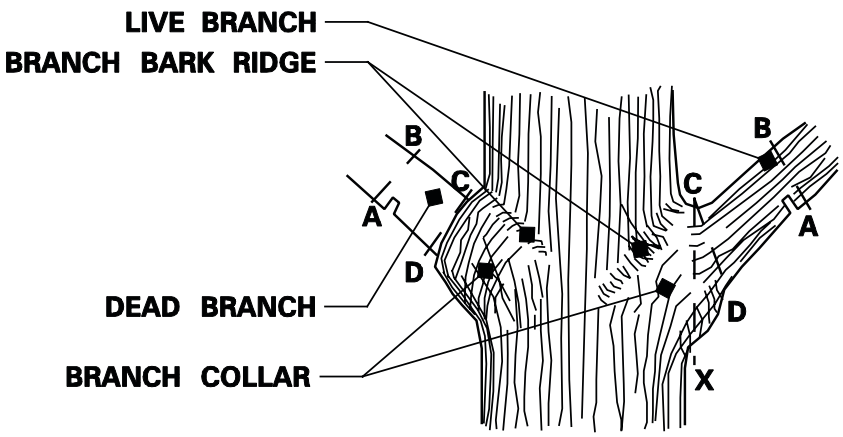
Scissor Pruners	Accepted	**Photo credit: www.felco.com** 
Anvil Pruners	Not accepted	
Pruning Saws	Accepted	 **Photo credit: www.felco.com**
Hedge Shears	Not accepted	
Pole Pruner	Accepted during PEP only	

Prune branches so that an outside bud becomes the new terminal bud. Trees with multiple leaders must be pruned to improve symmetry and to establish central leader dominance.

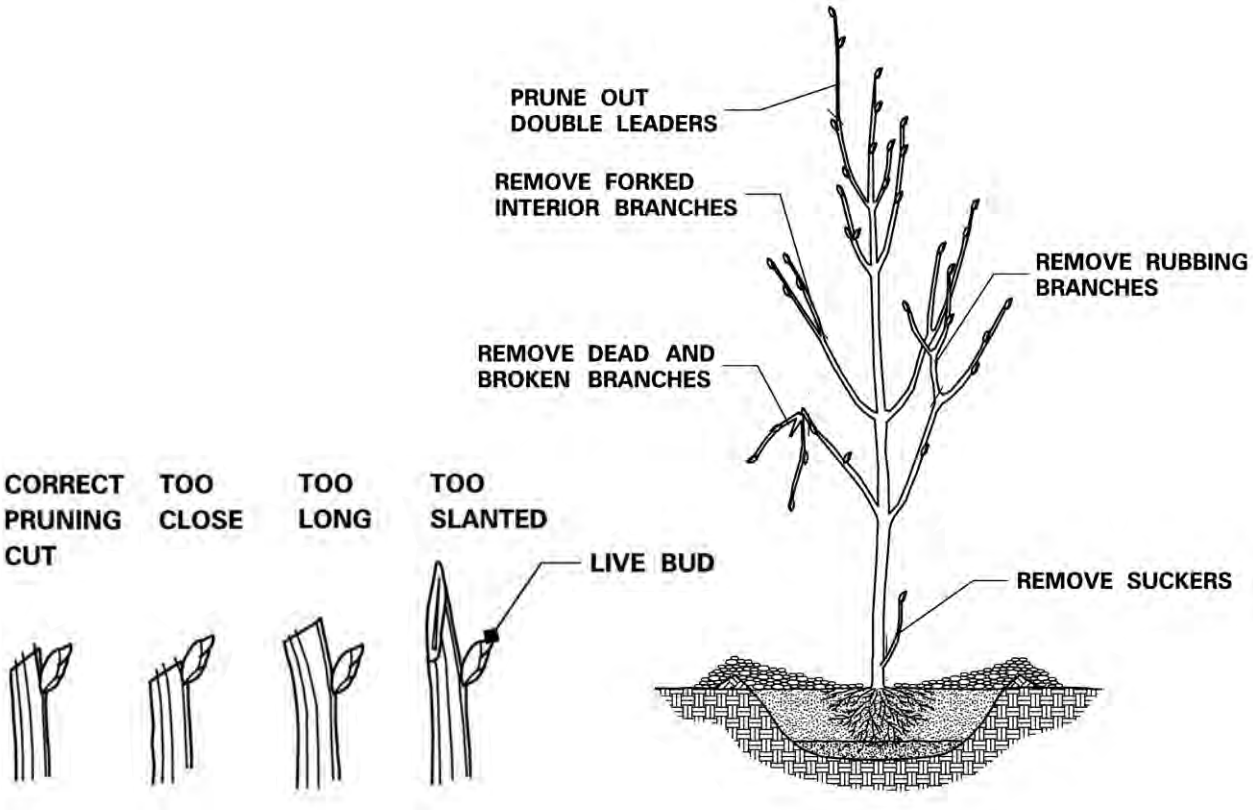
For tree branches larger than 2 inches in diameter, the Shigo pruning method is required.

To prune by the Shigo Method follow the steps below.

* Cut part way through the branch at point A.
* Cut completely through branch from point B to A.
* Cut from point C to D.
* Leave branch collar (C to D).
* **DO NOT** flush cut (C to X).
* **DO NOT** leave stubs (A to B).



Pruning by Shigo Method



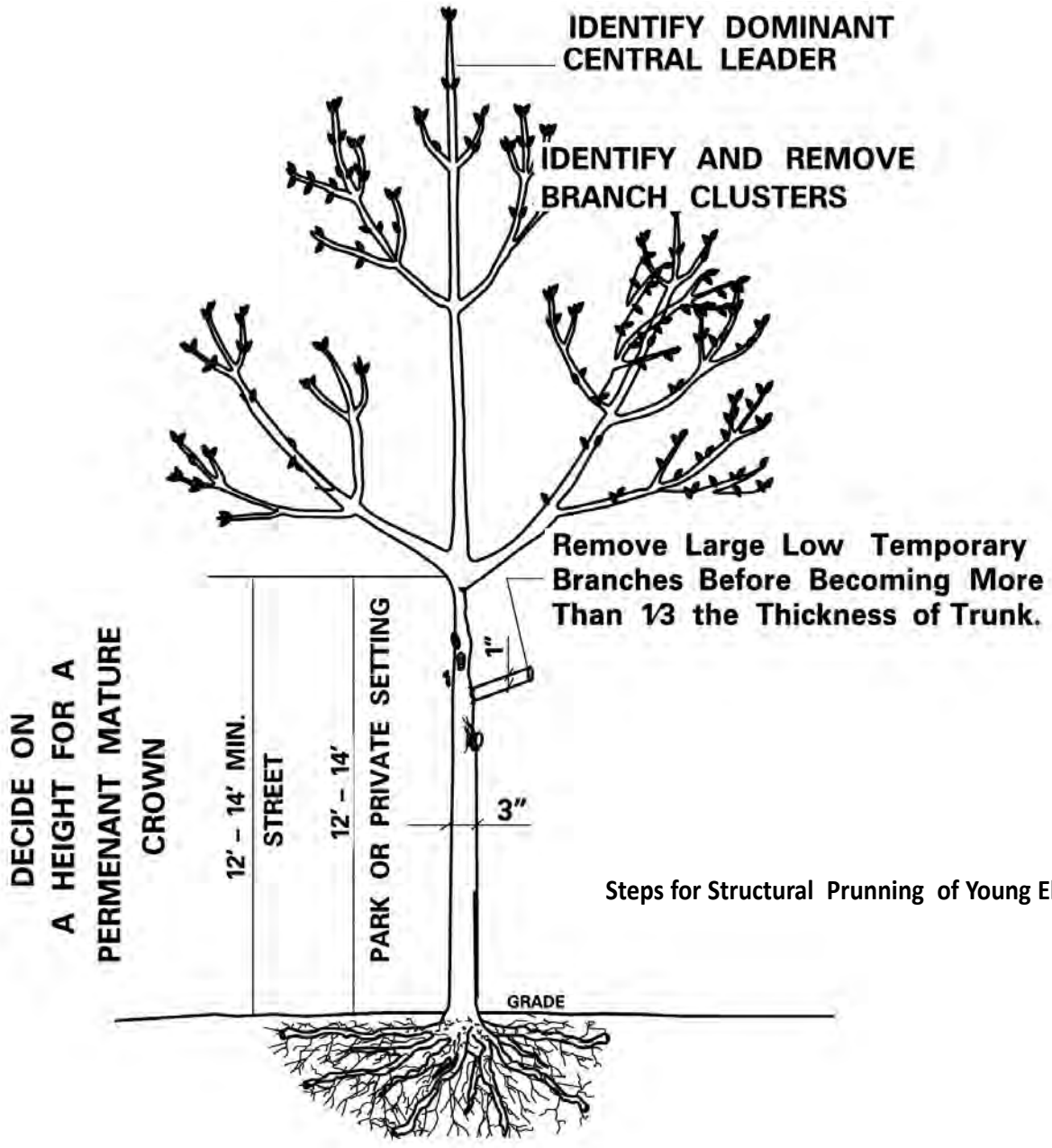
Pruning to Live Buds

Structural Pruning of Young Elms

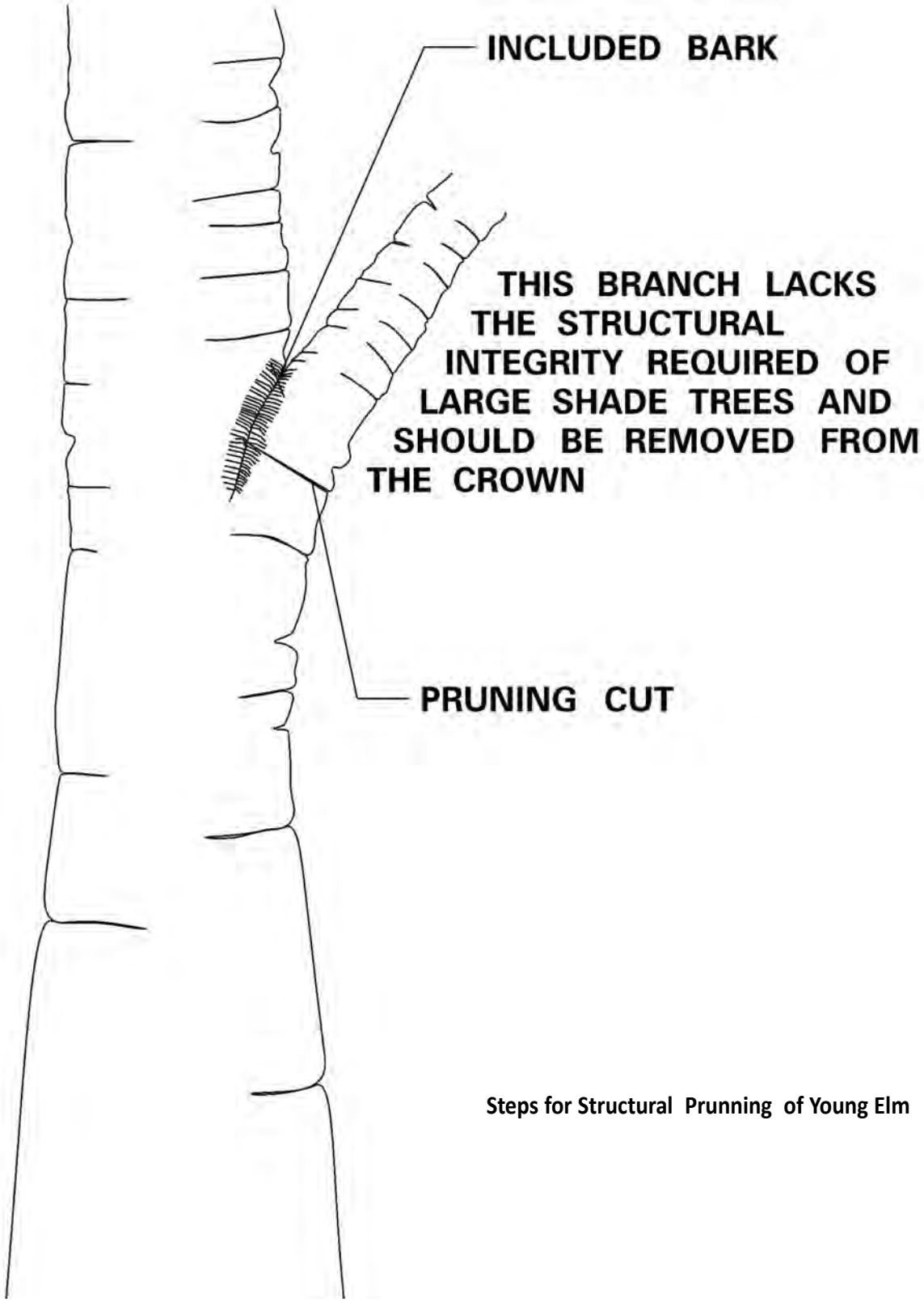
Dutch Elm Disease resistant Elms have gained in popularity and availability within the last few years. These trees are valued for their beauty, historical significance, fast growth and ability to tolerate a wide range of conditions. These American, Asian, Eurasian, and Hybrid Elms require special pruning to achieve their iconic vase shape, especially during the first ten years.

For detailed information on Pruning Young Elms, refer to "***Pruning Young Elms***" by Chad P. Giblin. More information is available at:

http://blog.lib.umn.edu/umtrees/trees/2010/05/how-to-order-pruning-young-elms.html



Steps for Structural Prunning of Young Elm



Steps for Structural Prunning of Young Elm

Oak Wilt

Avoid pruning branches or roots of oak trees during April – July in order to prevent the spread of oak wilt. Pruning or accidental cuts or wounds to oaks shall be immediately (within one minute) treated with an approved wound dressing. Wound dressing material should be latex paint, shellac, or other material as approved by the Engineer. The paint color should blend with the bark color. The Contractor shall have wound dressing on the Project site at all times. Asphalt-based wound dressing is not allowed.

Storm Water Management, Controlling Erosion and Establishing Vegetation (2575)

Maintaining Erosion Control Devices

The Contractor and the Erosion Control Supervisor are responsible for maintaining quality control on all work performed. When erosion or sediment control devices are installed, the work must be supervised by a certified installer. See Table 2573-1 in MnDOT's Standard Specifications for Construction and the NPDES permit for corrective actions and materials required to qualify for payment.

Sediment Removal

The Contractor shall remove sediment in sediment traps and basins that has been trapped or detained when the level of sediment reaches 50% of the height of the riser or 50% of the storage volume complete drainage and removal within 72 hours of discovery. The Contractor shall remove sediment captured in perimeter control devices as necessary to restore the functions of the device MnDOT 2573.3P.4.

If the Engineer determines that the Contractor has not followed specified erosion control practices and sedimentation occurs within the right-of-way, the Contractor shall retrieve all sediment that has left the right-of-way and restore the property to pre-existing condition, to the fullest extent possible, at the Contractor's expense. This must occur within 7 days of discovery and may require additional regulatory permits.

Plant Replacement

Within the first year of the 2-year PEP, the Contractor is responsible for determining plant compliance and the need for replacements based upon Project requirements. The Contractor shall conduct all plant replacement operations during the month of May (spring plantings) and September (fall plantings) within the first year of the PEP. At least 1 week prior to anticipated plant replacements, the Contractor shall submit a summary report of proposed plant replacements to the Engineer. The report shall include, by attachment, copies of plan sheets with the proposed replacement quantities and locations clearly identified and a completed MnDOT Certificate of Compliance form. The Contractor shall also clearly mark the plants to be replaced with brightly colored paint in the field.

The Contractor shall, at no extra expense to the Department, replace dead, defective, or missing plants and all incidental materials needed to meet initial installation requirements. This includes plants lost due to accidents, vandalism, theft, rodent damage, damage caused by Contractor, or as ordered by

the Engineer. Replacement plants and incidental materials shall be equal to or better than the initially specified material.

In order to provide at least 1 full year of establishment care, the Contractor shall not replace plants in the second year of the PEP unless the PEP is extended by a Supplemental Agreement or Change Order.

The Contractor is not responsible for replacement of transplant trees or shrubs furnished by the MnDOT. However, dead or defective trees shall be removed by the Contractor at no expense to MnDOT.

When replacing plants, the mulch must be pulled back without contaminating it with soil. Soil contaminated with wood chips robs plants of available nitrogen and creates voids in the soil. Mulch contaminated with soil provides a rooting environment for weed growth and must be removed from the project site and replaced.

Previously existing plants damaged by the Contractor's operations will be appraised for value using the most current edition of International Society of Arboriculture (ISA) "Guide for Plant Appraisal". The Contractor will be responsible for replacement, repair, and/or payment of damages in accordance with MnDOT 1712.

Debris Removal

Remove all excess material, rocks, debris, and obsolete temporary erosion control devices, from the Project site.

Daily Charges for Unsatisfactory Work

A daily charge of $200.00 may be assessed against the Contractor for failure to proceed satisfactorily with required plant establishment work.

The Contractor shall keep all plants in a healthy growing condition, using good horticultural practices continuously throughout the PEP.

The Engineer may assess a daily charge of $200.00 for non-compliance, on a calendar day basis, until the Contractor achieves compliance.

Final Acceptance

As a condition for terminating the PEP and conducting the final inspection, the Engineer may require the Contractor to bring the plant establishment work into compliance.

On or about the date on which the PEP is terminated, the Engineer will make a final inspection of the Project.

The Engineer will make a determination as to which plants will be accepted for payment at the Contract unit prices, at a reduced payment, or at no payment.

Upon final acceptance, the Contractor will not be required to provide any further care for the plantings. Final acceptance will be made upon completion of the 2-year PEP and a final inspection of the completed Project.

Method of Measurement

All plants will be measured separately by the number of acceptable plants for each contract item as listed in the Payment Schedule and by the following measurements to determine if the plant material is acceptable.

Coniferous Trees (2571.501)

Coniferous trees are defined as a plant with needle shaped or scalelike leaves with true cones and/or with an arillate fruit. Coniferous trees are usually upright and will have mature heights in excess of 30'. Coniferous trees are measured using the following criteria:

* ***SIZE***: Using either Inches or Feet, the plant is measured from the base to the tip to determine its height
* ***ROOT CATEGORY***: Plants are measured in four categories; Seedling, Bare Root (BR), Container (CONT) or Balled and Burlapped (B&B)

Deciduous tree (2571.502)

Deciduous trees are defined as a plant which tends to lose their leaves seasonally. The plant may or may not flower and the plant may or may not bear fruit. Deciduous trees are usually single stem plants (unless specified in a clump form), that have a mature height greater than 40'. Deciduous trees are measured using the following criteria:

* ***SIZE***: For trees using height, the plant is measured from the base of the plant to tip of the central leader. For trees using Caliper (CAL), the plant is measured by diameter at breast height.
* ***ROOT CATEGORY***: Plants are measured in four categories; Seedling, Bare Root (BR), Container (CONT) or Balled and Burlapped (B&B)

Ornamental tree (2571.503)

Ornamental trees are the same as Deciduous trees but have a smaller statue, usually between 12' and 40' in height. They can be either single stem or multi stem plants. Ornamental trees are measured using the following criteria:

* ***SIZE***: For trees using height, the plant is measured from the base of the plant to tip of the central leader. For trees using Caliper (CAL), the plant is measured by diameter at breast height.
* ***ROOT CATEGORY***: Plants are measured in four categories; Seedling, Bare Root (BR), Container (CONT) or Balled and Burlapped (B&B)

Coniferous shrub (2571.504)

Coniferous shrubs have the same definition as a coniferous tree, except they can have a multi stem form and are usually less than 30' tall. They can also have a spreading form, rounded form, or upright form. Coniferous shrubs are measured using the following criteria:

* ***SIZE***: For shrubs using height, the plant is measured from the base of the plant to tip of top of the plant. For shrubs using spread, the plant is measured by the average width in any direction.
* ***ROOT CATEGORY***: Plants are measured in two categories; Container (CONT) or Balled and Burlapped (B&B)

Deciduous shrubs (2571.505)

Deciduous shrubs have the same definition as both deciduous and ornamental trees, but usually are multi-stem in nature and are typically shorter than 25' when mature. Deciduous shrubs can also have a spreading nature. Deciduous shrubs are measured using the following criteria:

* ***SIZE***: Plants are measured using height from the base of the plant tip of the tallest cane.
* ***ROOT CATEGORY***: Plants are measured in five categories; Seedling, Bare Root (BR), Container (CONT) or Balled and Burlapped (B&B).
* ***ROSES***: Rose plants also are based on Grade.

Vine (2571.506)

A vine is defined as a weak stemmed plant that derives its support from climbing, twining or creeping along a surface. A vine is measured using the following criteria:

* ***AGE***: The number of years grown in the nursery.
* ***SIZE***: Plants are measured using height from the base of the plant to tip of the central leader.
* ***ROOT CATEGORY***: Plants are measured in two categories; Bare Root (BR), Container (CONT).

Perennial (2571.507)

A perennial plant is defined plant have a life cycle lasting more than two years. The above ground portion of the perennial plant dies back yearly, but send up fresh growth the following spring. Perennials are measured using the following criteria:

* ***SIZE***: Plants are measured using height from the base of the plant to tip of the central leader.
* ***ROOT CATEGORY***: Plants are measured in two categories; Bare Root (BR), Container (CONT).

Transplant tree/shrub/vine/perennial (2571.541, .544, .546, .547)

Transplants are trees, shrubs, vines or perennials that are exist in the landscape currently and are moved either mechanically or by hand to a new location. Transplants are measured using the following criteria:

* ***SIZE***: Measurement in inches for the width of the mechanical spading machine or size of the ball created after hand digging.

Definitions

* ***SIZE:*** Size it defined as how large the plant is at the time of sale from the nursery.
* ***ROOT CATEGORY:*** Root Category is defined one of the following: Seedling, Bare Root (BR), Container (Cont), Balled and Burlapped (B&B) or Machine Moved (MM) .

* ***AGE:*** Age is defined as how old the plant is at the age of sale, determined by when it was started as a seedling or root cutting.
* ***GRADE:*** Grade refers to a rating established by the American Association of Nurserymen and applies to grafted field grown roses as they are removed after two years of growing.

Payment schedules for non-plant contract item, such as subsoiling, erosion control, etc., can be found in MnDOT Standard Specifications for Construction.

Payment Schedule

All plants will be measured separately by the number of acceptable plants for each contract item as listed in the "Payment Schedule" (MnDOT 2571.5G).

The Department will make payment for plant installation and establishment at a percentage of the contract unit price per item unit of measure for all costs relating to furnishing, installing, and maintaining the required plants and associated incidental materials as specified and shown on the plans.

The Engineer may require additional materials and work beyond that specified or shown in the contract. The Department will make payment for the additional materials and work as extra work.

The Department may make full payment, reduced payment or no payment of no more than the maximum eligible partial payment percentage at any phase of payment (initial, interim, final) based on the performance of the Contractor (see Payment Checklist on pages B-13 & B-14 of this manual).

Initial Payment

The Department will make a payment of up to but not exceeding 70% of the contract unit price for each plant as follows:

Pre-Construction Work (up to 10%)

Upon completion and acceptance of preconstruction work, as defined in the Pre-Construction checklist on pages B-13 & B-14 of this manual, the Department will pay no more than 10% of the contract unit price for each plant pay item.

Preparation of Planting Holes and Beds (up to 15%)

Upon completion and acceptance of preparation of planting holes and beds work, as defined in the Preparation of Planting Holes and Beds Checklist on pages B-13 & B-14 of this manual, the Department will pay no more than 15 % of the contract unit price for each plant pay item.

Initial Planting Operations (up to 45%)

Upon completion and acceptance of initial planting operations, as defined in the Initial Planting Operations Checklist on pages B-13 & B-14 of this manual, the Department will pay no more than 45% of the contract unit price for each plant pay item.

The Contractor may receive no more than 70% if all Preconstruction Work, Preparation of Planting Holes and Beds, and Initial Planting Operations are met to the satisfaction of the Engineer. It is at the Engineer's discretion to withhold payments for unsatisfactory work and assessments. This amount withheld could be based on specific area, specific bed of plants, or as an overall percentage of the contract.

Interim Payment

At the end of the first calendar year of the Plant Establishment Period (PEP), and after completion and acceptance of the Contractor's work and continuous compliance with the plant establishment requirements as defined by ***Plant Establishment-Year One*** on pages B-13 & B-14 of this manual, the Engineer may authorize no more than 15% of the contract unit price for each plant.

The engineer may withhold payments for non-compliance, such as not turning in scouting reports on time and lack of ongoing maintenance of the site.

Assessments

Supervision by Contractor (MnDOT 1506)

The provisions of MnDOT 1506 are supplemented as follows:

At the Preconstruction Conference, the Contractor shall designate in writing who the competent superintendent and competent individual (if different) will be for this Project. These persons can only be changed throughout the duration of the Project by submission of written authorization to the Engineer by the Contractor. The submittal of these persons shall be done before any work is performed on this Project.

The Contractor will be subject to an hourly charge for failure to comply with the requirements of MnDOT 1506. Non-Compliance charges, for each incident, will be assessed at a rate of $100.00 per hour, for each hour or portion thereof, during which the Engineer determines that the Contractor has not complied. No charge will be made if the deficiency is corrected within 1 hour of notification.

An incident of Non-Compliance will be defined as the receipt of a written work order by the Contractor with instructions to correct a deficiency.

Plant Stock and Materials Documentation (2571.2A.2)

Work performed with plant stock, materials, and equipment that has been misrepresented in the documentation will be considered unauthorized work. If required documentation is not supplied as specified, subsequent work may be unauthorized and MnDOT may assess a daily charge of $200.00, on a calendar day basis, until the Contractor is in compliance.

Construction Requirements (2571.3)

Unauthorized Work and Penalties for Non-compliant Operations (2571.3A.3)

The Engineer will consider work performed as follows to be unauthorized work:

(1) Without required and acceptable documentation and notifications,

(2) Without supervision by a certified landscape specialist,

(3) Without conducting required and acceptable competency tests, or

(4) In conflict with the working hours of MnDOT 1803, "Prosecution of Work."

In the case of non-compliant operations, the Department may assess a daily charge of $200.00, on a calendar day basis, until the Contractor achieves compliance.

Establishment Work (2571.3K.2)

Keep plants in a healthy growing condition in accordance with the current edition of the ICAMMLP throughout the establishment period and submit MnDOT Landscape Contractor Scouting Reports in accordance with item 1 of MnDOT 2571.3K.2.a, "All Plants." Perform plant establishment work throughout the growing seasons from April through October and as necessary during the dormant seasons from November through March. The Engineer may perform random inspections throughout the PEP to verify compliance. The Engineer will consider the Contractor non-compliant if the Contractor does not maintain plants throughout the PEP and does not submit scouting reports.

The Department may assess a daily charge of $200.00 for non-compliance, on a calendar day basis, until the Contractor achieves compliance.

Storm Water Management (2573)

Installers (2573.3A.2)

If the Contractor fails to provide the required certified installers, the Engineer may reject the work as unauthorized work in accordance with MnDOT 1512, "Unacceptable and Unauthorized Work."

Storm Drain Inlet Protection (2573.5B)

The Department will withhold from monies owed to the Contractor for each improperly installed or maintained storm drain inlet protection and for each drain where the Contractor failed to remove sediments, the Engineer has ordered this corrective action.

Bonus Payment

When 90% or more of all plants installed within the initial plant installation period (PIP) and related contract operations have been continuously acceptable throughout the contract period, the Department will make a bonus payment of 10% of the total final contract price for plant installation and establishment. The Department considers replacement plants, replaced during the initial PIP, initially installed plants. Replacements made during the PEP are not eligible.

Final Payment

The Department will make final payment after final inspection and acceptance of the completed project at the end of the PEP. The Engineer may authorize no more than 15% of the contract unit price for each plant as defined by ***Plant Establishment*** Year 2 on pages B-13 & B-14 of this manual. The total final payment includes the PEP Year 2 payment, assessments, reduced payments if any, and bonus payment if eligible (see bonus payment above).

Payments

No additional payment will be made for replacement plants unless authorized by the Engineer.

Withheld Payments

Any percentage of initial and interim payment that is withheld may continue to be withheld from the final payment.

Any assessments charged during the Contract period will not be reimbursed at final payment. If the final voucher shows that the total of all initial and interim payments made exceeds the total amount due the Contractor, the Contractor shall promptly refund the overpayment. Final payment shall conform to MnDOT 1908 (Final Estimate And Payment).

Liquidated Damages

The Department is entitled to damages for failure of the Contractor to complete the work within the prescribed time. In view of the difficulty in making a precise determination of actual damages incurred, the Department will deduct, from money due the Contractor, a daily charge in the amount stipulated, not as a penalty but as liquidated damages to compensate for the additional costs incurred.

In suits involving assessment or recovery of liquidated damages, the reasonableness of daily charges will be presumed and the amount assessed will be in addition to every other remedy enforceable at law, in equity, by statute, or under the Contract.

Assessment of Liquidated Damages (1807.1)

The Department will deduct from money due the Contractor a daily charge for each calendar day that the work remains after the Contract time expires. The Engineer will assess the daily charge based on the original Contract amount and Table 1807-1, “Schedule of Liquidated Damages” in MnDOT’s Standard Specifications For Construction.

Appendix A

Partial List of Nursery Dealers and Growers			
Name/Address	**Phone Number**	**Type of Plant/ Landscape Material**	**Hardiness Zone**
Alpine Nursery 7155 State Highway 76 Houston, MN 55943 **www.alpinenursery.com**	507-896-3715 Fax 507-896-5463	Perennials, Trees, Shrubs	4b
Anderson Nurseries, Inc 46043 – 238th Street Wentworth, SD 57075-7307 **Email: andur@hcdp.com**	605-489-2582 Fax 605-489-1300	Conifers	4b
Badger Evergreen Farms, Inc. N2650 Maple Lane – PO Box 796 Merrill, WI 54452-0796 **Email: slatzig1@gmail.com** **www.badgerevergreen.com**	800-342-3152 715-218-5351 Fax 715-536-1629	Conifers	4a
Bachman's Nursery Wholesale Center 6877 – 235th St. W. Farmington, MN 55024 **Email: nurserysales@bachmans.com** **www.bachmanswholesale.com**	651-463-3288 800-525-6641 Fax 651-463-4747	All	4b
Badoura Forest Tree Nursery Mn/DNR 13885 – State 64 - PO Box 117 Akeley, MN 56433-0117 **www.dnr.state.mn.us/forestry/nursery/ordering.html**	218-652-2385 800-657-3767 Fax 218-652-2383	Bare Root Seedlings, Transplants, Cuttings	3b
Bailey Nurseries, Inc 1325 Bailey Rd St. Paul, MN 55119 **www.baileynursery.com**	651-459-9744 800-829-8898 Fax 651-459-5100	All	4b
Bergen's Greenhouses, Inc. 801 Willow Street West Detroit Lakes, MN 56501-3808 **www.bergensgreenhouses.com**	218-847-2138 800-492-4812 Fax 218-847-3515	All	3b

Partial List of Nursery Dealers and Growers			
Name/Address	**Phone Number**	**Type of Plant/ Landscape Material**	**Hardiness Zone**
The Bruce Company 2830 Parmenter Street Middleton, WI 53562 **www.bruceco.com** **www.brucecompany.com**	608-836-7041 Fax 608-831-4236	All	5a
Bork Evergreens LLC 44966 State Hwy 48 Hinckley, MN 55037 **www.borktreefarms.com**	320-384-7406 800-752-9182 Fax 320-384-7072	Conifers	3b
Buell's Landscape Design 836 Minnesota Street S. Bayport, MN 55003 **Email: info@buells.com** **www.buells.com**	651-459-9331 Fax 651-459-9358	All	4b
Cross Nurseries Inc. 22953 Highview Ave Lakeville, MN 55044 **Email: crossnurseries@frontiernet.net** **www.crossnurseries.com**	952-469-2414 Fax 952-469-1844	All	4b
Eagle Bay Farms 18277 – 150th St Park Rapids, MN 56470 **Email: eaglebayfarms@unitelc.com** **www.eaglebayfarms.com**	218-732-9137 800-726-3001 Fax 218-732-9137	Containerized tree, shrubs, perennials	3b
Evergreen Nursery Co, Inc 5027 County TT Sturgeon Bay, WI 54235 **Email: quality@evergreennurseryco.com** **www.evergreennurseryco.com**	920-743-4464 800-448-5691 Fax 920-743-9184	All	5b
Gertens Wholesale Nursery 5500 Blaine Ave. E Inver Grove Heights, MN 55076 **www.gertens.com/wholesale**	651-450-1501 Fax 651-450-9380	All	4b
Green Value Nursery 8301 20th Ave N Hugo, MN 55038 **www.greenvaluenursery.com**	651-483-9855 888-321-9855 Fax 651-483-3679	All	4b

Partial List of Nursery Dealers and Growers			
Name/Address	**Phone Number**	**Type of Plant/ Landscape Material**	**Hardiness Zone**
Grove Nursery 9650 Trail Haven Rd Corcoran, MN 55340 **Email: nwSales@GroveNursery.com** **www.grovenursery.com**	763-420-4202 800-944 8164 Fax 763-420-5056	All	4b
Happy Land Tree Farms 16706 Groningen Road Sandstone, MN 55072 **Email: hapland@ecenet.com** **www.happylandtreefarms.com**	320-245-5135 800-860-7819 Fax 320-245-5189	Conifers, Deciduous Trees, B&B/Container	3b
Hoffman and McNamara Co 9045-180th St E Hastings, MN 55033-9532 **www.hoffmanandmcnamara.com**	651-437-9463 Fax 651-437-9050	Conifers, Deciduous Trees, B&B/Container	4b
Kahnke Brothers Tree Farm 10603 Boone Road Plato, MN 55370 **Email: conniek@Kahnkefarm.com** **www.kahnkefarm.com**	320-238-2572 Fax 320-238-2574	All	4b
Hartman Companies, Inc, 8099 Bavaria Rd Victoria, MN 55386 **www.hartmantreefarm.com**	952-443-2990 Fax 952-443-2835	Shade Trees B&B	4b
Itasca Greenhouse, Inc 26385 Blackwater Rd – PO Box 273 Cohasset, MN 55721 **Email: info@itascagreenhouse.com** **www.itascagreenhouse.com**	218-328-6261 800-538-8733 Fax 218-328-9843	All Containerized Tree Seedlings	3b
Johnson's Nursery, Inc W180 N6275 Marcy Rd Menomonee Falls, WI 53051 **Email: info@johnsonsnursery.com** **www.johnsonsnursery.com**	262-252-4988 Fax 262-252-4495	Trees, Small Fruit, Ornamental	5b

Partial List of Nursery Dealers and Growers			
Name/Address	**Phone Number**	**Type of Plant/ Landscape Material**	**Hardiness Zone**
Landscape Alternatives, Inc. 25316 St. Croix Trail North Shafer, MN 55074 **Email: landscapealt@frontiernet.net** **www.landscapealternatives.com**	651-257-4460	Containers & Plugs, Prairie Wild Flowers, Grasses, Perennials	4a
Laurel Tree Farms 16101 Dayton River Road Dayton, MN 55327 **Email: trees@laureltreefarms.com** **www.laureltreefarms.com**	763-323-4406 Fax 763-323-4642	B&B Trees	4b
Law's Nursery, Inc 13030 Maycrest Ave Court S Hastings, MN 55033 **Email: paul@lawsnursery.com** **www.lawsnursery.com**	651-437-9119 Fax 651-438-3097	Shade B&B	4b
Lincoln-Oakes Nurseries 3310 University Drive Bismarck, ND 58504 **Email: lincolnoakes@btinet.net** **www.lincolnoakes.com**	701-223-8575 Fax 701-223-1291	Tree and Shrub Seedlings	4a
Lundeby Evergreens 2565 100th Ave NE Tolna, ND 58380-9789 **Email: lundebyf@gondtc.com** **www.lundebymfg.com**	701-262-4721 800-598-1228 Fax 701-262-4581	Conifers	4a
McKay Nursery Co 750 South Monroe St PO Box 185 Waterloo, WI 53594 **www.mckaynursery.com**	920-478-2121 800-236-4242 Fax 920-478-3615	All, Mostly Trees and Shrubs	5a

Partial List of Nursery Dealers and Growers			
Name/Address	**Phone Number**	**Type of Plant/ Landscape Material**	**Hardiness Zone**
Minnesota State Forest Nurseries Mn/DNR – General Andrews Tree Nursery 85894 County Highway 61 Willow River, MN 55795 **www.dnr.state.mn.us/state_forests/sft00020/index.html**	218-372-3182 800-657-3767 Fax 218-372-3091	Trees (All Seasons) Shrubs	3b
Mulligan's Landscaping PO Box 623 Northfield, MN 55057 **Email: mulligans@mulliganslandscape.com** **www.mulliganslandscaping.com**	612-332-8356 507-663-0393 800-232-8733 Fax 507-663-0477	B&B, Machine Transplant, Shade And Evergreen	4b
North Central Reforestation, Inc. 10466 – 405th Ave Evansville, MN 56326 **Email: info@ncrtrees.com** **www.ncrtrees.com**	218-747-2622 877-702-5579 Fax 218-747-2621	Tree Seedlings, Shrubs	4a
Northstar Seed and Nursery 18029 Ames Trail Faribault, MN 55021 **www.northstarnursery.com**	507-334-6288 Fax 507-334-8013	Perennials, Shrubs	4b
Northern Minnesota Nursery 12017 Eagle Road Floodwood, MN 55736 **Email: mikelaine@northernminnnursery.com** **www.northernminnnursery.com**	218-476-2162 888-883-5580 Fax 218-476-2162	Landscape Trees, Shrubs, Seedlings, Christmas Trees	3a & 4b
Out Back Nursery and Landscaping 15280 – 110th St. S. Hastings, MN 55033 **www.outbacknursery.com**	651-438-2771 800-651-3626 Fax 651-438-3816	Native Trees & Shrubs Prairie Wetland	4b
Plants Beautiful Nursery Nursery Address: 907 N Otter Ave Mailing Address: 15927 Co Hwy 42 Parkers Prairie, MN 56361-4552 **Email: pbnemidwestinfo.com** **www.plantsbeautifulnursery.com**	218- 338-6267 800-451-7623 Fax 218-338-5297	Shade Trees, Evergreens & Topiary Trees	4a

Partial List of Nursery Dealers and Growers			
Name/Address	**Phone Number**	**Type of Plant/ Landscape Material**	**Hardiness Zone**
Prairie Moon Nursery 32115 Prairie Lane Winona, MN 55987 **Email: info@prairiemoon.com** **www.prairiemoon.com**	507-452-1362 866-417-8156 Fax 507-454-5238	Native Plants Seed Wetland, Prairie, Savanna & Woodland	4b
Prairie Nursery PO Box 306 Westfield, WI 53964 **www.prairienursery.com**	608-296-3679 800-476-9453 Fax 608-296-2741	Wildflowers, Native Grasses	5a
Prairie Restorations, Inc 31646-128th Street Princeton, MN 55371 **Email: info@prairieresto.com** **www.prairieresto.com**	763-389-4342 800-837-5986 Fax 763-389-4346	Native Wildflowers & Grasses Limited Trees and Shrubs	4a
Rohde's Nursery, LLC N8098 Duck Creek Ave Neshkoro, WI 54960 **Email: rohdesnursery@centurytel.net** **www.rohdesnursery.com**	920-293-4374 Fax 920-293-4534	Limited Conifers Deciduous Trees Bur Oak E. Red Cedar	5a
Schumacher Nursery & Berry Farm, Inc 37806 – 910th St Heron Lake, MN 56137 **Email: berry01@centurytel.net** **www.schumachersnursery.com**	507-793-2288 Fax 507-793-0025	Small Container, Conifers, Bare Root Trees and Shrubs	4b
South Cedar Greenhouses 23111 Cedar Avenue South Farmington, MN 55024 **Email: info@southcedar.com** **www.southcedar.com**	952-469-3202 Fax 952-469-5335	Native Perennials and Annual Flowers	4b
Swedberg Nursery PO Box 418 37499 State Highway 210 East Battle Lake, MN 56515 **Email: swedbergnursery@gmail.com** **www.swedbergnursery.com**	218-864-5526 Fax 218-864-8212	All	3b

Partial List of Nursery Dealers and Growers			
Name/Address	**Phone Number**	**Type of Plant/ Landscape Material**	**Hardiness Zone**
Wilson's Nursery, Inc. PO Box 160 New Germany, MN 55367 **Email: andy@wilsonsnurseryinc.com** **www.wilsonsnurseryinc.com**	952-445-4088 800-477-4123 Fax 952-445-6219	All	4b
Wolcyn Tree Farms and Nursery 4542 Hwy 95 NW Cambridge, MN 55008 **Email: info@wolcyntreefarms.com** **www.wolcyntreefarms.com**	763-689-3346 Fax 763-689-0837	Conifers Christmas Trees Hardwoods & Shrubs	4a

The MnDNR maintains lists for "Native Plant Nurseries and Native Vegetation Consultants". These lists are availiable at:

http://www.dnr.state.mn.us/gardens/nativeplants/suppliers.html

Suppliers on these lists who sell seed may or may not be certified through the MN Crop Improvement Association (MCIA). Please check the MCIA web site for certified supplier if certified seed is specified at:

www.mncia.org

Appendix B

PRECONSTRUCTION CONFERENCE CHECKLIST (2571.3B) **S.P.** _____

Contractor Responsibility	Date	MnDOT Responsibility	*Payment Guidelines	
			Max %	Actual Amt.
Possess copies of the following: * Plan – including SWPPP (1401, 1402, 1504) * Proposal & special provisions (1202, 1205, 1206, 1210) * Current Standard Specifications for Construction * Addendums, if any * Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD) * Current MnDOT Standard Sign Manual * Current Inspection & Contract Administration Manual for MnDOT Landscape Projects		Explain the Engineer, Inspector & Technical Assistant roles. Explain the Project design intent & special considerations. Verify adequate equipment/ crews & time. Y_____ N _____ Verify the Contractor possesses all documents. Y_____ N_____ Determine staging areas.		
Provide the following documentation (2571.2A.2) * NPDES permit (or proof of application submitted by Prime Contractor). * Preliminary MnDOT Certificate of Compliance for Plant Stock, Landscape Materials, & Equipment. * Written documentation if plants are unavailable and list of proposed substitutions. * Compost, mulch, & seed must be from an approved source or will require testing. Compost Certificate of Compliance is required whether from approved source or not. Check current MnDOT Technical Memos and Approved Construction Materials http://www.mrr.dot.state.mn.us/materials/ApprovedProducts/appcharet.asp * Copy of a valid nursery stock dealer/grower certificate from all nurseries used. * Pesticide applicator license. Name _____ License # _____ A _____J_____ Expiration Date _____ * Preliminary progress schedule including Plant Installation Periods. * Certified Landscape Specialist(s) Name Expiration Date _____ _____ * NPDES Erosion Control Supervisor _____ and backup _____		Identify where to post permits. Review SWPPP Review MnDOT Certificate of Compliance with Technical Advisor: * Materials from acceptable approved source. Y____ N ____ * Written documentation if plants unavailable. Y____ N ____ * Substitutions acceptable (2571.2A.3). Y____ N ____ Review Preconstruction documentation. Date Received. _____ **NOTE:** Deduct $200/day if the Plant Stock documentation is not supplied at the Preconstruction conference (2571.2A.2) If late_____ days x $200 = $ _____		
This is part of Preconstruction Work Inspector (2571.5C.1).		**Inspector** _____ **Date** _____ **Engineer** _____ _____	*0% (Include in Preconstruction Work)	

*Partial initial payment. Maximum eligible percentage/amount. Pay up to this amount if work is acceptable. The suggested payment percentages are guidelines and do not obligate MnDOT to provide interim payment until operations are complete.

PRECONSTRUCTION WORK CHECKLIST (2571.3B) **S.P.** _____

Contractor Responsibility	Date	MnDOT Responsibility	*Payment Guidelines	
			Max %	Actual Amt.
Attend a Preconstruction conference. Supply the required Preconstruction documentation **SEE THE PRECONSTRUCTION CONFERENCE CHECKLIST.**		**NOTE:** If Preconstruction documentation is not supplied at the Preconstruction Conference, assess $200/day until acceptable documentation is supplied (2571.2A.2). Precon date _____ Documentation turn in date _____ If late, _____days x $200 = $ _____	5%	
Mobilize: * Provide 24-hour notice prior to beginning work. Notify the Engineer immediately if plans change. Move initial planting hole and bed preparation equipment and supplies to the Project site.		**NOTE:** Work performed without notice is unauthorized (2571.3A.3). Record notifications in project diary.	3%	
Vegetation Protection * Protect or avoid existing plants (in accordance with 1712, 2031, 2557, & 2572). Install temporary fence if deemed necessary.		Determine if equipment or operations endanger existing vegetation to remain? Y_____ N _____ Consult Technical Advisor to assess any damage	Entire 10% or greater (based on damage appraisal) 2%	
Inspector _____ **Date** _____ **Engineer** _____ **Date** _____			*10%	

Notes:

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PREPARATION OF PLANTING HOLES & BEDS CHECKLIST (2571.3A, C & D) **S.P.** _____

Contractor Responsibility	Date	MnDOT Responsibility	*Payment Guidelines	
			Max %	Actual Amt.
Provide **24-HOUR NOTICE** prior to beginning work or when changing operations (2571.3A.2). Notify the Engineer immediately if plans change.		Date of first 24 hour notice. **NOTE**: Work performed without notice is unauthorized (2571.3A.3).	1%	
Layout and stake planting beds and isolated plant locations (2571.3C). Review staking for conflicts with: * Buried utilities and Overhead lines. * Sight corners & sign visibility. * Wet, slowly draining, or low spots. Contact Gopher State One Call.		Plants located outside sight corners, clear zone, & utility lines. Y_____ N _____ Approve staking. Y _____ N _____ Contact Technical Advisor with any questions.	2%	
Weed Control & Soil Cultivation (2571.3D.2) Soil moisture must be at field capacity or drier before working. If too wet, cultivation will destroy the soil structure. **Steps:** 1 Mow one week prior to herbicide application. 2 Submit copies of labels & valid pesticide applicator license to Engineer 3 days prior to herbicide application. 3 Spray and kill all turf & weeds in specified areas. 4 Complete successful competency test in one planting bed and one tree planting area. 5 Cultivate in place soil to 12" depth. 6 Incorporate 4" of compost and other specified soil additives to a depth of 16". 7 Measure compaction levels, not to exceed 200 psi to a depth of 16". 8 Measure percolation rate if necessary to verify adequate drainage. 9 Install temporary erosion control measures. v		Date herbicide labels submitted. _____ Applicator is licensed for types A & J Commercial. Y_____ N _____ Weather conditions are suitable on spraying date. Y_____ N _____ Verify competence in cultivating & incorporating soil additives (2571.3D.2 step 4). Required depth: 16" including 4" of compost, plus any other additives. Planting hole competency test acceptable Y_____ N _____ Planting bed competency test acceptable. Y_____ N _____ Soil moisture at or below field capacity. Y_____ N _____ Compaction tester available. Y_____ N _____ Soil Reading _____ _____ Compacted Soil. Y_____ N _____	10%	
Comply with NPDES Permit Part IV (Construction Activity Requirements)		Verify Contractor compliance of NPDES work. Notify Contractor in writing of non-conforming work.	2%	
Inspector _____ **Date** _____ **Engineer** _____ **Date** _____			*15%	

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STORM WATER POLLUTION PREVENTION IMPLEMENTATION CHECKLIST (1717, 2573, 2574, 2575)
S.P. _____

Contractor Responsibility	Date	MnDOT Responsibility
NPDES Permit – Must be provided if the cumulative soil disturbed is 1 acre or more (application is in proposal). Erosion control materials list. Identify Erosion Control Supervisor:- _____ Erosion Control Supervisor responsibilities: * Coordinating erosion and sediment control measures and preparing weekly schedule. * Attending construction meetings with regard to NPDES log and other related issues. * Ensuring that Federal, State and Local regulations are followed.		Verify if NPDES Permit is required at the Preconstruction conference (see Plan/Proposal). Y_____ N _____ Review erosion control materials list (on Certificate of Compliance). Refer to Preconstruction conference checklist.
Erosion Control – Best Management Practices (2573.3, 1717) Comply with NPDES permit & SWPPP. * Ensuring that all erosion/sediment control work is functioning effectively and installed in a timely manner. * Ensuring that proper cleanup occurs and that erosion control devices are removed at the end of the Contract and damaged turf restored. * Install and maintain erosion control devices according to plan (mulch, seed, blanket, etc). * Submit site plans as needed detailing proposed erosion and sediment control measures. **Sedimentation Control – Best Management Practices (2573.3, 1717).** Comply with NPDES permit * Devices installed and maintained according to Plan & Specifications. _____ Silt fence* _____ Mulch _____ Sedimentation trap* _____ Sediment Control Log _____ Erosion Control Blanket _____ Inlet Protection* _____ Culvert End Control* _____ Stabilized Construction Exit* _____ Spill Kits _____ Other * Remove devices upon completion.		Determine seasonal restrictions (ex. Dormant wattles, fall prep left open on steep slope, etc.) Y_____ N _____ Verify erosion control devices installed/maintained according to Plan. Y_____ N _____ Verify Sediment Control devices are removed at completion or left to biodegrade (blanket, bioroll mulch). Y_____ N _____ **NOTE:** **NOTIFY CONTRACTOR IN WRITING OF NON-CONFORMING NPDES WORK.**

Inspector _____ **Date** _____
Engineer _____ **Date** _____

*Partial initial payment. Maximum eligible percentage/amount. Pay up to this amount if work is acceptable. The suggested payment percentages are guidelines and do not obligate MnDOT to provide interim payment until operations are complete.

PLANT STOCK ACCEPTANCE CHECKLIST (2571.2A & 3861)		S.P. _____
Contractor Responsibility	**Date**	**MnDOT Responsibility**
Provide Notices (2571.3A.2) 3-day notice prior to plant stock delivery.		Date Notified **NOTE:** Work performed without notice is unauthorized (2571.3A.3).
Plant Stock Documentation (2571.2A.2 & 3861) Required no later than 1 week prior to planting: * MN Department of Agriculture documentation for plants from quarantine areas. * Revised MnDOT Certificate of Compliance for Plant Stock, Landscape Materials, and Equipment (if needed). * Documentation verifying the seed or root stock source is MN-hardy if plants not grown for last 2 years within the specified growing range limits. * Written documentation if plants are unavailable. For each supplier provide: * Valid Dealer/Grower certificates. (License) * Documentation from the appropriate regulatory official from the State of origin for regulated pests (e.g. Gypsy moth, Emerald Ash Borer). Must be current and signed. Required at plant stock delivery. * Bills of lading (shipping papers). Required prior to payment: * All of the above, plus invoices.		**NOTE:** Work performed without Plant Stock Documentation is unauthorized. (2571.3A.3) Documentation is completed and supplied as specified. Y_____ N _____ Documentation turn in date. Date plants delivered. * Compare Certificate with invoices, bills of lading to verify plant health, hardiness, and regulated pest inspection. * Accept substitutions only if previously approved & documented. Date shipping papers received. Date invoices received.
Delivering & Storing Plants (2571.3E) * Ventilate plants to prevent overheating. * Maintain cool and humid environment for bare root plants to prevent breaking dormancy, unless species requires sweating. * Cover plants during transport. * Label individual plants and bundles. * Protect plants from sun, wind, heat, etc. * Install plants on delivery day. * If unable to install immediately, store plants to keep roots moist. * Handle all plants by the soil ball or container, not by the branches or trunk.		Verify: Plants protected during transport. Y_____ N _____ Plants protected while handling. Y_____ N _____ Plants protected during on-site storage. Y_____ N _____ **NOTE:** Reject plants with unacceptable delivery or storage methods.

PLANT STOCK ACCEPTANCE CHECKLIST (2571.2A & 3861) - CONTINUED **S.P.** _____

Contractor Responsibility	Date	MnDOT Responsibility
Provide plants that: * Meet or exceed the minimum size, branching, caliper and root/soil ball requirements. * Have a minimum 4" previous year's shoot growth. * Are dormant if bare root. * Are conifers that are not candled or if candled ONLY if they are **NOT** wilted or limp. * Have healthy, viable buds which are green when split open. **EXCEPTIONS**: buds of honeylocust, willow, Kentucky coffeetree, potentilla, and spirea are small and hard to see or are hidden. * Have no wounds or cracks unless they are small superficial cuts or abrasions which do not penetrate through the outer bark. * Have no cankers. * Have pruning cuts less than 1" diameter on the lower 6 feet of the trunk; intact branch collars; no branch stubs. * Have white or light-colored roots when scraped and are moist, mold-free, and rot-free. * Have intact soil balls with a root flair no more than 4" deep, no more than 10% off center and with roots that fill the soil, if B&B or container. * Have roots that are balanced, and are not encircling and not extending 4" beyond ball or container. * Are free of insects and disease. * Are from state-inspected nurseries and within the acceptable growing range limits. * Meet minimum spade size requirements for machine moved transplants. Remove rejected plants from the Project site.		Inspect Plants: * Randomly check individual plants (container and B&B) and open random bare root plant bundles. * Break open random soil balls of container and B&B plants to confirm root compliance. * Look at a representative sampling for compliance with the requirements listed under **CONTRACTOR RESPONSIBILITY**. * If you see any non-compliance, examine other plants to see if problems are widespread. **NOTE:** Reject plants that do not meet the requirements and confirm the Contractor has removed them from the Project site.
This is part of Initial Planting Operations (2571.5C.3)		**Date** **Inspector** _____ _____ **Engineer** _____ _____
Notes:		

*Partial initial payment. Maximum eligible percentage/amount. Pay up to this amount if work is acceptable. The suggested payment percentages are guidelines and do not obligate MnDOT to provide interim payment until operations are complete.

INITIAL PLANTING OPERATIONS CHECKLIST (2571.3F)`			**S.P.** _____	
Contractor Responsibility	**Date**	**MnDOT Responsibility**	***Payment Guidelines**	
			Max %	**Actual Amt.**
Plant Stock Documentation for required materials (2571.2A.2 & 3861) See Plant Stock Acceptance checklist.		Documentation completed and supplied as specified. Y_____ N _____ **NOTE:** Assess a daily charge of $200 if Plant Stock Documentation is not provided as specified. (2571.2A.2). If late, _____ days x $200 = $ _____	4%	
Provide Notices (2571.3A.2). * 24-hour notice when changing operations. * Planting must occur within a Plant Installation Period (PIP). *Notify the Engineer immediately if plans change.*		**NOTE:** Work performed without plant stock documentation or without notice is unauthorized (2571.3A.3). * Record notifications in project diary.	3% cumula-tive	
Complete successful plant installation competency test. * Soil moisture must be at or below field capacity to avoid destroying the soil structure. * Appropriate spading equipment. * Cultivation depth. * Amendments to soil. * Install one plant for each pay item or root category applicable to the project (2571.3F1).	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	**APPROVE COMPETENCY TEST** before allowing further work: * Coniferous Tree B&B * Coniferous Tree Cont. * Deciduous Tree B&B * Deciduous Tree B.R. * Deciduous Tree Cont. * Coniferous Shrub Cont. * Deciduous Shrub Cont. * Deciduous Shrub B.R. * Seedling * Vine * Perennial * Tree spade * Percolation rate (if needed)	2%	
Deliver & Store Plants (2571.3E). See Plant Stock Acceptance checklist.		Plant storage is acceptable. Y_____ N _____		
INSTALL PLANTS according to 2571.3F and MnDOT Standard Planting Detail A in Plan (planting hole dimensions). Plant prep prior to placement specific to stock type according to Standard Planting Details in plan. Alternative planting methods as needed according to Standard Planting Detail in plan.		Verify plants are installed as specified. Y_____ N _____ Alternative planting employed. Y_____ N _____ Keep records of unacceptable work.	20%	

INITIAL PLANTING OPERATIONS CHECKLIST (2571.3F) - CONTINUED		S.P. _____		
Contractor Responsibility	**Date**	**MnDOT Responsibility**	***Payment Guidelines**	
			Max %	**Actual Amt.**
Provide Initial Watering and Backfill (2571.3G) Watering equipment and forces must be available on the Project until all initial plant installation operations have been accepted. **First watering: thoroughly water each plant within 2 hours of installation to settle soil and fill voids.**		Watering equipment available during installation operations. Y_____ N _____ Plants are positioned at proper depth, are plumb, and with no soil air-voids. Y_____ N _____	5%	
Mulch plants (2571.3H) Place mulch within 48 hours after plant installation, unless delays are authorized due to excessive soil moisture. * Perennials depth 2" – 4" * All others depth 4" – 6" ***EXCEPTION: On slopes steeper than 3:1 above Special Waters, mulch placement must occur within 3 days of exposing soil.**		Verify soil is raked level and clods removed prior to placing mulch. Y_____ N _____ Mulch at proper depth. Y_____ N _____ SWPPP compliance. Y_____ N _____	5%	
Protect plants (2571.3I) Install rodent guards, paint, staking & guying, & tree shelters, as specified.		All rodent guards installed. All listed trees painted. All staking & guying installed. All tree shelters installed.	2%	
Clean up the Site (2571.3J) Remove all debris (twine, unearthed rocks/ debris, pots, burlap, nails, labels, trash, etc.) from Project. Sweep tracked soil from adjacent paved surfaces.		Site cleanup complete.	2%	
Restore/Repair the Site (2571.3J(2)) * Restore any compacted soil. * Repair all rutted/damaged turf with the specified or in place seed mixes/sod.		Compaction correction required (2105.3G). Y_____ N _____ All turf repaired. Turf mixes:_____ Sod: _____	2%	
		If at any time the Planting Operations are non-compliant, assess $200/day until the Contractor achieves compliance.		
Completed (2571.5C.3) **Inspector** _____ **Date** _____ **Engineer** _____ **Date** _____			*45%	

*Partial initial payment. Maximum eligible percentage/amount. Pay up to this amount if work is acceptable. The suggested payment percentages are guidelines and do not obligate MnDOT to provide interim payment until operations are complete.

PLANT ESTABLISHMENT CHECKLIST (2571.3K) – YEAR ONE **S.P.** _____

Contractor Responsibility	Date	MnDOT Responsibility	*Payment Guidelines	
			Max %	Actual Amt.
Provide 24-hour notice prior to beginning or changing operations (2571.3A.2). Notify the Engineer immediately if plans change.		Keep notifications for all plant establishment activities.	1%	
Maintenance and Scouting (2571.3K.2) * Scout to assess plant health and the landscape project condition. * Submit required scouting reports. * Water plants. Maintain adequate, but not excessive soil moisture. * Repair, adjust, or replace staking & guying, planting soil, rodent protection, seedling shelters, paint, & other incidental items. * Maintain mulch depth at a minimum of 3" at all times. * Maintain healthy, vigorous plants, free from harmful pests and disease. * Remove dead plants on a continuous basis. * Maintain plumb plants. * Continuously keep all planting areas weed-free. Control weeds (top & root growth) & remove from the Project site; avoid spreading weed seeds. * Hand pull any weeds in mulch. * Remove State and County-listed noxious weeds to at least 5' beyond the mulch line. * Mow - Mow turf areas to at least 5' beyond mulch line when 9" tall. Mow no shorter than 4". Mow all Contractor- installed turf when 18". * Prune using the Shigo method. See Standard Planting Detail A. * Replace unacceptable plants within the month of May (spring planted projects) and within the month of September (fall planted projects). * Determine which plants need to be replaced. * Replacement requirements are the same as for initial preparation & planting - Provide plant stock documentation (2571.2A.2); and replace incidental materials as necessary to meet initial installation requirements. * Housekeeping - All rocks & debris must be stored in containers and disposed of properly throughout the project.		**Keep scouting reports & record dates:** June 1 ☐ 15 ☐ July 1 ☐ 15 ☐ Aug 1 ☐ 15 ☐ Sept 1 ☐ 15 ☐ Oct 1 ☐ 15 ☐ Nov 1 ☐ Dec 1 ☐ Jan 1 ☐ Feb 1 ☐ Mar 1 ☐ Apr 1 ☐ 15 ☐ May 1 ☐ 15 ☐ *Keep Photo documentation with Scouting Reports. Year One establishment requirements were continuously acceptable. Y_____ N _____ The Engineer may notify the Contractor in writing of non-compliance. The Engineer will assess a daily charge of $200 for non-compliance, on a calendar day basis, until the Contractor achieves compliance. (2571.3K2) _____ # of days x $200 = _____ Refer to Plant Stock Documentation Checklist for plant replacements. Documentation turn in date _____ Date plants delivered _____ Reject unacceptable plants. Verify compliance based upon scouting reports, random site visits, photo documentation and Contractor communication.	14%	
Completed (2571.5D) **Inspector** _____ **Date** _____ **Engineer** _____ **Date** _____			***15%**	

*Partial initial payment. Maximum eligible percentage/amount. Pay up to this amount if work is acceptable. The suggested payment percentages are guidelines and do not obligate MnDOT to provide interim payment until operations are complete.

PLANT ESTABLISHMENT CHECKLIST (2571.3K) – YEAR TWO **S.P.** _____

Contractor Responsibility	Date	MnDOT Responsibility	*Payment Guidelines	
			Max %	Actual Amt.
Provide 24-hour notice prior to beginning or changing operations (2571.3A.2). Notify the Engineer immediately if plans change.		Keep notifications for all plant establishment activities.	1%	
Maintenance and Scouting (2571.3K.2) * Scout to assess plant health and the landscape project condition. * Submit required scouting reports. * Water plants. Maintain adequate, but not excessive soil moisture. * Repair, adjust, or replace staking & guying, planting soil, rodent protection, seedling shelters, paint, & other incidental items. * Maintain mulch depth at a minimum of 3" at all times. * Maintain healthy, vigorous plants, free from harmful pests and disease. * Remove dead plants on a continuous basis. * Maintain plumb plants. * Continuously keep all planting areas weed-free. Control weeds (top & root growth) & remove from the Project site; avoid spreading weed seeds. * Hand pull any weeds in mulch. * Remove State and County-listed noxious weeds to at least 5' beyond the mulch line. * Mow- Mow turf areas to at least 5' beyond mulch line when 9" tall. Mow no shorter than 4". Mow all Contractor- installed turf when 18" tall. * Prune using the Shigo method according Standard Planting Detail A. * Housekeeping - All rocks & debris must be stored in containers and disposed of properly throughout the project. All replacement plants must receive 1 full year of Plant Establishment Work to be acceptable. When less than one year remains in the Contract, replace only if the Establishment Period is extended one full year.		**Keep scouting reports & record dates:** June 1 ☐ 15 ☐ July 1 ☐ 15 ☐ Aug 1 ☐ 15 ☐ Sept 1 ☐ 15 ☐ Oct 1 ☐ 15 ☐ Nov 1 ☐ Dec 1 ☐ Jan 1 ☐ Feb 1 ☐ Mar 1 ☐ Apr 1 ☐ 15 ☐ May 1 ☐ 15 ☐ Year Two establishment requirements were continuously acceptable. Y_____ N _____ The Engineer may notify the Contractor in writing of non-compliance. The Engineer will assess a daily charge of $200 for non-compliance, on a calendar day basis, until the Contractor achieves compliance. (2571.3K.2) _____ # of days x $200 = _____ Reject and remove from Project site unacceptable plants. Verify compliance based upon scouting reports, random site visits, and Contractor communication.	14%	
Completed (2571.5E) **Inspector** _____ **Date** _____ **Engineer** _____ **Date** _____			***15%**	

*Partial initial payment. Maximum eligible percentage/amount. Pay up to this amount if work is acceptable. The suggested payment percentages are guidelines and do not obligate MnDOT to provide interim payment until operations are complete.

FINAL INSPECTION CHECKLIST (2571.3L.4)		**S.P.** _____
Contractor Responsibility	**Insp. Date**	**MnDOT Responsibility**
As a condition for terminating the Plant Establishment Period and conducting the final inspection, the Engineer may require the Contractor to address deficiencies. On or about the date on which the Plant Establishment Period is terminated, the Engineer will make a final inspection of the Project. The Engineer will make a determination as to which plants will be accepted for payment at the contract unit price, at a reduced payment, or at no payment. Upon final acceptance the Contractor will not be required to provide any further care for the plantings. **Final Watering:** * Maintain adequate but not excessive moisture.		Review Project with Contractor and indicate compliance: Y_____ N _____
Protection (as shown in plan details): * Adjust rodent guards to meet initial planting requirements. * Apply fresh latex paint on specified trees, as needed. * Remove all staking & guying. * Adjust seedling tree shelters to meet initial planting requirements.		Y_____ N _____ Y_____ N _____ Y_____ N _____ Y_____ N _____
Mulching: Maintain a minimum depth of 3" at specified widths. * Widths = 3' radius from plant center for deciduous and evergreen trees and individual deciduous and evergreen shrubs. * Widths = 3' beyond edge plants for deciduous and evergreen shrubs * Vines (2' wide x 10' long). Mulch is not contaminated with soil or weeds.		Y_____ N _____ Y_____ N _____ Y_____ N _____
Weed Control: * Control weeds (top growth and roots) by hand pulling in all mulched area. No chemical application is allowed within 2 weeks of final inspection. * Control State and County-listed noxious weeds within 5' of mulched areas.		Y_____ N _____ Y_____ N _____
Mowing: * Mow to 5' beyond the mulch line if taller than 9". * Mow all turf establishment/repair areas if taller than 18".		Y_____ N _____ Y_____ N _____
Plants are free from harmful insects and disease.		Y_____ N _____
Form: * Plumb trees. * Well-balanced and full branching. * Establish central leaders on trees.		Y_____ N _____ Y_____ N _____ Y_____ N _____

FINAL INSPECTION CHECKLIST (2571.3L.4) - FINAL ACCEPTANCE		**S.P.** _____
Contractor Responsibility	**Insp. Date**	**MnDOT Responsibility**
Pruning: * Employ the Shigo method. Standard Planting Detail A * Remove dead, diseased, broken, or crossing branches.		Y_____ N _____ Y_____ N _____
Plants are vigorous: * New twig growth averages 4"+. * Buds are plump. * Leaf/needle size is average size and healthy color. * Proper wound closure.		Y_____ N _____ Y_____ N _____ Y_____ N _____ Y_____ N _____
Cleanup and Restoration: (2575) * Restore turf with appropriate seed/sod. * Properly dispose of weeds/pruning debris off site. * Remove dead or defective plants. * Remove debris and unearthed rocks from Project site.		Y_____ N _____ Y_____ N _____ Y_____ N _____ Y_____ N _____

Storm Water Management: (2573)
* Notice of Termination.
  * Prepare project for compliance review.
  * Remove all sediment control devices.
  * Sign Notice of Termination, then submit to Engineer verifying that all Clean Water Act requirements have been met.
		Min. 70% perennial cover
		Y_____ N _____
		Sediment control devices removed
		Y_____ N _____
		Sign & send notice to Contractor
		
		NOTE:
		Contractor signature required for Final Payment

***Payment is based on plant & NPDES acceptance (2571.5E & 2575)**		**Inspector** _____ **Date** _____ **Engineer** _____ **Date** _____
*See 2571.5E for final payment requirements and percentages.		

FINAL PAYMENT CHECKLIST (2571.5) **S.P.** _____

MnDOT Checklist for Payment (prepare one for each contract item) **Contract Item No.**

Assessments: if any, per 1506, 1717.2G, 2571.2A.2, 2571.3A.3, 2571.3K.2, 2573.3P.1, 2573.5B.2

Plant Contract Item Payment Criteria: Summary of Checklists

Basis of Payment (as eligible for acceptable work)		Max %		Actual %	Qty	Cont-ract Unit Price	Total $ (% x Qty. x Price)
Preconstruction Work	Supply required documentation	5	10				
	Mobilization	3					
	Vegetation Protection	2					
Preparation of Planting Holes & Beds	Provide 24-hour Notice	1	15				
	Layout & Staking	2					
	Weed Control, Mowing & Soil Cultivation	10					
	Comply with NPDES	2					
Initial Planting Operations	Plant Stock Documentation and Seed Labels	4	45				
	Provide 3-day & 24-hour Notices	3					
	Competency Tests	2					
	Install Plants, Transplants or Seeding	20					
	Initial Watering & Backfill	5					
	Mulch Plants	5					
	Protect Plants	2					
	Clean up Site	2					
	Restore/Repair Site	2					
Initial Payment per plant contract item	Subtotal	70					
	Assessments						( )
	Total Initial Payment						
Plant Establishment - Year 1- See year 1 checklist page B-9	Provide 24-hour Notice	1					
	Scouting Maintenance	14					
Year 1 (Interim Payment) per plant contract item	Subtotal	15					
	Assessments						( )
	Year One Payment						
Plant Establishment - Year 2- see year 2 checklist page B-10	Provide 24-hour Notice	1					
	Scouting Maintenance	14					
Year 2 Payment per plant contract item	Subtotal	15					
	Assessments						( )
	Year Two Payment						
TOTAL Plant Stock Payment for Contract Item # ----------							$

Comments:

Full Payment: (2571.5A) The Department will make full payment of 100 percent of the contract unit price for each plant the Engineer considers acceptable, upon inspection, if the Contractor fully achieves all Payment Criteria listed in the Plant Contract Item Payment Criteria: Summary of Checklists.

Contract Item #	Total $	Contract Item #	Total $	Contract Item #	Total $
2571.		2571.		2571.	
Column Total		Column Total		Column Total	
			Total of all three columns	Full Payment	

Reduced/No Payment: The Department will make a reduced payment or no payment of the Contract unit price for each plant in accordance with Table 2571-1 below.

Table 2571-1 Plant Installation: Condition of Acceptance

Condition of Acceptance	Reduced by %	Reduction $
The plant is acceptable at final inspection, the work met all initial installation requirements and is in compliance with the plant establishment requirements upon final inspection, but has not been continuously in compliance with plant establishment requirements.	5-20	
The plant is acceptable at final inspection and the work met all initial installation requirements, but is not in compliance with plant establishment requirements upon final inspection.	20-50	
The plant is acceptable at final inspection, but the work does not meet some initial vegetation protection or plant installation requirements.	Reduce payment to the extent the Engineer determines acceptable.	
The plant is not acceptable at final inspection, but the work continuously met initial installation and plant establishment requirements.	50-65	
The plant is not acceptable at final inspection, and the work has not been continuously in compliance with initial installation or plant establishment requirements.	100	
	Payment Reduced by	$

Bonus Payment: (2571.5F) When 90 percent or more of all plants installed within the initial plant installation period (PIP) and related contract operations have been acceptable continuously throughout the contract period; the Department will make a bonus payment of 10 percent of the total final contract price for plant installation and establishment. The Department considers replacement plants, replaced during the initial PIP, initially installed plants. Replacements made during the Plant Establishment Period (PEP) are not eligible.

Final Payment	Year 2 Payment			
	Payment Reduced by			( )
	Assessments			( )
	Bonus Payment (If Eligible)	10%	Of the total final contract price for plant installation and establishment	
	Other Contract Items/Extra Work			

Inspector _____ **Date** _____

Engineer _____ **Date** _____

Final Payment **$**

MnDOT Landscape Contractor Scouting Report April through October

Project Number _____ T.H. _____ Engineer's Name _____

Scouting Date _____ Person Scouting _____

Firm Name _____ Location on Plan Sheet number(s) _____

Signature of Certified LS Spec/Project Supervisor _____ Phone Number _____

Weather Conditions: Temp. _____ °F Precipitation since last report _____ " Wind _____ mph

Plant Establishment Task	Conditions Found – Work Performed	Date
Maintain adequate soil moisture: _____ Gallons of water applied. Test soil moisture with soil recovery probe: (check one) soil forms ball _____ soil crumbles _____		
Replace, adjust or repair staking and guying. Remove from Project at end of first year.		
Replace, adjust or repair rodent protection.		
Maintain plumb plants.		
Replace, adjust, or repair seedling shelters.		
Repaint tree trunks to first lateral branches, as needed.		
Maintain min. 3" depth mulch (_____" measured). _____ cubic yards of mulch applied to _____ depth.		
Inspect for harmful insects and disease, treat as needed.		
Maintain mulched planting areas free of weeds by hand pulling tops and roots. * Do not contaminate mulch with soil. * Remove all weed parts from Project. * Wick applied or granular herbicides must be applied according to Manufacturer's label.	☐ Pesticide Application Record Form	
Remove State and County-listed noxious weeds to at least 5' beyond mulch lines.		
Maintain turf between 4" and 9" ht. to a distance 5' beyond all mulch lines. Remove all weed parts from Project.		
Maintain contractor-installed turf between 6" and 18" ht.		
Prune dead, diseased, broken and crossing branches using the Shigo method. Remove debris.		
Plants missing due to theft, animal damage, etc.		
Replace unacceptable plants and incidental items as per initial planting requirements.		
Maintain erosion control devices. Remove synthetic erosion control devises at end of Contract and remove from Project.		
Remove dead plants from Project. Do not contaminate mulch with soil.		
Other / Comments		

MnDOT Landscape Contractor Scouting Report November through March

Keeping plants healthy using good horticultural practices (2571.3K.2)

Project Number _____ T.H. _____ Scouting Date _____

Engineer's Name _____

Firm Name _____ Location on Plan Sheet number(s) _____

Person Scouting _____ Phone Number _____

Weather Conditions: Temp. _____ °F Precipitation since last report _____ " Wind _____ mph

Plant Establishment Task	Work Performed and Location on Plan	Date
Snow Load Damage * Is future damage avoidable?		
Animal Damage		
Trees Missing (Theft)		
Vehicle Damage		
Weather-related Damage * i.e. Ice storms, heavy snow, frost crack, sunscald, winter browning, etc		
Rodent Protection Damage		
Prune dead, diseased, broken, and crossing branches using the Shigo method. Remove debris.		
Replace, adjust, or repair staking and guying. Remove from Project at end of first year.		
Maintain plumb plants		
Plants missing due to theft, animal damage, etc.		
Other / Comments		

Template for Contractors Applying Herbicides and Other Pesticides on Roadside Rights of Way

Pesticide Application Record (Minn. Statutes, Chapter 18B.37)

Applicator must have valid MN Commercial Pesticide Application Record in CORE and the category required by the pesticide label. All herbicide applicators must be licensed in the Right of Way category

APPLICATOR'S COMPANY NAME		APPLICATOR'S COMPANY ADDRESS		
TELEPHONE	FAX (Optional)	CITY	STATE	ZIP CODE
CUSTOMER'S NAME (Mn/DOT District Staff)		CUSTOMER'S ADDRESS (Mn/DOT District)		
TELEPHONE (Optional)	FAX (Optional)	CITY	STATE	ZIP CODE
DATE OF APPLICATION ____/____/____ (MONTH) (DAY) (YEAR)		TIME OF APPLICATION STARTED____ ☐ A.M. ☐ P.M. COMPLETED____ ☐ A.M. ☐ P.M.		

The information in the section below must be updated at least every two hours.

TIME									
TEMPERATURE									
WIND SPEED									
WIND DIRECTION									

The information in the section below should identify application site, start point and end point.

Trunk Highway	Start Mile Post	Direction of Travel	Start Time	End Mile Post	End Time	Chemical Applied (Include brand name and rate for multiple chemicals in tank mix)	Water present

BRAND NAME & EPA REG. NO.	Chemical Application Rate per Acre (Ounces)	Total Mix Used (Ounces)	UNITS TREATED (square feet or acres)

Comments:

APPLICATOR'S NAME (PRINT)	APPLICATOR'S LICENSE NUMBER	APPLICATOR'S SIGNATURE
APPLICATOR'S NAME (PRINT)	APPLICATOR'S LICENSE NUMBER	APPLICATOR'S SIGNATURE

State of Minnesota Department of Transportation
Certificate of Compliance for Plant Stock,
Landscape Materials, and Equipment

Project S.P. Number _____ Date _____

Highway No. _____ City _____

Project Engineer _____

Lead Company Owner _____

Certified Landscape Specialist _____ Cert. # _____

Work Phone _____ Home Phone _____

Mobile Phone _____ Fax _____

The Landscape Contractor acknowledges that he or she has thoroughly investigated the supply of plant stock specified on this project and has obtained firm commitments from all the growers/suppliers listed. These commitments assure that the specified plant stock will be delivered as required to complete the Contract.

If information changes, the Contractor shall furnish the Engineer a revised MnDOT Certificate of Compliance no later than one week prior to the proposed planting date. As a condition for delivery and approval of plant stock, this Certificate of Compliance states that all plant stock furnished by the Contractor on this project is in conformance with the current edition of the MnDOT Standard Specification for Construction, the Supplemental Specifications, the Plans and Special Provisions, and the Contract Administration Manual for MnDOT Landscape Projects.

The attached Plant Stock Schedule shall list the following information for all plant stock specified: plant species, variety, size, root type, quantity, and growing range, supplier name, address, phone number, and growing range USDA hardiness zone. This Certificate of Compliance documents that all plant stock furnished by the Contractor on this Project is Category A (grown and cultivated on state-inspected growing ranges, within the Acceptable Plant Stock Growing Range, for at least the last two years), or Category B (grown outside of the Acceptable Plant Stock Growing Range, only if the seed source or root and graft stock is certified and documented as originating within the Acceptable Range). All plant stock shall be hardy to the Minnesota zone where the project is located.

The Landscape Contractor certifies that the information provided herein is accurate to the best of his or her knowledge:

Name/Title (Print) _____

Signed: _____ Date: _____

State of Minnesota Department of Transportation
Certificate of Compliance for Plant Stock Schedule (3861)

Plant Name, Species, Variety	Size	Root	Quantity	Supplier Name, Address, Phone	Growing Range Hardiness Zone	Growing Range A or B

State of Minnesota Department of Transportation
Certificate of Compliance for Landscape Materials and Equipment

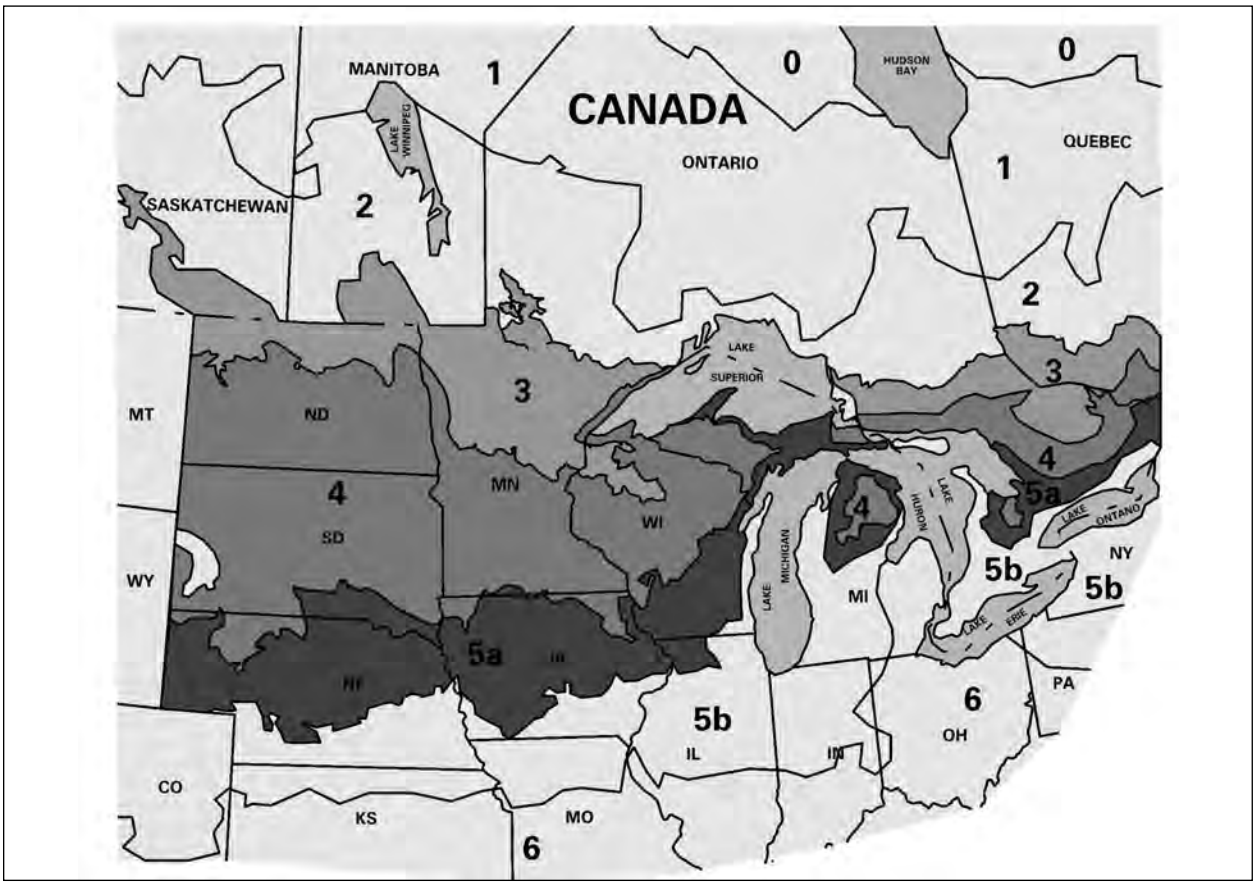
Landscape Materials		Supplier Name, Address, Phone
Compost (3890)	Grade	
Mulch (3882)	Type	
	Test Result	
Seed (3876)	Mix	
Storm Water Management (2573)	Material (silt fence):	
	Mulch Type	
	Blanket Category:	
	Other	
Pesticides *Attach additional sheets if more one applicator	Anticipated Pesticides	Applicator Name: _____ Applicator Co.: _____ Address: _____ Phone: _____ Applicator License No.: _____ License Category: _____ A _____ J
Fertilizers (3881)		
Soil or Root Additives (3896)		

Equipment List anticipated motorized/mechanized equipment. (Tractor, skid steer, etc.)	**Brand / Model #**

Required Equipment (Must be on Project at all times 2571.3A.4)	**Additional Landscape Specialists** MnDOT Certified Specialist(s) on Project	
	Certification #	**Name (Print)**
* Compaction Tester		
* Soil Probe		
* Caliper		

State of Minnesota Department of Transportation
Certificate of Compliance – Acceptable Plant Stock Growing Range

Acceptable Plant Stock Growing Range Limits Map



ACCEPTABLE ZONES		
ZONES	LEGEND	MIN. TEMP.
3		–34.4° TO –40° F
4		–28.9° TO –34.4° F
5a		–26.1° TO –28.9° F

UNACCEPTABLE ZONES	
ZONES	LEGEND
0, 1, 2, 5b and 6	

Preliminary Progress Schedule

Blank

Start Date/Duration

ACTIVITY	2014 March	April	May	June	July	August	September	October	November	December	2015 January	February	March	April	May	June	July	August	September	October	November	December	2016 January	February	March	April	May	June
MOBILIZATION																												
LAYOUT AND STAKING																												
WEED SPRAYING																												
PLANTING BED PREPARATION																												
PLANT INSTALLATION																												
PLANT PROTECTION AND MULCHING																												
PLANT ESTABLISHMENT																												
REPLACEMENT PLANTINGS																												

Note: Bar chart graphic delineation or footnotes should be used to clarify proposed starting dates and activity duration in days or weeks.

Sample

Project # _____ Location TH Y Anytown

Contractor Good Tree Planters Lead Certified Landscape Specialist Name _____ Cell _____

Start Date/Duration

ACTIVITY	2014 March	April	May	June	July	August	September	October	November	December	2015 January	February	March	April	May	June	July	August	September	October	November	December	2016 January	February	March	April	May	June
MOBILIZATION		12=																										
LAYOUT AND STAKING		14=																										
WEED SPRAYING		21==																										
PLANTING BED PREPARATION			05=																									
PLANT INSTALLATION			08==																									
PLANT PROTECTION AND MULCHING			11==																									
PLANT ESTABLISHMENT				16==========																								
REPLACEMENT PLANTINGS															7==													

Note: Bar chart graphic delineation or footnotes should be used to clarify proposed starting dates and activity duration in days or weeks.

Example:

1. **Anticipate beginning staking 04/14/14 – duration 7 days.**
2. **Anticipate beginning weed spraying 04/21/14 – duration 14 days.**
3. **Anticipate beginning soil prep 05/05/14 – duration 7 days.**

Please refer to Minnesota Pollution Control web site for most current forms.

http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/index.html

To complete online application form for an NPDES/SDS Stormwater Permit to construction activity.

Please refer to Minnesota Pollution Control web site for most current forms.

http://www.pca.state.mn.us/publications/wq-strm2-60.doc

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

CSW Notice of Termination/ Permit Modification Form

NPDES Construction Stormwater (CSW) Permit Program

Doc Type: Notice of Termination/Permit Modification

Purpose: Transfer or terminate your National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit. Allowable changes are permit termination and permit transfer for all or a portion of the site.

Questions: If you have questions about the administrative details of the permit process go to: http://www.pca.state.mn.us/publications/wq-strm2-60i.pdf or call the Stormwater Hotline at **651-757-2119 or 800-657-3804** (non-metro only).

Form will be invalid and returned to sender unless the checkbox associated with the applicable actions is checked and the corresponding signature is provided in section A-1, A-2, A-3, and/or A-4.

Submittals: You may either e-mail a signed and scanned PDF copy to csw.pca@state.mn.us, or you may mail a hard copy to:

Construction Stormwater Permit Program
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Existing Permit Identification

a. Current permit ID: C000 _ _ _ _ _ _ or MNR00 _ _ _ _ _ _

b. Project name: _____

Project location: _____

_____

Briefly describe where the construction activity occurs (for example, intersection of 45th St. and Irving Ave.). Include address if available.

Select Option 1, 2, or 3

☐ **1. Notice of Termination (NOT) for entire site by existing owner**

Select this option when a project has achieved Final Stabilization (according to Part IV.G of the Permit) with the existing owner/contractor and permit coverage for the site is being transferred to a new owner and all construction activity is complete.

Owner and contractor currently authorized under the permit must sign under the "Current" Owner (A-1) and "Current" Contractor (A-2) sections respectively.

☐ **2. Transfer of entire site to new owner or contractor (Transfer/Modification)**

Select this option if the ***entire*** site (represented by the ID above) has either a new owner and/or new general contractor. *"Current" Owner must authorize and sign for any and all changes. The "Current" Contractor needs to sign only if there is a "New" Contractor for the site. After the "Current" parties have signed their sections respectively, proceed to fill out the "New" Parties information in Section A-3 and/or A-4.*

☐ **3. Transfer of a portion of a site to a new owner or contractor (Subdivision)**

Select this option if *a **portion*** of a site (permitted under the ID above) has either a new owner and/or new general contractor. *"Current" Owner must authorize and sign for any and all changes. The "Current" Contractor needs to sign only if there is a "New" Contractor for the site. After the "Current" parties have signed their sections respectively, proceed to fill out the "New" Parties information in Section A-3 and/or A-4.*

Describe the portion of the site being transferred: Lot: _____ Block: _____

Project location/address: _____

City, State, and Zip: _____

Example: SW quadrant of 45th Street and Irving Avenue or Lots 1-17 of block 20. Include list of addresses if available or include a map

New Owner/Contractor Information

"New" Owner (A-3)

Business/Firm name: _____

Last name: _____ First name: _____ Title: _____

E-mail address: _____ Telephone: (___) _____ Ext. _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

Alternate contact:

Last name: _____ First name: _____ Title: _____

E-mail address: _____ Telephone: (___) _____ Ext. _____

"New" Contractor (A-4)

Business/Firm name: _____

Last name: _____ First name: _____ Title: _____

E-mail address: _____ Telephone: (___) _____ Ext. _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

Alternate contact:

Last name: _____ First name: _____ Title: _____

E-mail address: _____ Telephone: (___) _____ Ext. _____

Certification - All Parties Involved

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or the persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I also certify under penalty of law that I have read, understand and accept all terms and conditions of the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) General Stormwater Permit Construction Activity (MN R100001) that authorizes stormwater discharges associated with the construction activity identified on this form.

This Application must be signed by: ***Corporation:*** *a principal executive officer of at least the level of vice-president or the duly authorized representative or agent of the executive officer if the representative or agent is responsible for the overall operation of the facility that is the subject of the permit application.* ***Partnership or Sole Proprietorship:*** *a general partner or the proprietor.* ***Municipality, State, Federal or Other Public Agency:*** *principal executive officer or ranking elected official.*

Current Owner Authorized Representative (A-1)

By signing here, I certify the above statements to be true.

Print name: _____

Company: _____

Signature: _____

Date (mm/dd/yyyy): _____

Current Contractor Authorized Representative (A-2)

By signing here, I certify the above statements to be true.

Print name: _____

Company: _____

Signature: _____

Date (mm/dd/yyyy): _____

New Owner Authorized Representative (A-3)

By signing here, I certify the above statements to be true.

Print name: _____

Company: _____

Signature: _____

Date (mm/dd/yyyy): _____

New Contractor Authorized Representative (A-4)

By signing here, I certify the above statements to be true.

Print name: _____

Company: _____

Signature: _____

Date (mm/dd/yyyy): _____

Appendix C

The following explanation of clear zones, sight distances and adjacent outdoor advertising (billboards or business signs) is for ***INFORMATIONAL PURPOSES ONLY***!

If the Contractor feels there is a conflict between a planting location and a clear zone, sight distance and/or outdoor advertising device, they should contact the Engineer before doing any work. The Engineer will determine if any adjustment of the staking and/or layout is required and direct the Contractor as needed.

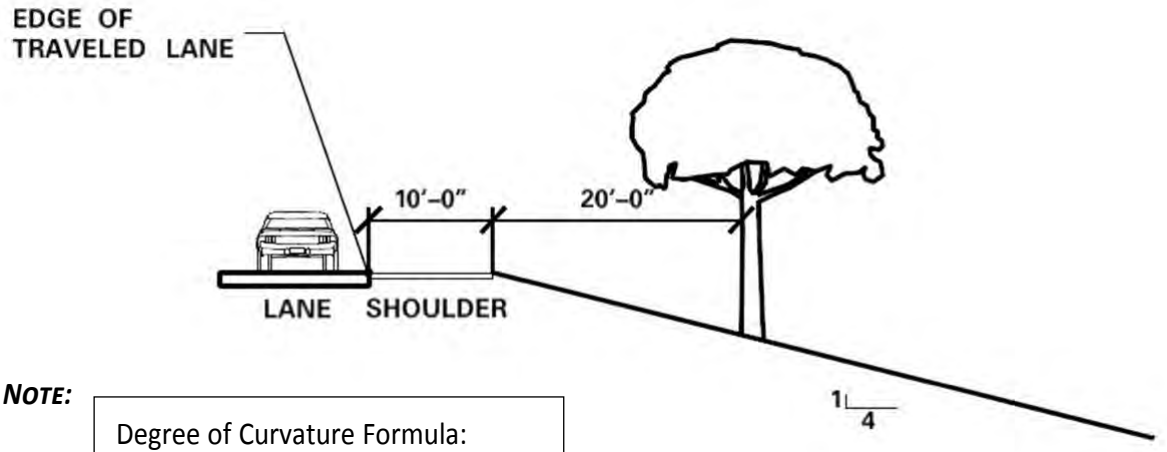
Clear Zone

The clear zone is the distance from the edge of the traveled lane which should be free of any non-traversable hazards, such as steep slopes or fixed objects. The following should be considered when determining the clear zone.

* Clear zone distances are targeted to permit about 80 percent of errant vehicles to recover or come to a stop.
* Clear zones are variable depending on design speed, degree of curvature, ADT (Average Daily Traffic), and the roadside geometry. Higher speeds and steeper slopes result in vehicles traveling farther before recovering. Horizontal curves increase the likelihood of a vehicle leaving the pavement and the distance it will travel off the highway. Higher ADT's translate into increased risk of a harmful event.
* Values are based on limited data and should be considered approximate. They do not represent a precise, absolute distance, nor should they be considered a boundary for introducing fixed objects. Introduced hazardous objects should be placed a discrete distance out from the computed clear zone to the extent practical.

60 mph design speed/ 2000-6000 ADT, 2° curve

Computed clear zone: 28 ft Available clear zone: 30



NOTE:

Degree of Curvature Formula:

$$D = 5729.58/R$$

WHERE:

D = Degree of Curvature

R = Radius of Curve, ft

Table 4-6.04A CLEAR ZONE DISTANCES (ft) Degree of curve TANGENT

DESIGN SPEED	ADT	CUT SECTION					FLAT	FILL SECTION				
		1:3	1:4	1:5	1:6	1:10			1:6	1:5	1:4	1:3
40 mph	< 1500	11	11	11	11	11	11	11	12	13	14	16
	1500 - 6000	13	13	13	13	13	13	13	14	15	16	17
	> 6000	14	14	14	14	14	14	14	15	16	17	19
45 mph	< 1500	11	13	14	14	14	14	14	15	17	20	37
	1500 - 6000	13	14	15	15	15	15	15	17	19	22	41
	> 6000	14	16	17	17	17	17	17	19	21	25	45
50 mph	< 1500	13	14	15	16	16	16	16	18	19	23	42
	1500 - 6000	14	16	17	18	18	18	18	20	21	26	47
	> 6000	16	18	19	20	20	20	20	22	24	29	52
55 mph	< 1500	15	18	19	20	22	23	23	25	29	33	76
	1500 - 6000	17	20	21	22	24	25	25	28	31	36	84
	> 6000	19	22	24	25	27	28	28	31	34	40	93
60 mph		17	21	23	24	25	26	26	29	31	38	87
	1500 - 6000	19	23	25	26	28	29	29	32	35	42	95
	> 6000	21	26	28	29	31	31	31	35	38	46	105
70 mph	< 1500	20	23	25	25	28	29	29	32	35	43	96
	1500 - 6000	22	25	27	28	30	31	31	35	39	47	106
	> 6000	24	28	30	31	33	34	34	38	42	51	116

*These slopes are considered to be traversable but non-recoverable and require special considerations.

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 2°

DESIGN SPEED	ADT	CUT SECTION					FLAT	FILL SECTION				
		1:3	1:4	1:5	1:6	1:10		1:10	1:6	1:5	1:4	1:3
40 mph	< 1500	12	12	12	12	12	12	12	13	14	15	17
	1500-6000	13	13	13	13	13	13	13	15	16	17	18
	> 6000	15	15	15	15	15	15	15	16	17	18	20
45 mph	< 1500	12	14	15	15	15	15	15	17	19	22	40
	1500-6000	13	16	16	16	16	16	16	19	20	24	45
	> 6000	15	17	18	18	18	18	18	20	23	27	49
50 mph	< 1500	14	16	17	18	18	18	18	20	22	26	48
	1500-6000	16	18	19	20	20	20	20	22	24	29	53
	> 6000	18	20	21	22	22	22	22	24	27	32	59
55 mph	< 1500	18	21	23	24	26	26	26	29	33	38	88
	1500-6000	20	23	25	26	28	29	29	32	36	42	97
	> 6000	22	25	28	29	31	32	32	35	40	47	107
60 mph	< 1500	21	25	27	29	31	31	31	35	38	46	104
	1500-6000	23	28	30	31	33	34	34	39	42	50	115
	> 6000	25	31	33	34	37	38	38	43	46	56	127
70 mph	< 1500	25	29	31	32	35	36	36	40	44	54	122
	1500-6000	27	32	34	35	38	40	40	44	49	59	134
	> 6000	30	35	37	38	42	44	44	48	53	65	147

*These slopes are considered to be traversable but non-recoverable and require special considerations.

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 3°												
DESIGN SPEED	ADT	CUT SECTION					FLAT	FILL SECTION				
		1:3	1:4	1:5	1:6	1:10		1:10	1:6	1:5	1:4	1:3
40 mph	< 1500	12	12	12	12	12	12	12	14	15	15	17
	1500-6000	14	14	14	14	14	14	14	15	16	17	19
	> 6000	15	15	15	15	15	15	15	16	17	18	20
45 mph	< 1500	13	14	16	16	16	16	16	17	19	23	42
	1500-6000	14	16	17	17	17	17	17	19	21	25	46
	> 6000	16	18	19	19	19	19	19	21	23	28	51
50 mph	< 1500	15	17	18	19	19	19	19	21	23	28	50
	1500-6000	17	19	20	21	21	21	21	23	25	31	56
	> 6000	19	21	22	23	23	23	23	26	28	34	62
55 mph	< 1500	19	22	24	25	27	28	28	31	35	41	94
	1500-6000	21	25	26	28	30	31	31	34	39	45	104
	> 6000	23	27	29	30	33	34	34	38	43	50	115
60 mph	< 1500	22	28	30	31	33	34	34	38	41	50	114
	1500-6000	25	30	33	34	36	37	37	42	46	55	125
	> 6000	27	33	36	37	40	41	41	46	50	61	138
70 mph	< 1500	28	32	34	35	39	40	40	44	49	59	134
	1500-6000	30	35	37	39	42	44	44	49	54	65	148
	> 6000	33	38	41	42	46	48	48	53	59	71	162

*These slopes are considered to be traversable but non-recoverable and require special considerations.

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 4°

DESIGN SPEED	ADT	CUT SECTION					FLAT	FILL SECTION				
		1:3	1:4	1:5	1:6	1:10		1:10	1:6	1:5	1:4	1:3
40 mph	< 1500	13	13	13	13	13	13	13	14	15	16	18
	1500-6000	14	14	14	14	14	14	14	15	17	18	20
	> 6000	15	15	15	15	15	15	15	17	18	19	21
45 mph	< 1500	13	15	16	16	16	16	16	18	20	24	44
	1500-6000	15	17	18	18	18	18	18	20	22	26	48
	> 6000	16	19	20	20	20	20	20	22	24	29	53
50 mph	< 1500	16	18	19	20	20	20	20	22	24	29	53
	1500-6000	18	20	21	22	22	22	22	25	27	32	59
	> 6000	20	22	23	25	25	25	25	27	30	35	65
55 mph	< 1500	20	23	26	27	29	30	30	33	38	44	100
	1500-6000	23	26	28	30	31	33	33	36	41	48	110
	> 6000	25	29	31	32	35	36	36	40	46	53	122
60 mph	< 1500	24	30	32	33	36	36	36	41	44	53	122
	1500-6000	26	33	35	36	39	40	40	45	49	59	135
	> 6000	29	36	39	40	43	44	44	50	54	65	148
70 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											

*These slopes are considered to be traversable but non-recoverable and require special considerations.

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 5°

DESIGN SPEED	ADT	CUT SECTION					FLAT	FILL SECTION				
		1:3	1:4	1:5	1:6	1:10		1:10	1:6	1:5	1:4	1:3
40 mph	< 1500	13	13	13	13	13	13	13	14	15	16	18
	1500-6000	15	15	15	15	15	15	15	16	17	18	20
	> 6000	16	16	16	16	16	16	16	17	18	19	22
45 mph	< 1500	13	16	17	17	17	17	17	19	21	24	45
	1500-6000	15	18	18	18	18	18	18	21	23	27	50
	> 6000	17	19	20	20	20	20	20	23	25	30	55
50 mph	< 1500	17	19	20	21	21	21	21	23	25	31	55
	1500-6000	19	21	22	23	23	23	23	26	28	34	62
	> 6000	21	23	24	26	26	26	26	28	31	37	68
55 mph	< 1500	22	25	27	29	31	31	31	35	40	46	106
	1500-6000	24	28	30	31	33	35	35	38	44	51	117
	> 6000	26	30	33	34	37	38	38	43	48	56	129
60 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
70 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											

*These slopes are considered to be traversable but non-recoverable and require special considerations.

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 6°												
DESIGN SPEED	**ADT**	**CUT SECTION**					**FLAT**	**FILL SECTION**				
		1:3	**1:4**	**1:5**	**1:6**	**1:10**		**1:10**	**1:6**	**1:5**	**1:4**	**1:3**
40 mph	< 1500	13	13	13	13	13	13	13	15	16	17	19
	1500-6000	15	15	15	15	15	15	15	16	17	19	21
	> 6000	16	16	16	16	16	16	16	17	19	20	22
45 mph	< 1500	14	16	17	17	17	17	17	19	22	26	47
	1500-6000	16	18	19	19	19	19	19	22	24	28	52
	> 6000	17	20	21	21	21	21	21	24	26	31	57
50 mph	< 1500	17	20	21	22	22	22	22	24	27	32	58
	1500-6000	20	22	23	24	24	24	24	27	29	35	65
	> 6000	22	24	26	27	27	27	27	30	32	39	71
55 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
60 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
70 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
*These slopes are considered to be traversable but non-recoverable and require special considerations.												

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 7°												
DESIGN SPEED	**ADT**	**CUT SECTION**					**FLAT**	**FILL SECTION**				
		1:3	**1:4**	**1:5**	**1:6**	**1:10**		**1:10**	**1:6**	**1:5**	**1:4**	**1:3**
40 mph	< 1500	14	14	14	14	14	14	14	15	16	17	19
	1500-6000	15	15	15	15	15	15	15	17	18	19	21
	> 6000	17	17	17	17	17	17	17	18	19	20	23
45 mph	< 1500	14	17	18	18	18	18	18	20	22	26	48
	1500-6000	16	19	20	20	20	20	20	22	24	29	53
	> 6000	18	21	22	22	22	22	22	24	27	32	59
50 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
55 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
60 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
70 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
*These slopes are considered to be traversable but non-recoverable and require special considerations.												

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 8°

DESIGN SPEED	ADT	CUT SECTION					FLAT	FILL SECTION				
		1:3	1:4	1:5	1:6	1:10		1:10	1:6	1:5	1:4	1:3
40 mph	< 1500	14	14	14	14	14	14	14	15	17	17	20
	1500-6000	16	16	16	16	16	16	16	17	18	20	22
	> 6000	17	17	17	17	17	17	17	18	20	21	23
45 mph	< 1500	15	17	18	18	18	18	18	21	23	27	50
	1500-6000	17	19	20	20	20	20	20	23	25	30	55
	> 6000	18	21	23	23	23	23	23	25	28	33	61
50 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
55 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
60 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
70 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											

*These slopes are considered to be traversable but non-recoverable and require special considerations.

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 9°

DESIGN SPEED	ADT	CUT SECTION					FLAT	FILL SECTION				
		1:3	1:4	1:5	1:6	1:10		1:10	1:6	1:5	1:4	1:3
40 mph	< 1500	14	14	14	14	14	14	14	16	17	18	20
	1500-6000	16	16	16	16	16	16	16	17	19	20	22
	> 6000	17	17	17	17	17	17	17	19	20	21	24
45 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
50 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
55 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
60 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
70 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											

*These slopes are considered to be traversable but non-recoverable and require special considerations.

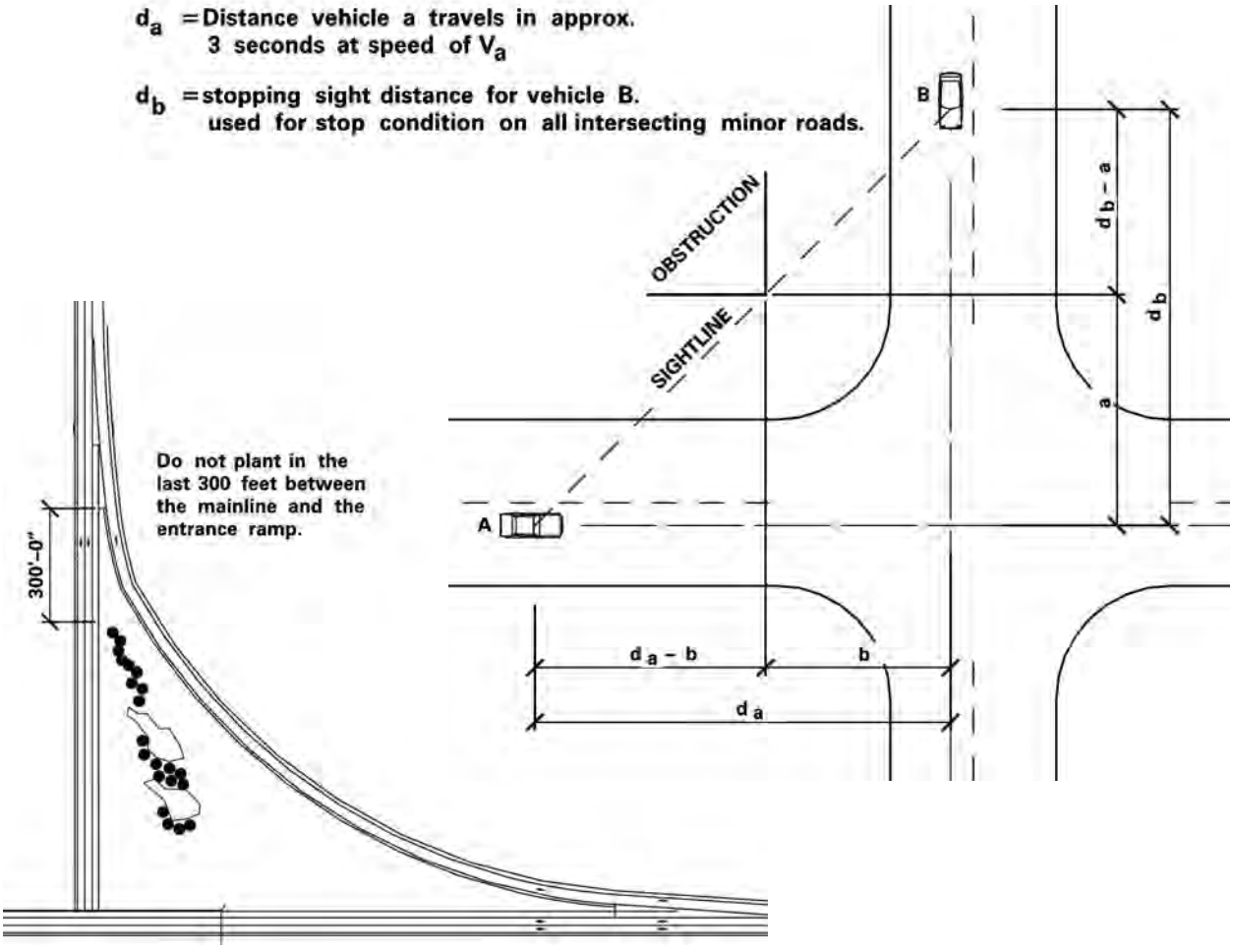
Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 10°												
DESIGN SPEED	ADT	CUT SECTION					FLAT	FILL SECTION				
		1:3	1:4	1:5	1:6	1:10		1:10	1:6	1:5	1:4	1:3
40 mph	< 1500	15	15	15	15	15	15	15	16	17	18	20
	1500-6000	17	17	17	17	17	17	17	18	19	20	23
	> 6000	18	18	18	18	18	18	18	19	20	22	24
45 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
50 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
55 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
60 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
70 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
*These slopes are considered to be traversable but non-recoverable and require special considerations.												

Table 4-6.04B CLEAR ZONE DISTANCES (ft) Degree of curve 11°												
DESIGN SPEED	**ADT**	**CUT SECTION**					**FLAT**	**FILL SECTION**				
		1:3	**1:4**	**1:5**	**1:6**	**1:10**		**1:10**	**1:6**	**1:5**	**1:4**	**1:3**
40 mph	< 1500	15	15	15	15	15	15	15	17	18	19	21
	1500-6000	17	17	17	17	17	17	17	18	20	21	23
	> 6000	18	18	18	18	18	18	18	20	21	22	25
45 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
50 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
55 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
60 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
70 mph	< 1500	Exceeds Maximum Allowable Curvature										
	1500-6000											
	> 6000											
*These slopes are considered to be traversable but non-recoverable and require special considerations.												

Sight Safety Distance, Sight Corner

A vehicle approaching or entering an intersection needs adequate sight distance to safely maneuver through intersections. Research has shown that of all intersection geometries which are related to accident history, sight distance was the most often mentioned contributing factor. Providing sufficient sight distance deserves special attention.

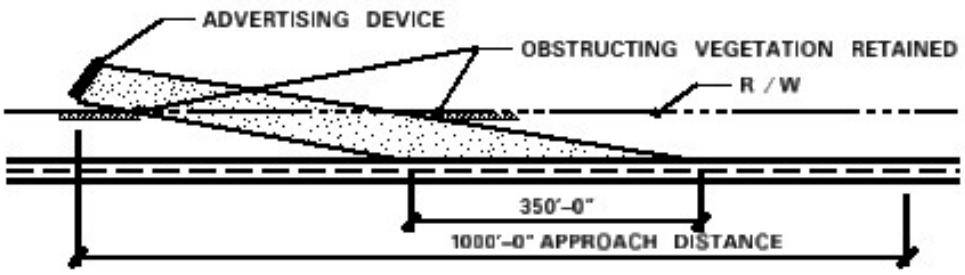
Stopping Sight Distance						
Design speed (mph)		30	40	50	60	70
Safe stopping distance (feet)		200	325	475	650	850
Distance Traveled in 3 Seconds						
Speed (mph)	20	30	40	50	60	70
Distance (feet)	90	130	185	220	260	310



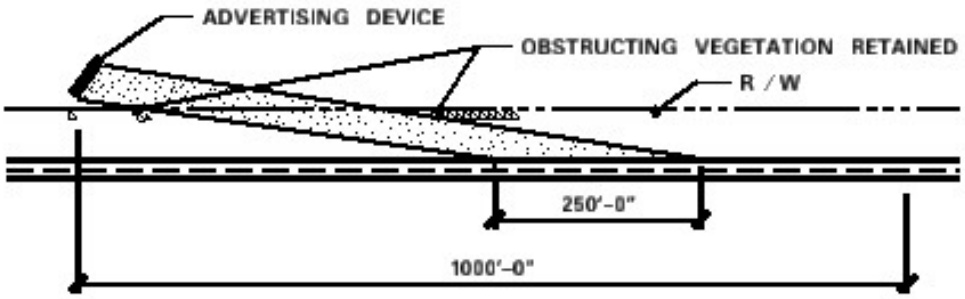
Outdoor Advertising

On projects with adjacent outdoor advertising devices (billboards or business signs) the following is the required sightline distances for unobscured viewing. Any proposed plantings that may interfere with these sightlines, initially or at maturity, should be brought to the attention of the Engineer. For more information refer to MnDOT Technical Memorandum titled “Guidelines for Responding to Requests for Managing Right-of-Way Vegetation Adjacent to Businesses and On-Premise and Off-Premise Advertising Devices”.

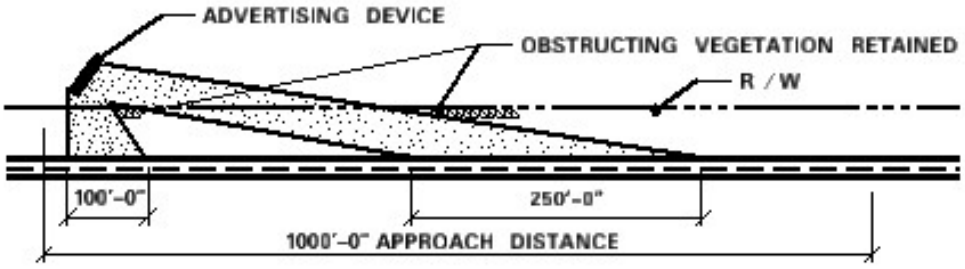
The viewing distances may be all one continuous segment or they may be divided into two segments with no less than 100 feet in either segment.



UNOBSTRUCTED DISTANCES FOR HIGHWAYS POSTED AT GREATER THAN 35mph



UNOBSTRUCTED DISTANCES FOR HIGHWAYS POSTED AT 35mph or LESS



UNOBSTRUCTED VIEWING DISTANCES MAY BE ALL ONE CONTINUOUS SEGMENT OR BE DIVIDED INTO TWO SEGMENTS WITH NO LESS THAN 100 FEET IN EITHER SEGMENT

NOT TO SCALE

Appendix D

MINNESOTA LAWS AND REGULATIONS PERTAINING TO NURSERY STOCK - THE PLANT PEST ACT

The Minnesota Department of Agriculture (MDA) is responsible for the enforcement of Minnesota ***Statute Chapter 18H Nursery Law*** (formerly known as The Plant Pest Act). Details of Chapter 18H can be found by visiting MDAs website (**http://www.mda.state.mn.us/** ->Plants/Pests -> Nursery Inspection and Certification). Another source for this information is provided by the Minnesota Office of the Revisor of Statutes (**https://www.revisor.mn.gov/statutes/**) and use the box in the left hand margin to 'Retrieve by number?' and type in "18H" to retrieve the entire chapter titled ***Nursery Law***.

Section	Title	Content of Interest
18H.02	Definitions	Subd. 6. Certified Nursery Stock Subd. 18. Nursery Certificate Subd. 20. Nursery Stock Subd. 21. Nursery Stock Broker Subd. 22. Nursery Stock Dealer Subd. 23. Nursery Stock Grower
18H.05	Nursery Certificate Requirements	Description of and use rules behind certificates.
18H.07	Fee Schedule	Certificate fees and additional fees.
18H.09	Nursery Stock Certification Requirements	Pertains to inspections.
18H.10	Storage of Nursery Stock	Maintain viability and vigor.
18H.11	Nursery Stock Standards	Sets ANSI Z60.1 as a standard when applicable.
18H.12	Damaged, Diseased, Infested or Misrepresented stock	Ensures quality nursery stock is available to consumers.
18H.15	Violations	
18H.18	Conservation of Certain Wildflowers	Pertains to collection of wildflowers potentially for sale.

SALE OF CERTAIN NURSERY STOCK

Roses Canewood must be alive and undamaged 8 inches from the graft. Any single stem not meeting this specification, disqualifies the entire plant. A bush can be pruned removing the dead or diseased canes provided at least one cane remains to qualify.

Dormant Stock It shall be required that dormant stock being held for sale be stored under conditions which will retard growth and protect viability. Dormant packaged roses, shrubs etc. are meant to be sold in a dormant condition. The material packed around the roots cannot provide the necessary nutrients to sustain growth. Therefore, dormant packaged material should be kept in a shaded cool area to keep them dormant. The shelf life is very limited for this type of stock. Proper handling can greatly extend the marketability.

Wild Nursery Stock It is a violation to sell or distribute nursery stock collected from the wild unless it has been officially inspected and labeled "Collected from the Wild". This collected stock may be grown in nursery rows for two years, inspected and sold without the collected tag.

Balled and Burlapped Stock It shall be required that balled and burlapped (B&B) stock held for sale be kept in moisture holding material not toxic to plants. This moisture holding material must adequately cover and protect the soil ball, and must be kept moist at all times.

Some of the pertinent sections are identified in the table below:

The inspection and certification program provides a vital service to the nursery industry. Annual inspections serve to reduce losses due to harmful pests as problems are detected and treated before they become big problems. The certified stock can move freely within the United States and special certifications are issued for export. A standard of quality is maintained to assure the industry as well as consumers that the product they purchase is viable and healthy.

Disease and Insect Pest Diagnosis and Control Guidelines

When inspecting plants for evidence of insects and/or diseases, follow the steps below:

Step 1 Identify the plant correctly. Most pests attack only certain plant species.

Step 2 Check the roots. Brown or black roots signal problems such as dryness or disease.

Step 3 Check appearance of the leaves or needles. Look for abnormalities such as size, condition, shape, and color of the foliage. Also, inspect foliage for signs of insect damage including frass, leaf mining, webbing, chewing which can leave holes, tattered edges or surface damage.

Step 4 Check trunk, limbs and shoots. Remove stem protectors and inspect for discolored or abnormal bark, wounds including mechanical damage, and/or small holes indicative of boring insects.

If you have found any insect or disease symptom in any one of these areas, note it in the Scouting Report and:

* During the contract period identify the nature and severity of problems as well as potential control methods using the following diagnostic pages. The diagnostic pages, while not all inclusive, will help determine potential treatment options or whether the damage or pest is grounds for rejection at initial or final acceptance.

or

* If you are uncertain of the reason for the abnormality, the Project Engineer or Inspector should call a Technical Advisor (Forester or Landscape Architect) for advice or a determination of the problem severity, impact, and control.

The Contractor, Project Inspector, and Technical Advisor must keep in mind that the presence of a pest or disease organism does not always require control measures.

Based on the region of the plant affected, the ***Diagnostic Key and Index*** pages provide a page number for a diagnostic sheet that may identify and further describe the pest including signs and/or symptoms to look for. Verify the diagnosis using the pictures and identification of the host plant(s) and determine what, if any, control option applies.

CONIFERS: DIAGNOSTIC KEY AND INDEX			
Region of Plant Affected	**Symptoms of Damage**	**Casual Agent**	**Diagnostic Sheet**
	Inner branch needles appear red or brown, current years new growth remains green.	Needlecasts	D-22
	Yellow to straw brown needles that are hollow.	Needleminers	D-8
	Part or all of needles chewed or missing	Caterpillars, Sawflies	D-7
	Brown spots or dead sections on needles adjacent to living tissue	Blights	D-20 to D-21
	Off colored needles, branches which may be sticky when touched.	Aphids, scales, spider mites, spittlebugs, adelgid	D-11 to D-13
	Brown dead needles, many may have fallen off. Sunken depressed and/or discolored areas on the tree trunk with white ooze flowing from the wound.	Canker	D-25
	White fungal fans forming between the bark and the wood around the tree base.	Decay organisms, Armillaria root rot	D-27
	Holes in the bark, tunnels under the bark, dieback or loss of needles	Borers, weevils	D-14 to D-16
	Bumps, or swollen projections on the trunk, branches or roots. Needles may be a rust color.	Gall rusts, white pine blister rust, cedar apple rust	D-23 to D-24

= Coniferous Needles

= Coniferous Main Stem or Branches

= Coniferous Tree (Entire)

= Roots

DECIDUOUS TREES AND SHRUBS: DIAGNOSTIC KEY AND INDEX			
Region of Plant Affected	**Symptoms of Damage**	**Casual Agent**	**Diagnostic Sheet**
	Spots on leaves. Spots may grow together.	Black spot, apple scab, anthracnose, cedar-apple rust	D-22 to D-24
	White or tan areas or trails winding inside the leaves causing the loss of the green pigment.	Birch leaf miner, elm leaf miner	D-8
	Part or all of the leaf chewed or missing.	Cankerworms, caterpillars, webworms, gypsy moth	D-9 to D-10
 	Part of the leaf is chewed or missing. Roots may appear to be chewed	Japanese beetle	D-10
 	Sudden wilting, blackening of foliage and/or stem	Fire blight, blight	D-21
 	Discolored, drooping, wilted, spotted leaves, with stunted new growth.	Aphids, scales, spider mites	D-13
 	Display of sparse or weak looking foliage. Localized dead areas on the twigs, branches, or trunk. These dead areas may appear sunken, discolored, cracked or raised.	Cankers, black knot	D-25

= Deciduous Leaves

= Deciduous Main Stem or Branches

= Deciduous Tree (Entire)

= Roots

DECIDUOUS TREES AND SHRUBS: DIAGNOSTIC KEY AND INDEX			
Region of Plant Affected	**Symptoms of Damage**	**Casual Agent**	**Diagnostic Sheet**
 	Extensive tip dieback with lots of sprouts coming out of lower tree trunk. The leaves are not uniformly shaped. These symptoms are occurring in a green, black or white ash tree.	Emerald Ash borer (EAB) Ash yellow	D-17 D-27
	White fungal fans forming between the bark and the wood around the tree base. Conks (mushrooms) on bark or around base of tree.	Armillaria root rot, decay organisms	D-27
	Holes in the bark, tunnels under the bark, bark swelling. Infested trees typically show extensive dieback.	Borers, weevils	D-15 to D-19
	Wilted chlorotic cup-shaped leaves. The sapwood under the bark is stained with brown streaks.	Verticillium wilt, oak wilt, Dutch elm disease	D-26
	Bumps or swollen projections on either the leaves, trunk or roots. Common on Oak leaves.	Gall forming insects, gall forming diseases, crown galls	D-13

= Deciduous Leaves

= Deciduous Main Stem or Branches

= Deciduous Tree (Entire)

= Roots

Diagnostic Sheets: Disease and Insect

INSECT DEFOLIATORS

There is usually a very limited time frame to actually observe insects feeding on foliage. Recognition should be based on characteristic feeding patterns and by remnants of insects such as pupa cases, cocoons and cast skins.

Yellow-Headed Spruce Sawfly

Photos by E. Bradford Walker, Vermont Department of Forests, Parks & Recreation, **www.forestryimages.org**

HOSTS: All spruce

SYMPTOMS: Larvae prefer new needles, but older larvae will eat previous season's needles when new foliage is scarce. Damage is usually from top down. Entire needles or parts of needles missing. Feeding begins in mid-May and continues until mid-July.

ACTIONS: Reject stock prior to installation. If pest appears after installation manual control or approved pesticide may be applied.

NOTE: Bacillus thuringiensis (Bt) will not affect sawflies. Sawfly larvae have 6 or more pairs of prolegs. Butterfly/moth larvae have up to 5 pairs of prolegs.

Pine Sawflies

European Pine Sawfly – Late April thru June, Red-headed Pine Sawfly – Mid-August through September.

HOSTS: Many species of pines; however, red and jack pines less than 15 feet tall are preferred.

SYMPTOMS: Larvae feed in groups and can defoliate branches or entire trees. Needles may be eaten completely.

ACTION: Reject stock prior to installation. If pest appears after installation manual control or approved pesticide may be applied.

NOTE: Bacillus thuringiensis (Bt) will not affect sawflies.

Redheaded Pine Sawfly, Photo by Gerald J. Lenhard, **www.forestryimages.org**

European Pine Sawfly, Photo by Dave Hanson, MnDOT.

Sawfly vdamage Photos by MnDNR

Pine Needleminers

HOSTS: Mugo, Scotch, and red pines

SYMPTOMS: Yellow to brown, hollow needles.

ACTION: Reject stock prior to installation. If pest appears after installation manual control or approved pesticide may be applied.

Archives, Connecticut Agricultural Experiment Station
www.forestryimages.org

Spruce Needleminers

HOSTS: All spruce species

SYMPTOMS: Look for groups of tan needles on the previous year's growth. Webbing appears among needles and a solitary hole at the base of each needle.

ACTION: Reject stock prior to installation. If pest appears after installation manual control or approved pesticide may be applied.

Typical damage

Adult miner

Photos from Christmas Tree Fact Sheet-The Ohio State University, David Shetlar Ph.D. OSU Entomology
http://bugs.osu.edu/index.html

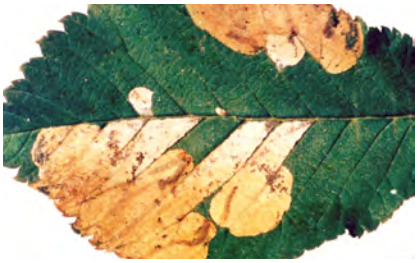
Leaf Miners

HOSTS: Wide range of hosts

SYMPTOMS: The green pigment within the leaf is gone. Blotch and serpentine mines.

ACTION: Reject stock prior to installation. If pest appears after installation manual control or approved pesticide may be applied.

Birch leaf miners
Steven Katovich, USDA Forest Service
Bugwood.org



Damage of elm leaf miner
Whitney Cranshaw, Colorado State University
www.forestryimages.org

Aspen Leaf Miner
(Serpentine mine)
Dave Hanson, MnDOT

Cankerworm

Hosts: Elm and apple preferred, but also affects hackberry, basswood, oak, boxelder, maple, ash, and deciduous shrubs

Symptoms: Young larvae eat holes in the leaves giving them shot hole appearance. Old larvae eat all leaf material except large veins.

Action: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Feeding damage to leaf and newly hatched larvae

Scott Tunnock, USDA Forest Service
www.forestryimages.org

Feeding on maple leaf

E. Bradford Walker, Vermont Department of Forests, Parks and Recreation
www.forestryimages.org

Forest Tent Caterpillar (FTC)

Hosts: Poplar, plum, cherries, apple, hawthorn, ash, birch, maple and oak

Symptoms: Larvae emerge early to mid-May. Larvae eat leaves except large veins. Larvae are blue with white exclamation points on the back. FTC does not make tents!

Action: Reject stock prior to installation. If pest appears after installation manual control or approved pesticide may be applied.

Caterpillar

Ronald Billings
Texas Forest Service
Bugwood.org

Heavy defoliation by forest tent caterpillar. Minnesota

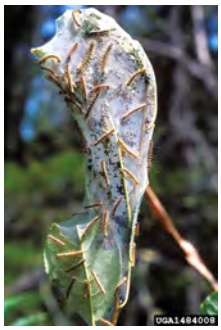
Steven Katovich,
USDA Forest Service
Bugwood.org

Fall Webworm

Hosts: Over 100 deciduous hosts including walnut, hickory, birch, chokecherry, poplar, crabapple, and linden.

Symptoms: Look for small webs (tents) in mid-July to late August.

Action: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.



Tent with larvae inside.

Steven Katovich, USDA Forest Service
www.forestryimages.org

Larvae

James B. Hanson, USDA Forest Service
www.forestryimages.org

Gypsy Moth

HOSTS: Oak and Aspen and hundreds of other plants

SYMPTOMS: May through July look for a dark, hairy caterpillar with 5 pairs of blue spots nearest the head then 6 pairs of red spots. In September through April, look for buff colored, fuzzy egg masses.

ACTIONS: In you believe you have found an egg mass, leave intact. If you find a caterpillar, place in jar with air holes and leaves. If you find either, contact MnDOT's RVM Unit at 651/366-3600.

Female moth laying eggs

Steven Katovich, USDA Forest Service
Bugwood.org

Late-Stage Larvae

Typical feeding damage caused by young larvae

USDA – APHIS, DPQ Archive
Bugwood.org

Japanese Beetle

HOSTS: Maple, linden, oak, elm, grape, fruit trees, viburnum, roses, turf and over 300 other species

SYMPTOMS: Adult beetles feed on leaves leaving large veins. Flowers and fruit are eaten completely. Larvae look like grubs and feed on roots, turf roots are preferred.

ACTIONS: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Adult beetle: white spots on side of body

Larvae (grub)

Photos from USDA- APHIS

SUCKING INSECTS

These insects are usually very small. They can attack either the leaves/needles or stem and branches.

Pine Needle Scale

HOSTS: White, red, Scotch, Austrian, and mugo pine, spruce, and fir

SYMPTOMS: Trees have grayish appearance with elongated white scales on the needles. Needles will drop.

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Heavy infestation on mugo pine

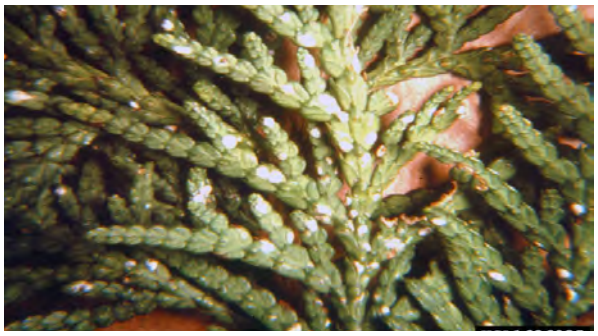
Scott Tunnock, USDA Forest Service
www.forestryimages.org

Juniper Scale

HOSTS: Juniper and arborvitae

SYMPTOMS: Dirty white scales on the underside of twigs. Branches yellowing and dying.

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.



White spots on the under side of leaves.

John A. Weidhass, Virginia Polytechnic Institute and State University
www.forestryimages.org

Spruce Spider Mite

HOSTS: Spruce preferred, but all conifers can be affected

SYMPTOMS: Trees with off-color needles and webbing present between needles.

ACTION: No control required.

Spider mites and webbing.

USDA Forest Service - Region 4 Archives
www.forestryimages.org

Cooley and Eastern Spruce Gall Adelgids

HOSTS: Spruces - white, black, Colorado, and Norway.

SYMPTOMS: Appearance of disfiguring pineapple or cone-like structures at the base of twigs (Cooley) or branch tips (Eastern).

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Cooley spruce gall adelgid galls

Whitney Cranshaw, Colorado State University
www.forestryimages.org

Spittlebugs

HOSTS: Scotch, red, and white pine, Norway, white, and black spruce, hemlock, balsam fir, and larch. Also on numerous perennials.

SYMPTOMS: Appearance of a foam like substance on either limbs or shoots.

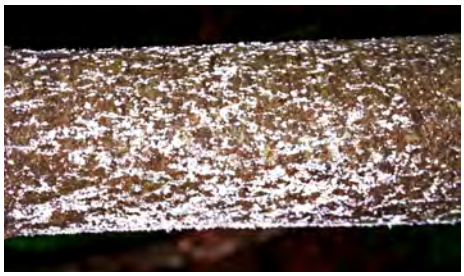
ACTION: No control required.

Pine Bark Adelgid

HOSTS: White, Scotch, and Austrian pine

SYMPTOMS: Main stems appeared to have been whitewashed.

ACTION: Reject and remove stock from project site if found at any time.



Infestation on stem

Steven Katovich, USDA Forest Service
www.forestryimages.org

Aphids

HOSTS: All deciduous, and coniferous trees and shrubs as well as numerous perennials.

SYMPTOMS: Cupped or curled leaves, witches' brooms, and/or spots on leaves. Yellowing of needles. Watch for ants and sooty mold. Ants feed on the sticky "honeydew" produced by aphids.

ACTION: No control required.

Aphids on leaf

Whitney Cranshaw, Colorado State University
Bugwood.org

Damage caused by green peach aphid

Two Spotted Spider Mite

HOSTS: All deciduous and coniferous trees

SYMPTOMS: Look for fine flecking or stippling on leaves or needles.

ACTION: No control required.

Whitney Cranshaw, Colorado State University
Bugwood.org

Oystershell Scale Insects

HOSTS: Apple, ash, aspen, cotoneaster, elm, lilac, and viburnum

SYMPTOMS: Clusters of visible scales on twigs, branches, or stem. Discolored and/or wilted foliage with dead or dying branches.

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Oystershell scale lifted to reveal eggs

Whitney Cranshaw, Colorado State University
www.forestryimages.org

Gall Forming Insects

HOSTS: Numerous deciduous trees and shrubs

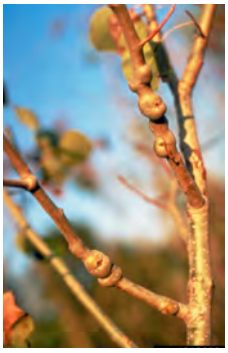
SYMPTOMS: Projections or galls growing on leaf surfaces, twigs, branches, or stems.

ACTION: No control required.

Horned oak galls

Saperda sp. Galls on aspen

Photos from MN DNR forest Pest Diagnostic Sheets January 1991



BORER INSECTS

These insects usually bore in and out of bark and wood as adults. Larvae tunnel under bark, disrupting the flow of water and nutrients. You will seldom see larvae unless you peel back the bark.

Zimmerman Pine Moth

HOSTS: Red, Scotch, mugo, ponderosa, white, and Austrian pine

SYMPTOMS: Dieback of upper portion of trees. Shiny, pinkish-yellow pitch masses on the stem. Stem is frequently swollen above whorl. Larvae are commonly found in pitch mass.

ACTION: Reject and remove stock from project site if found at any time.

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

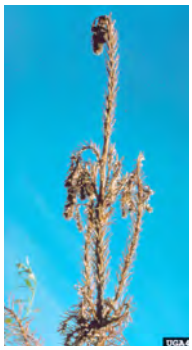
White Pine Weevil

HOSTS: White pine

SYMPTOMS: New weevil attacks become visible in early July when the terminal shoot suddenly wilts. The wilted terminal forms a very characteristic shepherds crook

ACTION: Reject and remove stock from project site if found at any time.

Exit holes and chip cocoons
(bark removed)



Shepherd's Crook of terminal

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Northern Pine Weevil

HOSTS: All pine and spruce are susceptible. Insects prefer weakened, stressed, or dying trees.

SYMPTOMS: Off-color, pale green or greenish-yellow to brown foliage. Candle shoot growth is reduced or may not occur. Elliptical 'chip' cocoon under bark. In late summer, 'shot holes' appear where adult weevil exits.

ACTION: Reject and remove stock from project site if found at any time.

Adult weevil

Chip cocoon

Photos from The Ohio State University
http://bugs.osu.edu/~bugdoc/Shetlar/factsheet/christmasstree/images/NorthPineWeevil/NorthPineWeev.PDF

Pine Engraver

HOSTS: All pine and spruce are susceptible. Insects prefer weakened, stressed, or dying trees.

SYMPTOMS: Star-like galleries under the bark. Frass – whitish or reddish dust-like frass clinging to rough bark or on the ground at the base of the tree.

Adult beetle

Ladd Livingston, Idaho Department of Lands
www.forestryimages.org

ACTION: Reject and remove stock from project site if found at any time.

Pine engraver damage.

William M. Ciesla, Forest Health Management International
www.forestryimages.org

Galleries on white pine

Robert L. Anderson, USDA Forest Service
www.forestryimages.orgy

Wood Borers

HOSTS: Many coniferous and deciduous trees and shrubs. Insects prefer weakened, stressed, or dying trees.

SYMPTOMS: Holes in bark and wood that may enter the heartwood. Frass of various colors and textures may be present.

ACTION: Reject and remove stock from project site if found at any time.

Wood borer on red pine larva and frass

Two types of wood borer exit holes

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Pine Root Collar Weevil

HOSTS: Scotch, red, Austrian, and white pine

SYMPTOMS: Entire tree turns yellow then reddish-brown. Black masses of pitch and soil around the stem just below leaf litter line. Root collar area will be considerably smaller in diameter than the stem.

ACTION: Reject and remove stock from project site if found at any time.

Fallen Pine

from Manfred Mielke

USDA Forest Service
Bugwood.org

Pitch encrusted soil

from Steven Katovich

Black Vine Weevil

Photos from Oregon State University

HOSTS: Yew, arborvitae, and hundreds of other species.

SYMPTOMS: Notches eaten out of leaves by adult weevil. Larvae strip bark off roots.

ACTION: Reject and remove stock from project site if found at any time.

Clearwing Borers (lilac/ash borer)

Frass and death of terminal leader caused by larvae

Adult clear wing borer

Photos by James Solomon, USDA Forest Service
www.forestryimages.org

HOSTS: Ash species, lilac, and many other deciduous species.

SYMPTOMS: Openings in the bark may have sap oozing. Sawdust and frass may be evident at openings, in bark crevices and at the base of plants. Advanced symptoms include swollen, cracked bark, and holes in stems or branches.

ACTION: Reject and remove stock from project site if found at any time.

Ash Bark Beetle

Galleries

Adult

Photos by James Solomon, USDA Forest Service
www.forestryimages.org

HOSTS: Ash species

SYMPTOMS: Adult beetles excavate egg galleries around twigs, branches and stem. Larvae create tunnels under bark, which run parallel to the grain.

ACTION: Reject and remove stock from project site if found at any time.

Emerald Ash Borer (EAB)

HOSTS: Ash species

SYMPTOMS: Canopy dieback. D-shaped exit holes caused by adults. Larvae make serpentine tunnels under the bark. Callus tissue may form over the larval tunnels which may cause vertical slits in the bark.

ACTION: If you suspect Emerald Ash Borer, leave tree in place, if you have found adult or larvae, place in container with lid and contact Mn***DOT'S RVM UNIT AT 651/366-3600.***

Galleries

USDA Forest Service
Publication NA-PR Resources
www.forestryimages.org

Heavily infested ash trees

Joseph O'Brien,
USDA Forestry Service

D-shaped exit hole

David Cappaert,
Michigan State University

Adult beetle

Howard Russell,
Michigan State University

Bronze Birch Borer

HOSTS: Paper birch, quaking aspen, willow, and cottonwood

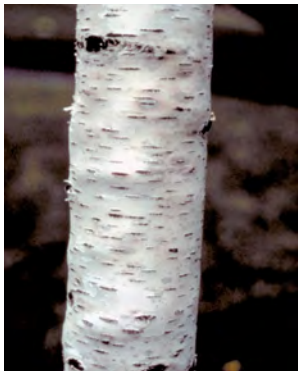
SYMPTOMS: Stems and branches appear swollen with raised ridges. Adult beetles create D-shaped exit holes.

ACTION: Reject and remove stock from project site if found at any time.

Etri, nissic maximena, Patquidinces

D-shaped exit holes

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991



Ridges in the smooth bark

Poplar and Willow Borer

HOSTS: Poplar, willow, and occasionally white birch

SYMPTOMS: First symptoms of attack are cracks and dead patches in the bark and holes chewed through the bark, usually on the lower part of the stem. Adults will feed on new shoots in the spring.

ACTION: Reject and remove stock from project site if found at any time.

Gyorgy Csoka, Hungary Forest Research Institute
www.forestryimages.org

Fabio Stergulc, University of Udine
www.forestryimages.org

Two-lined Chestnut Borer

HOSTS: Attacks all oaks, red oak is preferred.

SYMPTOMS: Adult beetles lay eggs on weakened oaks in late May and June. June to August, larvae feed on the inner bark of live branches and stems. Nutrient- and water-conducting tissues are damaged causing browning of foliage that will remain on the branches. Larvae create meandering galleries under the bark of infested branches or stems. Larvae are white with an enlarged head. Upon emergence, Adult beetles create D-shaped exit holes.

ACTION: Reject and remove from project site if found at any time.

Creamy white, segmented larvae of two-lined chestnut borer.

Callus material forming over larval galleries cause bark splits.

Weeping wounds with cankers beginning to develop.

Recently planted oak stems (painted white) responding to two-lined chestnut borer infestations.

Flatheaded Apple Tree Borer

HOSTS: Variety of deciduous trees, especially apple (flatheaded appletree borer), cotoneaster, dogwood, elm, linden, maple, oak, and willowv

SYMPTOMS: Larvae tunnel under bark causing cracks in the bark, from which sap will ooze. Branch dieback and oval exit holes may become evident.

ACTION: Reject and remove stock from project site if found at any time.

Sap flow

Photos by
James Solomon
USDA Forest Service
www.forestryimages.org

Larvae

Asian Longhorn Beetle

HOSTS: Variety of deciduous trees, especially maple, birch, ash, and willow

SYMPTOMS: Look for deep, perfectly round holes a little bigger than a pencil. Sap may be flowing out of these holes. Also look for unseasonable yellowing or dropping of leaves and branch dieback.

ACTION: If you suspect Asian Longhorn Beetle, leave tree in place, if you have found adult or larvae, place in container with lid and contact ***MnDOT's RVM Unit at 651/366-3600.***

Damage under bark

Dennis Haugen,
USDA Forest Service
www.forestryimages.org

Exit hole and adult beetle

Beetle is smooth and shiny black with white spots. Antennae have distinct white bands on each segment and are 1.5 to 2.5 times the body length.

USDA APHIS Archives, USDA APHIS
www.forestryimages.org

Note. Asian longhorn beetle looks similar to 2 native insects in MN

Whitespotted Sawyer Beetle

Beetle is rough and bronzy-black with mottled white to gray patches. Antennae are faintly banded gray and black and slightly longer on females. Male antennae are all black and much longer than the body.

Joseph Berger
www.forestryimages.org

Cottonwood Borer (rare in Minnesota)

Beetle is black with numerous white cross stripes formed by dense growths of white hairs. Antennae are solid black and nearly as long as the body.

Charles T. Bryson, USDA Agricultural Research Service
www.forestryimages.org

DISEASES

Blights

Brown Spot Needle Blight

Edward L. Barnard, Florida Department of Agriculture and Consumer Services
www.forestryimages.org

HOSTS: Scotch, ponderosa, red, jack, white, mugo, and Austrian pine

SYMPTOMS: Severely infected trees may have green needles only on the top few branches. Brown spots and bands form on the needles in late summer. The tips of the needles turn brown within a few weeks, then the entire needle turns brown and falls off. Most needle drop occurs before winter. Look for dark brown football-shaped fruiting bodies which protrude from infected needles.

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Diplodia Tip Blight

HOSTS: Austrian, Scotch, and sometimes red pine

SYMPTOMS: Look for scattered, blighted needle tips with resin formation on the lower branches and black spots at the base of needles located beneath the sheath. If tree has pine cones, look on the base of the cones for small black dots, especially cones on the ground.

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Multiple shoots infected

Early season infection

USDA Forest Service Archive
Bugwood.org

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Dothistroma Needle Blight

HOSTS: Austrian and ponderosa pines are preferred, but mugo pine is also susceptible

SYMPTOMS: Yellow to reddish-brown spots and bands on needles. Dead needle tips: spots and bands girdle needles, causing them to dieback from the tips. Branch defoliation and dieback, starting on lower branches and spreading upward within the tree.

Photos from Andrej Kunca
Forest Research Institute- Slovakia
www.forestryimages.org

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Fire Blight

HOSTS: Serviceberry, black chokeberry, crappapple cotoneaster, hawthorn, apple, ninebark, Potentilla, plum, rose, false spirea, and mountain ash

SYMPTOMS: Bacterial oozing, which looks like sap flow, during periods of high humidity. Blighted twigs and branches resemble a shepherd's crook. Leaves appear fire scorched.

ACTION: Reject and remove stock from project site if found at any time.

Infected twig showing shepherd's hook
Minnesota Department of Natural Resources Archives
Minnesota Department of Natural Resources
www.forestryimages.org

Blight

HOSTS: Chinese lilac, Japanese tree lilac, common lilac, plum, apple, rose, poplar, willow, linden, Norway maple, red maple, sugar maple, ash and Amur maple

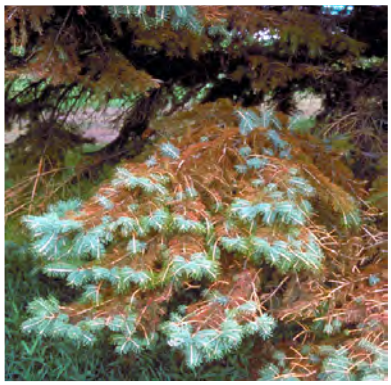
SYMPTOMS: Sudden wilting and blackening of leaves.

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Manfred Mielke
USDA Forest Service
www.forestryimages.org

Needlecasts

Rhizosphaera Needlecast



Another view of pattern & color

MN DNR Forest Pest Diagnostic Sheets January 1991

HOSTS: Colorado, white, and Black Hills spruce

SYMPTOMS: Needles become mottled yellow in late summer, then turn brown to purple-brown in late winter and the following spring, and drop off the tree during the following summer and autumn. Black, dot-like spores on infected needles (both green and discolored). Branch defoliation and dieback is from bottom-up and inside out pattern within the tree.

Fruiting bodies on upper needle

Michael Kangas
NDSU, North Dakota Forest Service

ACTION: Reject and remove stock from project site if found at any time.

Leaf Spots

Black Spot

HOSTS: Roses

SYMPTOMS: Black leaf spots are 1/16 to ½ inch in diameter with a yellow zone around the black spot. Early leaf drop.

Clemson University- USDA Cooperative Extension Slide Series
www.forestryimages.org

ACTION: Reject and remove stock from project site if found at any time.

Apple Scab

Apple scab on leaf

Photo: U of MN Plant Disease Clinic

HOSTS: Apple, crabapple, and hawthorn

SYMPTOMS: Look for dull smokey-olive green spots that change to velvety grayish dark olive-drab spots without a sharp outline on the leaves and fruit. Defoliation may occur.

ACTION: No control required.

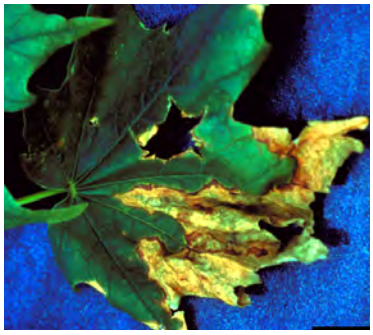
Anthracnose

HOSTS: Primarily ash, maple, oak, and walnut

SYMPTOMS: Leaves become spotted and drop prematurely (e.g. green ash). Spots can develop anywhere, will vary in size, and can grow together on the leaf surface. Spots can be light brown, purple, or black in color. Typically occurs during cool wet weather.

ACTION: No control required.

Oak anthracnose: close-up



Maple anthracnose

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Powdery Mildew

HOSTS: Most weeds, shrubs, fruit trees, and deciduous trees. Commonly found on Virginia creeper, lilac, grapes, poplar, willow, and apple trees during the growing season

SYMPTOMS: The leaves appear to turn a grayish-white color.

ACTION: No control required.

William M. Ciesla, Forest Health Management International
www.forestryimages.org

Rusts

Gall Rust of Pine

HOSTS: Pine, alternate host needed

SYMPTOMS: Galls can occur on branches and main stem.

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Rust pustules fruiting in May

Stem distortion from sweetfern blister rust canker

White Pine Blister Rust

HOSTS: White pine, alternate hosts are Ribes (currants / gooseberries)

SYMPTOMS: Elongated cankers on stems. Blisters appear on stems in spring.

ACTION: Reject and remove stock from project site if found at any time.

Flagged branch

Canker with spore-laden pustules

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Cedar-Apple Rust

HOSTS: Apples, crabapples, hawthorn, cotoneaster, serviceberry, Rocky Mountain junipers, eastern red cedar and Chinese junipers

Dry gall on cedar

Edward L. Barnard
Florida Department of Agriculture and Consumer Services
www.forestryimages.org

Wet gall on cedar

SYMPTOMS: On cedar, dimpled rust colored galls attached to leaves and stems. During warm humid conditions in late spring, the galls gelatinize and turn bright yellow-orange. On deciduous hosts, leaves have bright orange-yellow spots.

ACTION: Reject stock prior to installation. If pest appears after installation, manual control or approved pesticide may be applied.

Leaf Spots

Clemson University- USDA Cooperative Extension Slide Series
www.forestryimages.org

Cankers

Cytospora Canker

Hosts: Spruce and fir

Symptoms: Scattered branch defoliation and dieback that typically occurs on lower branches first and progresses from the branch tips inward. Cankers develop and are often covered by copious amounts of exuding sap.

Actions: Reject and remove stock from project site if found at any time.

Cytospora canker killing spruce branches

Cytospora canker: close-up

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Black Knot

Hosts: Plum, chokecherry, and black cherry

Symptoms: Look for the characteristic black knots on twigs branches or the stem. The knots vary from a ½ inch length to more than a foot and up to 2 inches in diameter.

Action: Reject stock prior to installation. If pest appears after installation manual control or approved pesticide may be applied.

Robert L. Anderson, USDA Forest Service
www.forestryimages.orgorg

Cankers

Hosts: All deciduous trees and shrubs

Symptoms: Localized dead areas on the branches, twigs, or trunk. Typically appear as sunken or raised lesions of varying size and discoloration. Cankers usually form around a dead bud, branch stub or stem wound.

Action: Reject stock prior to installation. If pest appears after installation manual control or approved pesticide may be applied.

Neonectria canker

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Hypoxylon canker on aspen

Wilts

Verticillium Wilt

Hosts: Maple, Ash, black locust, catapla, elm, linden, sugar and red maple, plum, chokecherry, Russian olive, currant, lilac, privet, sumac and viburnum and hundreds of other species.

Staining on twig

Clemson University- USDA Cooperative Extension Slide Series, www.forestryimages.org

Branches flagging

USDA Forest Service Archives, USDA Forest Service www.forestryimages.org

Symptoms: Wilted leaves and branches, chlorotic cup-shaped leaves and the death of infected branches. Peeling back the bark will reveal olive green to brown streaks, instead of the normal solid white sapwood.

Action: Reject and remove stock from project site if found at any time.

Oak Wilt

Hosts: Oak

Symptoms: Leaf bronzing, wilting and early shedding. A cross section of a branch shows discoloration often seen as small dark dots in cross section of stem.

Action: Reject and remove stock from project site if found at any time.

Bronzing and browning of leaves

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Infected oak with dieback

Dutch Elm Disease

Hosts: Elm

Symptoms: Wilted leaves and loss of foliage. A cross section of a branch shows discoloration, peeling back the bark reveals brown streaks instead of the normal solid white sapwood

Action: Reject and remove stock from project site if found at any time.

Closeup of leaves wilting

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Flagging branches on an elm

Rot

Armillaria Root Rot

HOSTS: Most species of deciduous and coniferous trees

SYMPTOMS: White fungal fans forming between the bark and wood around the tree base. Dark brown shoestrings on decayed wood or in the soil around the roots. Honey-yellow to brown mushrooms will form on diseased trees in the fall.

ACTION: Reject and remove stock from project site if found at any time.

Mycelial fan and pitching at root collar of pine

Rhizomorphs, also called "shoestrings"

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Other Diseases

Ash Yellows

HOSTS: Ash

SYMPTOMS: Top dieback with broom like sprouts growing from the main stem. Symptoms may mimic Emerald Ash Borer.

ACTION: Reject and remove stock from project site if found at any time.

USDA Forest Service – Forest Health Protech, St. Paul Archive

Stem Decay

HOSTS: All deciduous and coniferous trees and shrubs

SYMPTOMS: Look for fruiting bodies on the bark, a strong indication of stem decay and plants may have a hollow cavity inside the stem or branch.

ACTION: Reject and remove stock from project site if found at any time.

Fruiting bodies

Laetiporus sulphureus fruiting bodies

ABIOTIC FACTORS

Weather

Weather can cause structural injuries, disrupt physiological processes or cause death. Most often weather damage occurs when environmental conditions are extreme or untimely.

Hail damage

Paul Mistretta, USDA Forest Service

Lightning damage

Paul Mistretta, USDA Forest Service

Frost damage

USDA Forest Service, North Central Research Station Archive

Drought-induced mortality

MN DNR Forest Pest Diagnostic Sheets January 1991

Ice loading caused branch breakage

MN DNR Forest Pest Diagnostic Sheets January 1991

Winter burn

MN DNR Forest Pest Diagnostic Sheets January 1991

Winter injury to new growth

MN DNR Forest Pest Diagnostic Sheets January 1991

Elm leaf scorch

MN DNR Forest Pest Diagnostic Sheets January 1991

Wind damage

Steven Katovich, USDA Forest Service

Flood damage

MN DNR Forest Pest Diagnostic Sheets January 1991

Snow loading damage

MN DNR Forest Pest Diagnostic Sheets January 1991

Animals

Animals injure foliage, branches, stems or roots by feeding, rubbing or trampling.

Porcupine girdled stem

William M. Ciesla, Forest Health Management International

Sapsucker holes

Photos from MN DNR Forest Pest Diagnostic Sheets

January 1991

Squirrel peeled bark

Photos from MN DNR Forest Pest Diagnostic Sheets January 1991

Rabbit girdled stem

Photos from MN DNR Forest Pest Diagnostic Sheets

January 1991

Gopher destroyed roots

Photos from MN DNR Forest Pest Diagnostic Sheets

January 1991

Deer antler rub

David Mooter, Prairie Silvics, Inc

Bugwood.org

Beaver chewed stem

Photos from MN DNR Forest Pest Diagnostic Sheets

January 1991

Noxious Weeds

For more information:

http://www.mda.state.us/plants/pestmanagement/weedcontrol/noxiouslist.aspx

http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf

Noxious Weeds

For more information:

http://www.mda.state.us/plants/pestmanagement/weedcontrol/noxiouslist.aspx

http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf

Appendix E

Web Site Addresses

Minnesota Department of Transportation -- http://www .dot.state.mn.us

Plant Selector Web Site

http://www.dot.state.mn.us/roadside/plantselector/

Standard Specifications for Construction

http://www.dot.state.mn.us/pre-letting/spec/index.html

MnDOT's Office of Environmental Stewardship

http://www.dot.state.mn.us/environment/

1. MnDOT Seeding Manual

   http://www.dot.state.mn.us/environment/erosion/pdf/seedingmanual.pdf

2. Links to Environmental Technical Memorandums (lists approved vendors or wide-spreading changes to the Standard Specifications for Construction).

   http://www.dot.state.mn.us/environment/techmemos.html

MnDOT Active and Historical Technical Memoranda

http://techmemos.dot.state.mn.us/

Minnesota Department of Natural Resources -- http://www.dnr.state.mn.us/index.html

Forest Insect and Disease Newsletter: Minnesota DNR

http://www.dnr.state.mn.us/publications/forestry/index.html

Native Plant Nurseries and Native Vegetation Consultants List

http://www.dnr.state.mn.us/gardens/nativeplants/suppliers.html

Minnesota Department of Agriculture -- http://www.mda.state.mn.us/

Pesticide Applicators License

http://www.mda.state.mn.us/licensing/licensetypes/pesticideapplicator.aspx

Minnesota Shade Tree Advisory Committee -- http://www.mnstac.org/

USDA Forest Service, St. Paul Field Office -- http://www.fs.fed.us/

University of Minnesota -- http://www.extension.umn.edu/

Department of Forest Resource

http://www.forestry.umn.edu/index.htm

Pests of Trees and Shrubs

http://www.entomology.umn.edu/cues/IPM-trees/IPM-trees.html

Minnesota Crop Improvement Association -- http://www.mncia.org/

National Urban and Community Forestry Advisory Council --

http://www.fs.fed.us/managing-land/urban-forests/ucf/nucfac

The Simple Act of Planting a Tree - online version

http://www.treepeople.org/simple-act-planting-tree

International Society of Arboriculture -- http://www.isa-arbor.com/

Gopher State One Call -- http://www.gopherstateonecall.org

Appendix F

ABSCISSION – Forming of a breaking point that allows loosening and falling of leaves, flowers, and fruits from trees and shrubs, for leaves this occurs in the fall.

ABSORPTION – The intake of gas or liquids from the air or a solution.

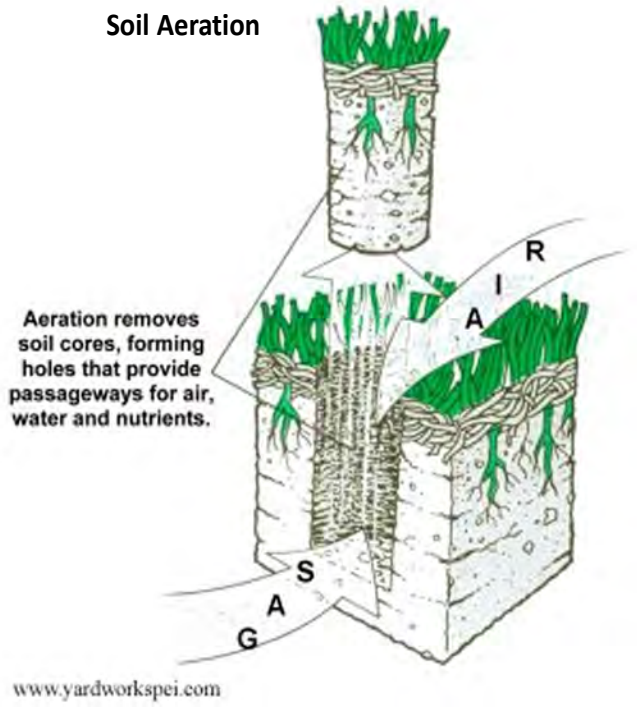
ACIDIC SOIL – Acidity describes an aspect of the soil's chemical reaction: the concentration of hydrogen ions (an ion is an electrically charged atom or molecule). The relative concentration of hydrogen ions is represented by a mathematical symbol called pH. A pH below 7 means soil is acidic.

Soils in areas with high rainfall tend to be acidic. Areas with light rainfall tend to have alkaline soil. Roadside soils are usually alkaline due to the high degree of construction disturbance. Add peat moss, ground bark, sulfur, or sawdust to increase soil acidity.

ACCLIMATE – To adapt to a new temperature, altitude, climate or environment.

ADVENTITIOUS – The formation of a root or shoot or bud that arise or occur sporadically in tissue which does not normally produce such structures in other than the usual location.

Soil Aeration



AERATION, SOIL – Process by which air in the soil is replaced by air from the atmosphere. In a well-aerated soil, the soil air is similar in composition to the atmosphere above the soil. Poorly aerated soils usually contain a much higher percentage of carbon dioxide and a correspondingly lower percentage of oxygen than the atmosphere above the soil. The rate of aeration depends largely on the size, volume, and continuity of pores from the surface and within the soil.

AEROBIC – Occurring only in the presence of molecular oxygen.

AESTHETICS – The philosophy pertaining to the nature, creation, and appreciation of desirable visual values or beauty.

ALKALINE SOIL – Alkalinity describes an aspect of the soil's chemical reaction: the concentration of hydrogen ions (an ion is an electrically charged atom or molecule). The relative concentration of hydrogen ions is represented by a mathematical symbol called pH. A pH above 7 is alkaline.

ANAEROBIC – Occurring in the absence of molecular oxygen.

ANNUAL – Plant which grows from a seed, tuber or bulb, produces flowers and fruit, and dies in a single growing season.

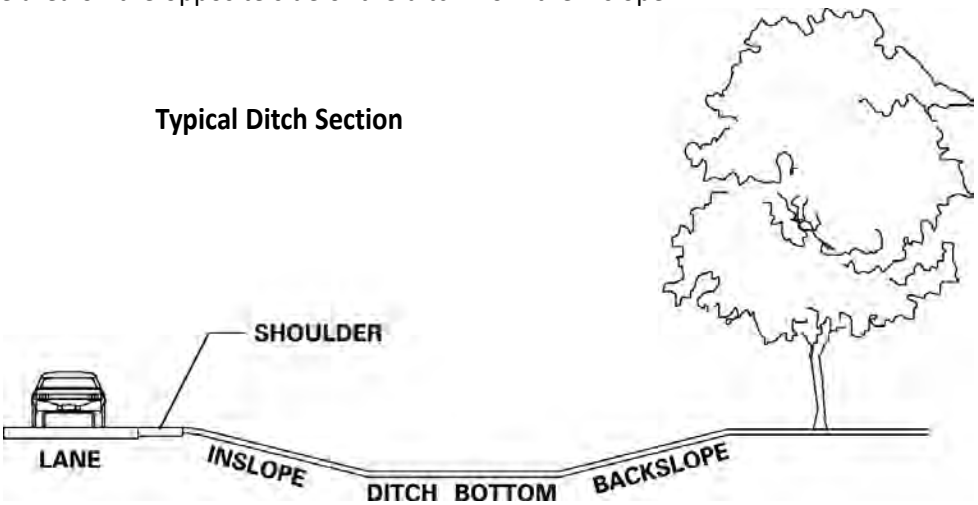
ARBORIST – One who tends, cultivates, and manages trees and shrubs, generally for ornamental purposes.

AXILLARY BUD – A shoot arising from the joint where a leaf meets the stem.

BACKFILL – Cultivated and amended soil excavated from planting holes, with all debris removed including rocks larger than 3 inches diameter.

BACKSLOPE – Slope area on the opposite side of the ditch from the inslope.

Typical Ditch Section



BALLED AND BURLAPPED, (B & B) – Shrubs and trees dug from fields with a ball of dirt around the roots; the ball is wrapped in burlap to hold it together. Usually dug from late fall to early spring, during the dormant season.

Balled & Burlapped (B & B)

BARE ROOT, (BR) – Trees and shrubs dug from the field without soil around the roots. Plants are dug dormant from field; the roots are cleaned, trimmed and kept from drying out. Bare root plants are stored in very humid, cold storage lockers until spring.

Bare Root

BARK – An outer protective tissue of woody plants, derived from the cortex. Varies greatly in appearance and texture; including all tissue from the vascular cambium outward.

BERM – A raised and elongated area of earth intended to direct the flow of water, visually screen, reduce noise levels or to raise the root zones of plants for better aeration in heavy or poorly drained soils.

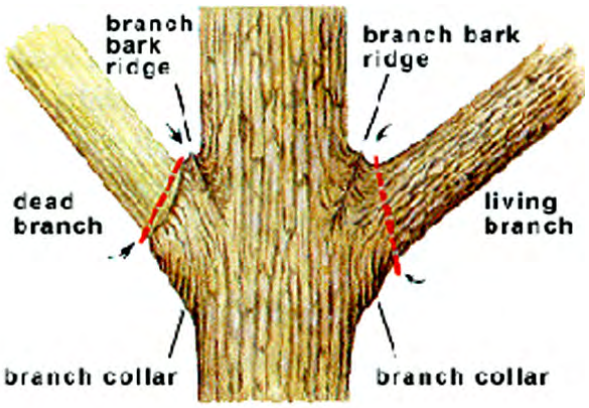
Berm

BIENNIAL – Plants which live for two seasons, normally flowering, fruiting and dying the second growing season from time of seed germination.

BRANCH – Secondary shoot or stem of a plant, a natural subdivision of the main plant stem.

BRANCH BARK RIDGE – The bark boundary which separates the trunk from the branch. Located on the top side of the junction of the main stem and the branch.

BRANCH COLLAR – The swollen base of a branch which contains trunk and branch tissues which should not be injured during pruning if proper callus closure is to occur.



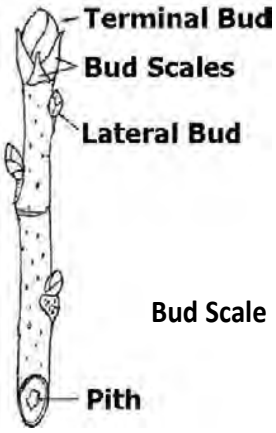
Branch Bark Ridge & Branch Collar

BROAD-LEAF – 1. In connection with weeds, it means any weeds that are not grasses. 2. In the sense of "broad-leafed evergreen", it refers to a plant that is evergreen but not a conifer with needle-like leaves, for example Rhododendron.

BUD – A structure of embryonic tissues, which will become a leaf, flower, new shoot or some combination of the three. The stage in which a growing point spends the winter or a dry season. May be naked or enclosed in scales.

BUDDING – In basic principle it's similar to grafting. A bud of one plant is inserted in the bark of another plant (called the stock). If the bud and stock unite; the bud will then develop the characteristics of the plant it came from, while the stock supplies it with water and nutrients.

BUD SCALE – A modified leaf or stipule, protective of the embryonic tissue of the bud.



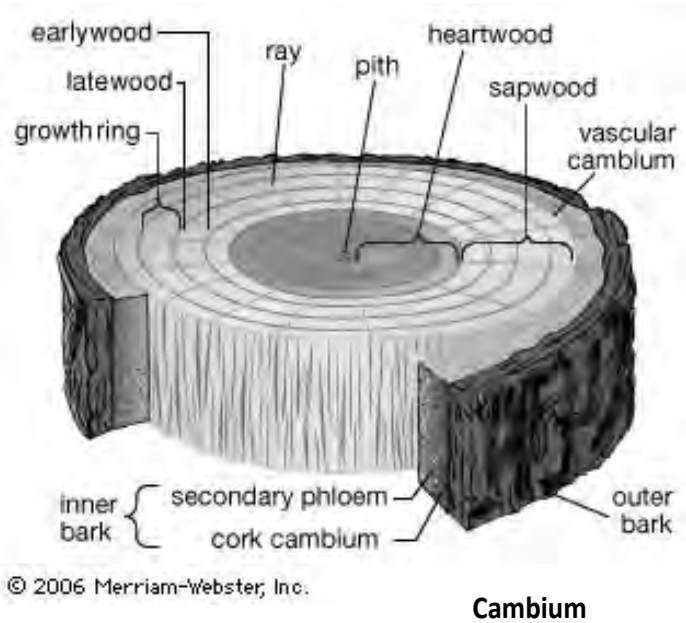
Bud Scale

BUD UNION – The point where the woody shoot is grafted (attached) on to a rootstock.

CALENDAR DAY – Every day shown on the calendar.

CALLUS (plants) – Undifferentiated tissue that proliferates at cut surfaces or wound edges; also, organized tissues including xylem, phloem, and periderms, usually growing more rapidly than normal, that proliferate at the edges of wounds and gradually cover wounds.

CAMBIUM – A thin formative layer between the xylem and phloem of most vascular plants that gives rise to new cells and is responsible for secondary growth.

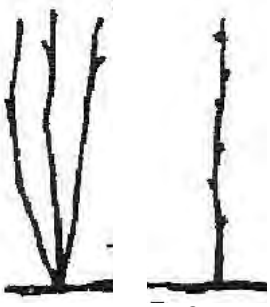


Cambium

CANDLE – The growing terminal shoot of conifers, notably pines. Generally refers to spring growth on conifers.

CANE (SHRUBS) – A long woody pliable stem rising from the ground or a point not higher than 1/4 of the height of the shrub.

CANKER – A necrotic (dead tissue) lesion in bark of the stem or root, often extending to the xylem; also, the scar left after shedding of bark tissues killed by localized disease or environmental injury.



Cane (Shrubs)


Candle

* **CANKER, ANNUAL** – A canker that enlarges only once and does so within an interval more brief than the growth cycle of the plant, usually less than 1 year.
* **CANKER, DIFFUSE** – A canker that enlarges without characteristic shape or noticeable callus formation at margins.
* **CANKER, PERENNIAL** – A canker that enlarges during more than 1 year. See related term below - Canker, Target.
* **CANKER, TARGET** – A canker that includes concentric ridges of callus. Often, the canker is caused by a fungal pathogen.

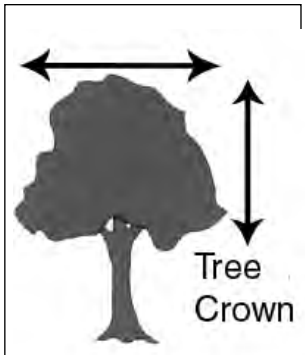

Canker

CANOPY (CROWN) – 1. The upper mass or head of a tree, comprising the branches. 2. Central point near the ground level of a perennial herb from which new shoots arise each year.

CAPILLARY – Very small hair-sized tubes or pores in plants or in soils.

CAPILLARY WATER – Water held as a film around soil particles and in tiny spaces between particles. This water is available to plants.

CARBON: NITROGEN RATIO – The ratio of the weight of organic carbon to the weight of total nitrogen in the soil or in organic material, obtained by dividing the percentage of organic carbon (C) by the percentage of total nitrogen (N).



Canopy (Crown)

CERTIFICATE OF COMPLIANCE *FOR PLANT STOCK, LANDSCAPE MATERIALS AND EQUIPMENT* – Part of the required documentation provided by the Contractor to the Engineer at or prior to the Preconstruction Conference to verify that all plants are in conformance with the Project requirements. At least one week prior to the plant stock delivery date the Contractor shall furnish the Engineer with an updated Certificate of Compliance ***FOR PLANT STOCK, LANDSCAPE MATERIALS AND EQUIPMENT*** signed by the Contractor's representative.

CERTIFIED NURSERY STOCK – Nursery stock which has been inspected and found free of plant pests or problems by the State Department of Agriculture.

CERTIFIED TEST REPORT – Provided by a manufacturer, producer, or supplier of a product such as compost or mulch, indicating actual results of tests or analysis.

CHANGE ORDER – A written order issued by the Engineer to the Contractor, covering permissible adjustments and minor plan changes or corrections and rulings with respect to omissions, discrepancies or intent of the plans and Specifications, but not including any extra work or other alterations that are required to be covered by supplemental agreement.

Orders issued to implement changes made by mutual agreement shall not become effective until the order has been signed by the Contractor and returned to the Engineer.

CHLOROPHYLL – A green pigment utilizing light to produce sugar from carbon dioxide and water as photosynthesis.

CHLOROSIS – When a leaf looks more yellow than it should (especially between the leaf veins), it often is chlorotic or suffering from chlorosis. Frequently chlorosis is caused by a plant's inability to obtain the iron it needs to produce chlorophyll. For one way to correct this condition, see IRON CHELATE.

Chlorosis

CHLOROTIC – A plant symptom showing the effect of chlorosis (see CHLOROSIS).

CLAY (SOILS) – 1. Mineral soil consisting of particles less than 0.002 mm in equivalent diameter which are not visible under a normal microscope. 2. A soil textural class. 3. A fine-grained soil that has a high plasticity index in relation to the liquid limits (engineering). 4. A specific mineral structure.

CLAYPAN – A dense, compact layer in the subsoil having a much higher clay content than the overlying material, from which it is separated by a sharply defined boundary; usually hard when dry and plastic and sticky when wet. Claypans usually impede the movement of water and air and the growth of plant roots. Compare with Hardpan.

CLEARING – The removal of surface vegetation, structures or objects as an item of highway landscape construction.

CLEAR ZONE – An unobstructed, relatively flat area beyond the edge of the traveled way that allows a driver to stop safely or regain control of a vehicle that leaves the traveled way.

CLIMATIC ZONE – A geographical area in which weather conditions are typically similar.

COHESION – Holding together; force holding a solid or liquid together because of attraction between molecules; cohesion decreases with a rise in temperature.

COLLECTED STOCK – Refers to native grass, wildflowers, trees, and shrubs which have been harvested directly from native stands and put into production.

COMPOST – See MnDOT 3890. Organic residues or a mixture of organic residues and soil that have been piled and allowed to undergo full biological decomposition. MnDOT contracts require compost derived from yard waste.

CONIFER – A plant which bears naked seeds in cones or cone-like structures and most have needle shaped or scale-like leaves which remain green on the plant throughout the dormant season. Often referred to as "evergreen", including juniper, spruce, pine, cedar, and yew. Not all conifers are evergreen including larch and gingko.

CONSISTENCY – The degree of cohesion or adhesion of the soil mass. Terms used for describing consistency of soil materials at various soil moisture contents and degrees of cementation are as follows:

* **WET (STICKINESS)** – Stickiness is the quality of adhesion to other objects. For field evaluation of stickiness, soil material is pressed between thumb and forefinger and its adherence is noted.
* **WET (PLASTICITY)** – Plasticity is the ability to change shape continuously under the influence of an applied force and retain the impressed shape on removal of the force.

  For field determination of plasticity, roll the soil material between thumb and forefinger and observe whether a thin rod ("wire") of soil can be formed.
* **MOIST** – Consistency when soil is moist is determined at a moisture content approximately midway between air-dry and field capacity.
* **DRY** – The consistency of soil material when dry is characterized by rigidity, brittleness, maximum resistance to pressure, tendency to crush to a powder and inability of crushed material to cohere again when pressed together.
* **CEMENTED** – Brittle, hard consistency caused by some cementing substance other than clay materials.

CONTAINER – A pot, can, or box used for growing plants.

CONTAINERIZED (CONTAINER GROWN) – A growing plant, in a container with its root system ready for retail sale. Often, a field grown plant that has been potted in preparation for retail sale.


Container Grown

CONTRACT – The written agreement between the Contracting Authority and the Contractor, setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment.

The contract documents include the advertisement for bids, proposal, contract form, contract bond, specifications, supplemental specifications, special provisions, general and detailed plans, and notice to proceed, also any change orders and agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

CONTRACT BOND – The approved form of security, executed by the Contractor and Surety or Sureties, guaranteeing complete execution of the Contract and all Supplemental Agreements pertaining thereto and the payment of all legal debts pertaining to construction of the Project.

CONTRACT TIME – The number of working days or calendar days, including authorized time extensions, allowed for completion of the contract. When a calendar date of completion is shown in the proposal in lieu of the number of working or calendar days, the contract shall be completed by that date.

CONTRACTING AUTHORITY – The governmental body, board, department, commission, or officer making the award and execution of Contract as the party of the first part.

CONTRACTOR – The individual, firm or corporation contracting for and undertaking prosecution of the prescribed work; the party of the second part to the Contract, acting directly or through a duly authorized representative.

COOL-SEASON PLANT – A plant that produces most of its growth and flowers during spring, slows growth or becomes dormant during the hot part of summer, and may resume growth in the fall with cooler temperatures.

CULL – Nursery stock that is rejected as inferior because it does not meet the standards for individual grades as established in the “American Standard For Nursery Stock”.

CULTIVAR – A horticultural or cultivated variety that has originated and persisted under cultivation, distinguished by single quotation marks. For example, in the scientific name Fraxinus pennsylvanica ‘Marshall’s Seedless’, the cultivar is Marshall’s Seedless.

CULTIVATION – 1. To improve or prepare soil, by plowing, tilling or fertilizing, for the purposes of promoting or maintaining plant growth. 2. To promote, tend to or assist the growth of plants.

CUTTING – A severed vegetative or asexual part of a plant used in propagation; as in a cutting of a root, stem or leaf.

DEBUDDED – Any process which results in the loss of buds on a plant. Generally refers to trees or shrubs that have, through cultural practices, had a large portion of buds removed, especially terminal buds on the leader or branches. Debudding may occur with pruning. Shearing is common practice in Christmas tree farms but may occur at any grower.

DECIDUOUS – A plant that sheds all of its leaves at one time annually.

DECLINE – The general loss of a plant’s vitality caused by a disease or by a series of events that disrupt essential life processes (i.e. too little or too much water, etc.)

DEFOLIATION – Unnatural loss of plant leaves.

DEPARTMENT – The Minnesota Department of Transportation; or the department, division, or agency constituted for administration of the Contract work within its jurisdiction.

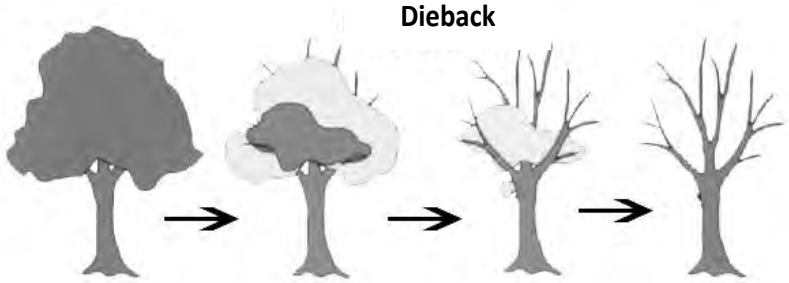
DIEBACK – Progressive dying from the tips of twigs towards the trunk of the tree.

DIKE – A berm of soil constructed to maintain or control surface water in a drainage system or watering basin.

DISC – To cultivate with a disc harrow or similar implement.

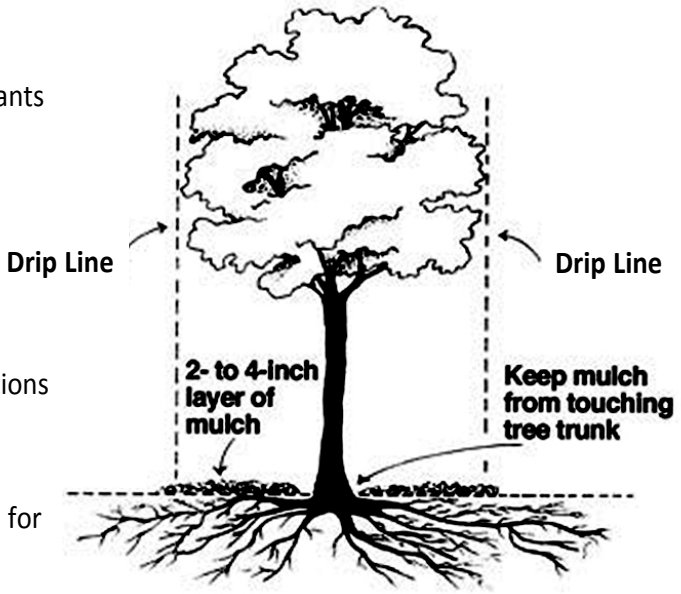
DORMANCY – A state when the plant is not actively growing due to either internal or external conditions. A resting period especially during winter or drought.

Dieback



DRAINAGE – "Good drainage," "bad drainage," "slow drainage," "fast drainage," "well drained" – all of these terms refer to the speed with which water passes through soil in a plant's root area, and water must pass through if most plants are to grow. It's not the standing water that hurts plants directly; it is the fact that the water excludes oxygen. Most roots can't live without oxygen. (SEE PERCOLATION)

DRIP LINE – The line you would draw on the soil around a tree directly under its outermost branch tips. The term is used in connection with feeding, watering, and limitations upon grading or other disturbances around existing trees and shrubs.



DWARF – An atypically small plant, often bred for this trait.

EASEMENT – A right acquired by a public authority through the use of direct purchase or eminent domain to use or control property for designated purpose.

EMBANKMENT – A slope or raised area created with fill material.

ENGINEER – The duly authorized engineering representative of the Contracting Authority, acting directly or through designated representatives who have been delegated the responsibility for engineering supervision of the project, acting within the scope of the duties and authority delegated to them.

EQUIPMENT – All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the Contract within its intended scope.

EROSION – The dislocation or movement of soil and land surface by water, wind, frost or other agents.

EROSION CONTROL – Protecting soil from dislocation by water, wind or other agents. Includes the proper grading and drainage and the utilization of vegetation and/or other erosion control equipment to absorb the impact of rainfall, slow the velocity of runoff or to hold the soil in place.

ESTABLISHED – Growing and reproducing without cultivation. Pre-existing vegetation.

EVERGREEN – See ***CONIFER***

EXFOLIATING – The splitting, shedding and pealing of the outer bark of a tree (i.e. River Birch).

EXOTIC – A plant not indigenous or native to the area at the time of European settlement.

EXTRA WORK – Any work not required by the Contract as awarded, but which is authorized and performed by Supplemental Agreement, either at negotiated prices or on a force account basis as provided elsewhere in the Specifications.

FALLOW – Allowing tilled planting areas to lie idle during a portion of, or between growing seasons.

FERTILITY – A measure of the quality of soil that provides proper nutrients in the correct amounts and balance for plant growth.

FERTILIZER – Any material containing one or more available nutrient and/or elements.

FERTILIZER ANALYSIS – The actual composition of a fertilizer as determined in a chemical laboratory by standard methods. See Fertilizer Grade.

FERTILIZER GRADE – The guaranteed minimum analysis in whole numbers, in percent, of the nitrogen, phosphorus, and potassium in a fertilizer material. For example, a fertilizer with a grade of 20-10-5 is guaranteed to contain 20 percent total nitrogen (N), 10 percent available phosphoric acid (H3PO4), and 5 percent water-soluble potash (K2O).

FIBROUS ROOT SYSTEM – A root arrangement whereby roots arising from the stem base are similar in size and length, each bearing numerous side branches. A diffuse root system.

FIELD CAPACITY (FIELD MOISTURE CAPACITY) – The amount of water remaining in a soil after the free (gravitational) water has been allowed to drain away (a day or two) after the root zone had been previously saturated. Estimated at -1/3 bar water potential using a tensiometer. See Field Capacity Table (Chapter 3).

FIELD POTTED – Refers to plants dug from the field with soil intact around the roots and immediately potted. These may be supplied and must meet the requirements for B&B plant stock specified on MnDOT contracts.

FINES – Extremely small soil particles.

FIRST ORDER BRANCHING – Branches that are attached to a tree's main stem.

FLOWER – The sexually reproductive structure of angiosperms.

FORB – A herbaceous plant that is not a grass or grass-like plant (i.e. wildflowers).

FORESTER – A person trained to evaluate, develop, care for, and cultivate trees, shrubs, and other plants.

FORM – Characteristic shapes of tree, shrub, vine and herbaceous plant species referring to the outline of the crown as perceived in silhouette, grown in an open field under favorable environmental conditions.

FRASS – Chewed wood fragments and plant tissues mixed with excrement produced by insects.

FRIABLE – A loose crumbly condition of the soil (tilth).

FROST-CRACK – A vertical split in a tree trunk due to unequal stresses in cold weather.

FROST HEAVING – The raising of the surface soil due to the growth of ice crystals in the underlying soil. Such action may push plants out of the ground.

FRUIT – An enlarged ovary which contains ovules which will develop into seeds. May be edible or not, true or accessory, fleshy or dry.

FUNGI – An order of plant organisms, which cause decay in living or dead organic material.

FUNGICIDE – Any material which will destroy or repel fungus infection.

Frost Crack

GALL – An abnormal growth or excrescence on a plant, usually caused by an insect.

GALLERIES – Vertical and lateral channels or tunnels found under a plant's bark or in other areas and denoting current or past activity by boring insects.

GENUS – A group of species possessing fundamental traits in common but differing in other lesser characteristics. White pines scientific name is Pinus strobus, with Pinus being the genus name.

GRADE – 1. The level of the land or the deviation from level. 2. The standardized description of a nursery stock plant's proportionate size and mass of top growth and root growth as measured by visual inspection.

GRADIENT – Rise or fall per unit of horizontal distance (slope ratio). Commonly expressed such as 10% or 10:1.

GRADING – 1. To level or smooth the land to a desired gradient. 2. To rank or sort nursery stock by a standardized sizing system as described in the "American Standard For Nursery Stock". Nursery stock that does not meet the standards for individual grades is defined as a cull (reject).

GRAFT – The top of one plant and the roots of another forming a living union. A branch or bud (scion) inserted on another plant with the intention that it will grow there.

GRAFTING – A method of propagating plants. A section from one plant (scion) is inserted into a branch of another plant (stock). The graft works, the two grow together as one plant, only if the cambium layers of both scion and stock make contact. (The cambium is a thin layer of tissue between the bark and wood.) If the graft takes, the scion develops foliage, flowers, and fruits just like the plant it came from; the stock supplies water and nutrients as before.

GRANULAR MATERIAL – Any natural or synthetic mineral aggregate such as sand, gravel, or crushed rock that when graded will pass a one inch sieve and not more than 20 percent, by weight will pass the No. 200 sieve.

GRASS – Plants, mostly herbaceous, with jointed stems used to cover open soil areas, to provide drainage and erosion control and to provide wildlife habitat. Characterized by reduced non-showy flowers, grain type fruit and narrow, usually long leaves.

GRAVEL – Naturally occurring rock or mineral particles produced by glacial and water action. Particle size ranges from 3 inches (76mm) in diameter to the size retained on a No. 10 sieve .08 inches (2mm diameter)

GROUND-COVER – Plants, other than grass, which grow closely together to cover the surface of the ground.

GROUNDWATER – Water found underground in porous rock strata and soils.

GROWING SEASON – The period when soil temperature rises above 50°F in the spring until the soil temperature lowers below 50°F in the fall; for scouting purposes, April through November.

GROWTH RATE – The measured vertical and horizontal increase in height, spread and diameter during one growing season.

GRUBBING – The process of removing tree roots, stumps and low-growing vegetation.

GUARANTEED ANALYSIS – A guarantee from a manufacturer, producer or supplier of a product that the product complies with the ingredients or specifications as indicated on the product label.

GUYING – Temporary placement of cable between a stake and an elevated spot on a tree trunk after transplanting. Guying systems provide firm anchorage to prevent the tree from tipping over while new root growth is developing or to prevent excessive bending due to wind pressures.

HABIT – The general aspect or mode of growth of a plant.

HABITAT – A place where environmental factors favor a specific plant or organism.

HARDENING-OFF – To expose plants gradually to more extreme conditions such as lower temperatures in advance of winter.

HARDPAN (PRESSURE PAN) – A layer of soil impervious to air and water, or a soil layer that retains water so tight that it will not pass through. PRESSURE PAN – A subsurface horizon or soil layer having a high bulk density and a lower total porosity than the soil directly above or below it as a result of pressure by normal tillage operations or by other artificial means. Frequently referred to as hard pan, plow pan, plowsole, tillage pan, or traffic pan.

HARDWOOD – Term loosely applied to deciduous trees.

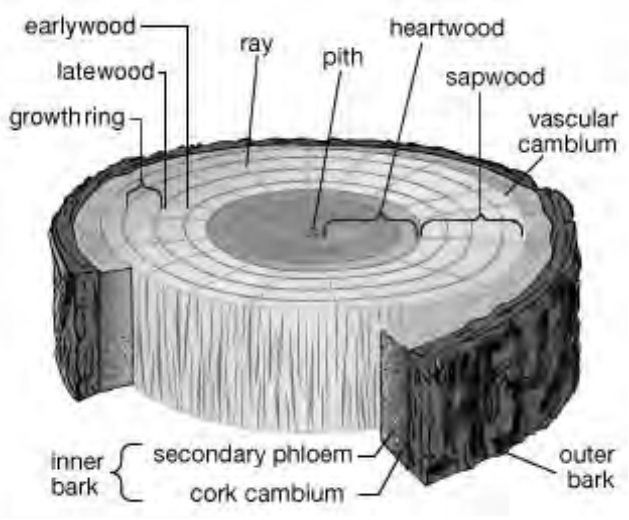
HARDY – The ability of a plant to survive under extremes of cold, drought, etc. Refers to plant capability of withstanding winter conditions in a particular area. It does not mean tough, pest resistant, or disease-resistant. The U.S. is divided into 13 Hardiness Zones with Minnesota in Hardiness Zones 3, 4 and 5. The lower the number the hardier a plant must be to survive.

HAUL ROAD – A road used to transport material to and from construction areas.

HEADING BACK – A pruning term for cutting a branch back to a bud or side branch to increase the number of shoots, or make the plant bushier. For a method that produces roughly the opposite effect, see ***THINNING OUT***.

HEALTH – Characterized by the ability of plants to resist irreversible condition caused by excessive stresses to the plant such as disease, pests, etc..

HEARTWOOD – Older harder non-living central wood of trees that is usually darker, denser, less permeable, and more durable than the surrounding sapwood.



Heartwood

HEAVY SOIL – Imprecise term meaning dense soil, made up of extremely fine particles (clay particles are especially fine), packed closely together.

HEELING IN – Temporarily storing plants by covering or burying the roots with moist soil, sawdust, or similar material. Plants are heeled in before planting to keep the bare roots or root balls from drying out.

Healing In

HERBACEOUS – A non-woody plant whose above ground portion dies to the ground in the fall.

HERBICIDE – Material toxic to plants that is generally used for weed/plant control.

HIDDEN BUD – Bud covered by the petiole base and therefore inconspicuous.

HIGHWAY, STREET, OR ROAD – A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

HORTICULTURE – The science of specifically treating plants in order to develop their full individual potentials.

HOST – A plant parasitized by another organism such as insects or fungi.

HYBRID – A plant resulting from a cross between species, strains, or inbred lines.

HYBRID VIGOR – Characteristic of a hybrid that is better adapted or structured for survival in an environment, than either of its parents.

IMPERVIOUS SOIL – A soil through which water, air, or roots cannot penetrate.

INCIDENTAL – Work and materials for which no direct payment will be made.

INDIGENOUS – See ***NATIVE***.

INDUSTRY STANDARD – An acknowledged and acceptable measure of quantitative or qualitative value or an established procedure to be followed for a given operation within the given industry. This will generally be in the form of a written code, standard or specification by a creditable industry association.

INFECTION – The establishment of disease-producing organism in a host.

INFESTATION – Invasion by pests or pathogens such as plants, insects, mites, nematodes, etc.

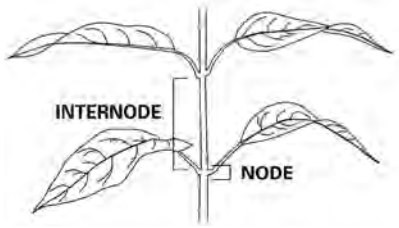
INOCULATION – Introducing cultures of specific bacteria or microorganisms into soils or culture media, i.e. adding Rhizobia bacteria to legume seed. Legumes have root tubercles which can absorb and utilize nitrogen from the air but only if certain bacteria are present in the soil.

INSECTICIDE – A material used to destroy or repel insects.

INSLOPE – Slope area between the road edge and the bottom of the ditch. See ***BACKSLOPE*** for image.

INSPECTOR – The Engineer's authorized representative assigned to make detailed inspections of Contract performance.

INTEGRATED PEST MANAGEMENT (IPM) – The use of many different techniques, in combination, to control pests. One example is the combined uses of resistant plant varieties, natural predators of the pest, pesticides and preventive practices. (i.e. watering, pruning, fertilizing)



INTERIM SEEDING – Seeding when permanent seeding cannot be performed because of contract requirements for temporary construction or because topsoil placement and permanent seeding are to be accomplished under a future contract.

INTERNODE – The part of a plant stem between two nodes.

IRON CHELATE (PRONOUNCED KEY-LATE) – A chemical added to the soil to treat plants with iron chlorosis (see CHLOROSIS). It is a combination of iron and a complex organic substance that makes the iron already in the soil more available to roots.

IRRIGATION SYSTEM – A watering system, either temporary or permanent, used to establish or sustain plants and turf where natural rainfall or groundwater is inadequate or where supplemental watering is necessary and cannot be provided by other means.

LANDSCAPE – Any portion of the earth's surface visible from any given point. The land form of a region including its vegetation, wildlife, hydrology, geology, and physical and biological characteristics of form.

LANDSCAPE ARCHITECT – A person who applies artistic and scientific principles to the research, planning, design, integration, and management of both natural and built environments.

LANDSCAPING, HIGHWAY – Treatment of the highway or transportation facility and roadside to conserve, enhance and effectively display the character and quality of the environment it passes through, taking into account safety, utility, beauty, economy, sustainability history and context, pollution prevention and other functions by means of proper location, design, construction and maintenance.

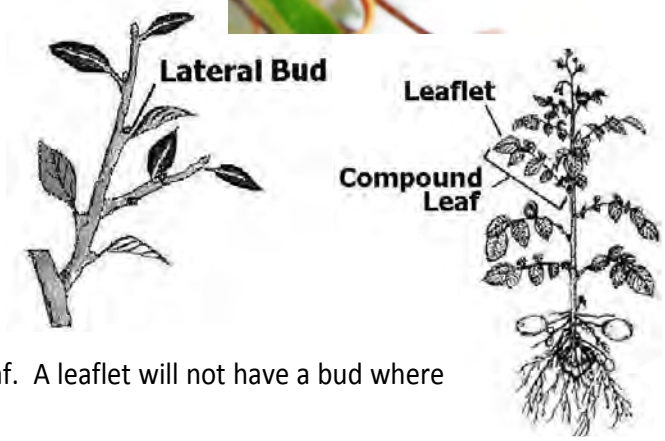
LARVA – An immature insect that emerges from the egg in an early stage of metamorphological development, differing fundamentally in form from the adult into which it develops via the pupal stage.


Larva

LATERAL BUD – A bud growing from the side of a branch, and not at the apical meristematic area.

LEACHING – The loss of mineral elements from the soil by the downward movement of water, through the soil.

LEADER – The primary or central stem of a tree. Multiple or competing leaders are not desirable with most tree species and indicate a lack of proper prior care (pruning) in a nursery.



LEAF – The main photosynthetic organ of a plant.

LEAFING OUT – When leaf buds break open and new foliage begins to grow.

LEAFLET – A leaf like portion of a compound leaf. A leaflet will not have a bud where the stem grows out of the branch.

LEGUME – A member of the legume or pea family, nitrogen-fixing plants -Leguminosae. This includes many valuable food and forage species, such as peas, beans, peanuts, clovers, alfalfas, sweet clovers, lespedezas, and vetches plus trees and shrubs like honeylocust and peashrub.

LIME, AGRICULTURAL – a variety of acid-neutralizing materials; most are the oxide, hydroxide, or carbonate of calcium, or of calcium and magnesium. The most commonly used forms of agricultural lime are ground limestone, marl, and oyster shells (carbonates), hydrated lime (hydroxides), and burnt lime (oxides).

LINERS (LINING OUT STOCK) – Young plants, typically unbranched, grown for sale to nursery growers at wholesale cost for lining out in their fields to further develop them as tree and shrub grade stock.

LONGEVITY – The length of time a selected plant can be expected to live when environmental conditions are normal.

MAINTENANCE – The proper care of plants and other landscape features to promote plant health and vigor under all environmental conditions.

MARGIN – The edge of a leaf.

MASS PLANTING – The placement of a large number of plants close together to give a uniform aspect.


Mass Planting

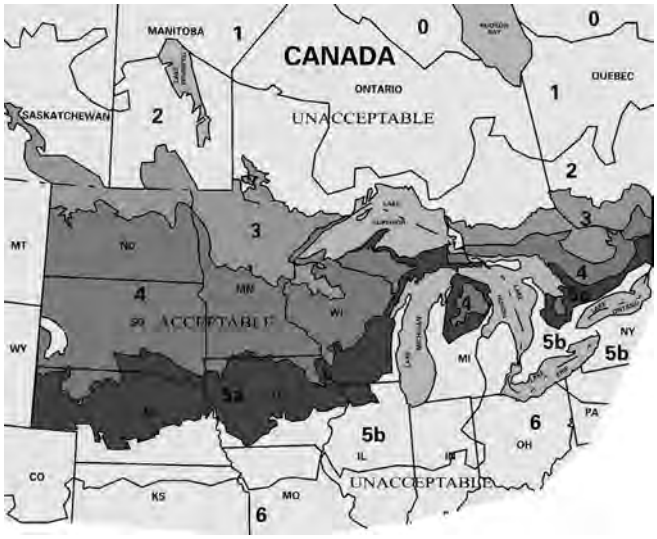
MATERIALS – Any substances specified for use in the construction of the Project and its appurtenances.

MATERIALS LABORATORY – The Central Materials Laboratory of the Department, and for those tests so authorized, the District Materials Laboratories.

MEDIAN – The portion of a divided roadway separating the traveled ways for traffic moving in opposite directions.

MICROCLIMATE – A small localized area where the conditions of temperature, moisture, etc., are significantly different from those of the general area.

MINNESOTA ZONE HARDY – Certification required to ensure that plant stock has been continously grown (for at least 2 years) within the acceptable limits so that the origin of seed, root, graft or plant stock grown outside of the acceptable Midwest and Northern grown plant stock growing range is hardy in the hardiness zone in which it will be planted in Minnesota.



MN Zone Hardy

MOTTLED (SOILS) – Soil horizons consisting of irregular soil masses of various colors. A common cause of mottling is impeded drainage.

MOWING LIMITS OR LINE – Boundaries established to show the desired extent of mowing.

MULCH – Any material placed on the surface of the soil (i.e. wood chips) to conserve moisture, prevent erosion control weeds, and moderate surface soil temperature.

MYCORRHIZAE – Literally "fungus root." Typically, beneficial associations (symbiotic) of specific fungi with roots of specific higher plants that provide benefit to plants by enhancing nutrient uptake, water availability and resistance to infection by soil-borne pathogens. Some trees including those on previously unforested land may fail because certain fungi are not present to form mycorrhizae with the roots. Mycorrhizal plants grow more vigorously and remain healthier than non-infected plants in harsh, stressful and infertile conditions.

NATIVE – A plant species existing in an area from the time prior to European settlement.

NEEDLE – The slender leaf of many conifers.

NEMATODE – Microscopic worms most of which feed on roots causing various types of injury to roots, stems and leaves. Some feed on leaves resulting in injury by infection.

NITROGEN, ACTUAL – The portion of a manufactured fertilizer (or any product containing several ingredients) that supplies a specific needed element. A 25-pound bag of fertilizer containing 22 percent nitrogen will yield 5-1/2 pounds actual nitrogen (25 pounds x .22 = 5.5 pounds).

NODE – The points or joints on a stem from which the buds, leaves and branches originate; sometimes represented by a swollen or constricted ring, or by a distinct leaf scar. See internode for image.

NOMENCLATURE – An International system of Standardized names used in biology for animals and plants.

NON-NATIVE (INTRODUCED) – A plant species established in an area from the time after European settlement.

NOXIOUS WEEDS – Noxious weeds are regulated under Minnesota Rules 1505.0730 1505.0750. Prohibited noxious weeds are injurious to public health, the environment, public roads, crops, livestock, and other property. Prohibited noxious weeds must be controlled or eradicated as required in Minnesota statutes, section 18.78.

NOXIOUS WEED SEEDS – Noxious weed seeds are regulated under Minnesota Rules 1510.0271 - 1510.0320. They include prohibited and restricted classifications.

* Prohibited weed seeds are prohibited from being present in agricultural, vegetable, flower, tree, and shrub seeds sold in Minnesota.
* Restricted weed seeds are those which, if present in agricultural, vegetable, flower, tree, and shrub seed, must be named on the label together with the number per ounce or pound of seed specified and which may not exceed the legal limit. They are seeds of weeds which are objectionable in fields, lawns, and gardens of this state, and which can be controlled by good cultural practice and use of herbicides.

NPDES – National Pollutant Discharge Elimination System (NPDES) Permits Program.

NURSERY – Any place where plant stock is grown for sale or distribution.

NURSERY INSPECTOR – One who has been assigned the duties of nursery inspection by the Commissioner of Agriculture.

NURSERY LICENSE – Annual certification (based upon field inspection) required by the State Department of Agriculture to lawfully enable a grower or dealer of nursery stock to offer nursery stock for sale.

NURSERY STOCK – Nursery stock includes: Trees, shrubs and other plants having a persistent woody stem; all hardy herbaceous perennials; and parts of either of those which are capable of propagation.

NURSERY STOCK DEALER/GROWER– Any person who obtains nursery stock for the purpose of sale or distribution and includes any person who sells and distributes for more than one nursery grower. If a person purchases more than half of the nursery stock offered for sale at his or her sales locations during the current certificate, he or she shall be considered a dealer rather than a nursery grower for the purposes of determining his or her proper fee schedule.

NUT – A dry, one-seeded, indehiscent (does not open on its own to release seed) fruit.

ORGANIC – A substance derived from any portion of a plant or an animal. A compound that contains carbon.

ORGANIC MATTER – Plant or animal residue or remains.

ORGANIC SOILS – A soil which contains a high percentage (more than 20%) of organic matter throughout the A and B horizons. Usually formed in swampy conditions and frequently requires drainage. Because the large amounts of humus decompose rapidly after drainage, organic soils subside (sink in elevation) appreciably. They may also burn and blow easily. Organic soils have lower pH than is typical for mineral soils. Although fairly fertile, many organic soils are not able to supply adequate macronutrients and some micronutrients to plants. See Peat.

OUTER BARK – Mostly dead cells which protect the phloem (inner bark) and cambium. See Cambium for image.

PARASITE – A plant or animal that lives upon another living plant or animal (the host).

PATHOGEN – An organism which causes a disease.

PATHOGENIC – Disease producing.

CONTRACT ITEM – A specifically described unit of work for which a price is provided in the Contract.

PEAT – Largely undecomposed or only slightly decomposed organic matter accumulated under conditions of excessive moisture.

* **HYPNUM PEAT MOSS** – Light weight, porous and fibrous (but free from woody material) peat primarily composed of slightly or moderately decomposed leaves and stems of hypnum moss. Darker in color and neutral in pH but providing similar benefits to sphagnum peat moss when used as a soil amendment. Suitable for use in acidic soils to help neutralize soil.
* **SPHAGNUM PEAT MOSS** – Composed of slightly or moderately decomposed leaves and stems of sphagnum moss which is found in cool humid regions resulting in higher acidity and lighter color than hypnum peat moss.
* **REED-SEDGE PEAT** – Medium to fibrous texture (may contain woody material) peat containing the moderately decomposed remains of reeds, sedges and reed-like grasses (cattails, rushes). Ranges from slightly alkaline to slightly acid in pH.
* **HUMUS PEAT** – Highly decomposed peat in which the original plants making up the peat can no longer be distinguished by observation. Ranges from slightly acid to neutral in pH and is dark brown to black in color with a fine-grained texture.

PERCOLATION, SOIL WATER – The downward movement of water through soil, especially the downward flow of water in saturated or nearly saturated soil.

PERCOLATION TEST – Completely fill a 16 inches deep planting hole with water. Allow water to drain from the hole. Completely re-fill the hole and measure the time it takes for the water to drain from the hole. Adequate drainage will be considered equal to or greater than a percolation rate of 1/2 inch (12mm) per hour.

PERENNIAL – A plant that lives more than two years. Generally the word is used to mean a plant whose top growth dies down each winter and regrows the following spring. But some perennials keep leaves all year.

PERMEABILITY, SOIL – Quality of a soil layer that enables water or air to move through it.

PERSISTENT – Remaining on the plant beyond the period when such parts commonly fall, as in fruits, leaves, etc.

PESTICIDE – A substance or mixture of substances intended to prevent, destroy, repel or mitigate a pest.

PESTICIDE APPLICATOR LICENSE – A license issued by the Minnesota Department of Agriculture that allows an individual to use a restricted use pesticides. All commercial applicators must be licensed to apply pesticides.

PH – Hydrogen ion concentration. The acidity or baseness (alkalinity) of a substance. A pH of 7 is alkaline, above 7 is basic, and below 7 is acidic. A pH in the range of 6.0 to 7.5 is generally preferred or tolerated by most but not all plants.

PHLOEM – The inner bark of woody plants which transports sugars and manufactured food downward to the roots.

PHOTOSYNTHESIS – The process by which plants and other photoautotrophs generate carbohydrates and oxygen from carbon dioxide, water, and light energy in chloroplasts.

pH Indicator: Acidic & Alkaline Soil

PLAN – The approved plan, profiles, typical cross sections and supplemental drawings, or exact reproductions thereof, which show the locations, character, dimensions, and details of the work to be done.

PLANT – Any living organism consisting of one or more cells, which does not typically exhibit voluntary motion or possess sensory or nerve organs.

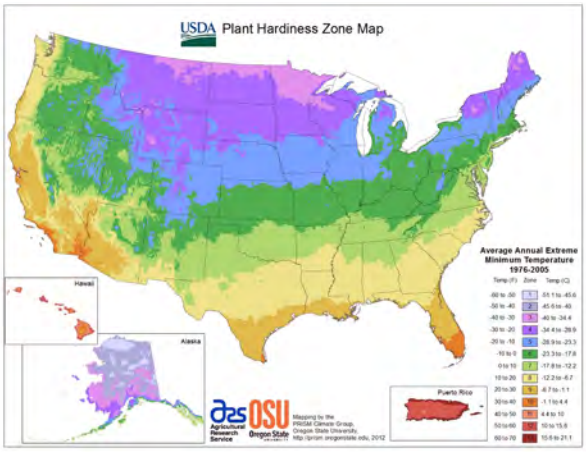
PLANT CLASSIFICATION – Botanists have classified plants into an orderly, ranked system that reflects the similarities among the world's plant life. The plant kingdom, the most inclusive group, is broken down into groups that are less and less inclusive: division, class, order, family, genus, species, variety, hybrid and strain. Genus, species and horticultural varieties (clones) are the industry terms most used to identify landscaping plant material.

PLANT ENVIRONMENT – The sum total of all the conditions surrounding the plant.

PLANT ESTABLISHMENT – The agronomic and horticultural practices within an acceptable and specified period of time, following plant installation, necessary to enable plants to adapt and grow successfully in their new environment.

PLANT HARDINESS ZONE MAP – The division of the North American continent into zones based on the average winter minimum temperature. See U.S.D.A. Misc. Pub. 1475.1990.

http://planthardiness.ars.usda.gov/phzmweb



USDA Plant Hardiness Zone Map

PLANT INSTALLATION – The work of furnishing and planting trees, shrubs, vines and perennials complete with all incidental materials and requirements at the locations designated in the plans or as directed by the Engineer.

PLANT PESTS – Plant pests shall include any form of plant or animal life, including any disease producing organism dangerous to plants. Alternate hosts of any plant disease are included in this definition.

PLANTING SEASON – The period of the year within a climatic regime when planting, transplanting or seeding is recommended for successful establishment.

PLANTING SOIL – 4 inches of Grade 2 compost and other specified additives thoroughly mixed with 12 inches of cultivated inplace soil resulting in a minimum 16 inch total depth of mixture.

PLANT STOCK – Trees, shrubs, vines and perennials that meet type and size requirements, as specified in the plan.

POTTED – Bare root plants not grown in a pot long enough for the roots and soil ball to retain its shape and hold together when removed from the container.

PROGRESS SCHEDULE – A bar chart or critical path diagram showing starting, activity and completion dates for all progress of the Contract work.

PROJECT – The specific section of the highway together with all appurtenances and construction to be performed thereon under the Contract.

PROPOSAL – The offer of a bidder, in the prescribed proposal form, to perform the work and to furnish the labor and materials at the prices quoted.

PRUNING – The judicious removal of plant parts to increase structural safety, health, usefulness, beauty, and/or vigor.

PYRAMIDAL – A conical tree form broad near the ground and becoming narrower as it grows upward.

QUARANTINE – A federal or state regulation to restrict the movement of plants, or materials (mulch).

REPELLENT – A substance disliked by pests which is used to protect plants.

RHIZOME – A horizontal underground stem which may form both roots and shoots at the nodes.

RIGHT-OF-WAY – A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to a highway.

RILL – A small, eroded ditch, usually only a few inches deep and hence no great obstacle to operations but a potentially serious condition promoting increasing erosion.

RODENTICIDE – A substance, usually poisonous, used to control rodents.

ROOT – An underground plant organ performing the functions of anchorage and of water and mineral absorption. The descending axis of the plant, without nodes and internodes.

ROOT COLLAR (ROOT FLARE) – The transition zone between the stem and the root, sometimes recognized in trees and seedlings by the presence of a slight swelling.

ROOT HAIR – Extension of the epidermis on the root which collects water and nutrients from the soil.

ROOT NODULE – A swelling formed on the roots of leguminous plants, caused by the symbiotic nitrogen-fixing bacteria, Rhizobium.

ROOT STOCK – The rooted portion of a plant to which a graft has been applied.

ROOTBOUND (OR POTBOUND) – Condition that occurs when a plant grows for too long in its container - tangled, matted roots with no room for additional growth go around in circles. Root bound plants placed in the ground often do not outgrow their choked roots and decline from the constriction later on.

ROOTLET – A subdivision of a root, also, an aerial root.

RUNNER – A slender horizontal stem or trailing shoot above ground that usually forms roots at the tip and at some nodes.

SAND – Loose, granular, gritty particles of worn or disintegrated rock, finer than gravel and coarser than dust.

* **VERY COARSE SAND** – 2.0 to 1.0 mm diameter or the thickness of a house key
* **COARSE SAND** – 1.0 to 0.5 mm diameter or the thickness of a pinhead.
* **MEDIUM SAND** – 0.5 to 0.25 mm diameter or the thickness of sugar crystals.
* **FINE SAND** – 0.25 mm to 0.10 mm diameter or the thickness of this sheet of paper.
* **VERY FINE SAND** – 0.10 to 0.05 mm diameter or a thickness invisible to the eye.

SAPWOOD (XYLEM) – The portion of the tree between the heartwood and the cambium which consists of living cells or the Xylem. The conducting tissues which transport water and nutrients to the leaves.

SATURATED – Soil condition where high or perched water table is detrimental to plant growth due to replacement of soil air space with water.

SCARIFY – Roughen sides and bottom of planting hole.

SCIENTIFIC NAME – A system of taxonomy, whereby every living structure, or bios, is assigned a genus and a species name (binomial nomenclature). The scientific name of yarrow for example is Achillea millefolium.

SCRIBE (TRACE) – To cut the bark about a jagged wound to a neat, clean round or oval shape to encourage rapid and continuous callus closure.

SCORE – Cut slits at 6 inch intervals in the root mass of containerized stock or balled and burlapped Stock with treated burlap.

SEDIMENT – Material deposited by water, wind, or glaciers; the matter that settles to the bottom of a liquid.

SEDIMENTATION – the action or process of forming or depositing sediment.

SEED – A fertilized ripened ovule that contains an embryo of angiosperms and gymnosperms usually protected by a tough seed coat.

SHEAR – To cut or clip a plant at a certain height or to a definite shape or form, which may remove the next year's growth.

SHOOT – A plant's current season stem growth with leaves and buds.

SHOULDER – The portion of the roadway parallel with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of the base and surface courses. (See backslope for image.)

SHRUB – A low growing woody perennial, with multiple stems usually less than 15 feet in height.

SIEVE – A woven wire screen meeting the requirements of AASHTO M-92 for the size specified.

SIGHT DISTANCE – The visual distance required for a motorist to safely maneuver their vehicle through intersections (for stopping, turning, signs, etc.) as determined by the highway design engineering standards.

SILT – A sedimentary soil consisting of fine mineral particles intermediate in size between sand and clay with a diameter between 0.05 and 0.002 mm. Particle diameter size is less than clay (0.002mm).

SITE – The area shown in the plan where project operations will occur..

SITE SPECIFIC – Specific to only one particular location.

SLOPE RATIO – An arithmetic expression of the horizontal and vertical value relationships (gradient) of a slope. Horizontal values are always expressed preceding vertical values (i.e. 3:1).

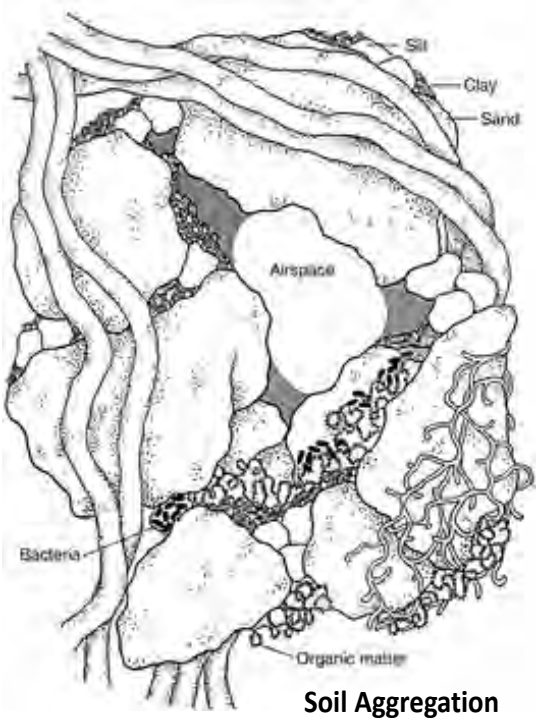
SLOW RELEASE FERTILIZER – A fertilizer which is available to the plant over a long period of time in comparison to inorganic, soluble fertilizers, which are immediately available to the plants.

SOD – A portable mass of groundcover plants, usually grasses, used to establish turf.

SOIL – 1. The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. 2. The unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of parent material, climate, macro- and microorganisms, and topography, all acting over a period of time and producing a product—soil—that differs from the material from which it is derived in many physical, chemical, biological, and morphological properties and characteristics.

SOIL BULK DENSITY– The mass (weight) of dry soil per unit of volume. The volume is determined by drying a soil sample to a constant weight at 105 degrees C. and then determining the volume. A unit of measure expressed as g per cubic cm or Ib per cubic ft.

SOIL AGGREGATION – The cementing or binding together of several soil particles into a secondary unit, aggregate, or granule. Water-stable aggregates, which will not crumble, or disintegrate easily, are important to a stable soil structure and plant growth.



Soil Aggregation

SOIL HORIZON – Any layer of soil, roughly parallel to the land surface, that may be distinguished from adjacent layers because it differs in physical, chemical or biological characteristics, e.g. color, kinds and numbers of organisms present, structure, texture, consistency, amount of organic matter, and degree of acidity or alkalinity. Undisturbed soil horizons will have distinct soil ranges from surface organic matter to bedrock.

SOIL MOISTURE – Water held in the soil by capillary and hygroscopic forces. Plants only utilize capillary soil moisture for growth processes.

SOIL PROFILE – A vertical section of the soil through all its horizons and extending into the parent material.

SOIL SAMPLE – A specimen of soil collected for laboratory testing and analysis.

SOIL STRUCTURE – The combination or arrangement of primary soil particles into secondary particles, units, or peds. A ped is a natural aggregate (crumb, prism, block or granule formed by natural processes) as opposed to a clod which is a coherent mass of soil broken into any shape by artificial means such as tilling.

SOIL TEXTURE – The proportion of sand, silt, and clay in a soil sample constitutes its textural class.

* **SAND** – Sand is the largest particles and they feel "gritty"
* **SILT** – Silt is medium sized and they feel soft, silky or "floury".
* **CLAY** – Clay is the smallest sized particles and they feel "sticky" and they are hard to squeeze.

SOIL TEST – A chemical, physical, or microbiological operation that estimates a property of the soil pertinent to the suitability of the soil to support plant growth.

SPECIAL PROVISIONS – Additions and revisions to the Standard and supplemental Specifications to cover conditions unique to an individual project. A list can be found at Minnesota Pollution Control Agency's web site.

SPECIAL WATERS – Specific bodies of water designated by the Minnesota Pollution Control Agency which may require permits and BMPs when disturbing soil within 1 mile of their location.

SPECIES – taxonomic classification, ranking below a genus or subgenus and consisting of related organisms capable of interbreeding. White pines scientific name is Pinus strobus, with strobus being the species name.

SPECIFICATIONS – 1) A general term applied to all directions, provisions and requirements pertaining to performance of the work. 2) Used in reference to Standard Specifications for Construction.

SPECIFIED COMPLETION DATE – The date on which the contract work is specified to be completed.

SPECIMEN TREE – A notable and valued tree in consideration of species, size, condition, age, longevity, durability, crown development, function, visual quality, and public or private prominence or benefit as indicated in the contract documents or as determined by the Engineer.

SPREADING – Growing outward or horizontally.

STATE – The State of Minnesota, acting through its elected officials and their authorized representatives.

STEM – The main axis of a plant that generally grows above ground, giving rise to branches, leaves and flowers.

STEM GIRDLING-ROOT – A root which has grown so that it encircles and constricts the main stem. Typically, results in decline or death of a plant.

STRESS – A gradation of events or conditions which drain, block or disrupt the flow of energy within a plant. The condition or injury may be reversible with a change in the conditions.

STOLON – A runner or horizontal above-ground stem often forming roots and shoots at the nodes.

STRUCTURES – Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, endwalls, buildings, sewers, service pipes, underdrains, foundation drains, and other features which may be encountered in the work and not otherwise classified herein.

SUBCONTRACTOR – An individual, firm or corporation to whom the Contractor sublets part of the Contract.

SUBGRADE – The top surface of a roadbed upon which the pavement structure and shoulders are constructed. Also, a general term denoting the foundation upon which a base course, surface course, or other construction is to be placed, in which case reference to subgrade operations may imply depth as well as top surface.

SUBSOIL – The underlying less fertile and compacted soil horizon beneath the upper layer of topsoil.

SUBSOILING – The tillage of subsurface soil without inversion, to break up compacted or dense soil layers that restrict air and water movement and root penetration.

SUCKER – Any unwanted shoot—it may come up from underground, the lower part of a plant, or even on the trunk or large branches (in which case it's called a water sprout).

SUNSCALD – Dead or injured bark and cambium due to fluctuating winter temperature.

SUPERINTENDENT – The Contractor's authorized representative responsible for the work.

SUPPLEMENTAL AGREEMENT – A written agreement between the Contracting Authority and the Contractor, executed on the prescribed form and approved as required by law, covering the performance of extra work or other alterations or adjustments as provided for within the general scope of the Contract, but which extra work or change order constitutes a modification of the contract as originally executed and approved.

SUPPLEMENTAL DRAWINGS – An approved set of drawings consisting of standard plates or Plans showing the details of design and construction for various structures and products for which standards have been developed. These standard plates and Plans shall govern by reference as identified and supplemented or amended in the general Plans and Specifications.

SUPPLEMENTAL SPECIFICATIONS – Additions and revisions to the Standard Specifications that are approved subsequent to issuance of the printed book of Standard Specifications for construction.

SURETY – The corporation, partnership or individual, other than the Contractor, executing a bond furnished by the Contractor.

SURFACE TENSION – The adhesive force that holds capillary water in the soil.

SWALE – A natural or man-made depression or channel which allows water to be carried away.

SYMBIOTIC – Describes two dissimilar organisms living together in a mutually beneficial relationship.

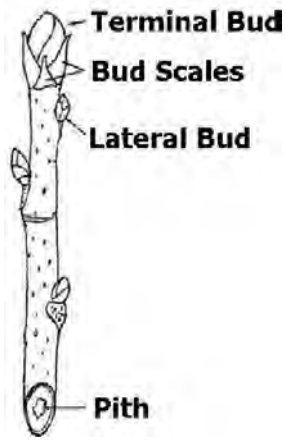
SYMPTOM – Any circumstance or phenomenon affecting living organism which can be regarded as a departure from normal function or as an indication of disorder or disease.

SYSTEMIC – A substance which may permeate all living parts of a plant as in systemic insecticides and herbicides.

TAMP – To firm soil or backfill gently about roots when planting.

TAPROOT – A main fleshy root that grows straight down. Some plants have very deep taproots in order to get their water from deep down in the soil.

TENDRIL – A twisting thread like projection found on many vines which enables them to cling to and climb on objects.



TERMINAL BUD – A bud at the end of a branch, limb, or petiole. May develop into a branch, leaf, or inflorescence (flower).

TENSIOMETER – Instrument used for measuring the water potential (suction or negative pressure) of soil water. Used to measure the availability of soil water for the plants.

THINNING OUT – In pruning, this term means removing entire branches—large or small ones-clear back to the main trunk or side branch. The object is to give the plant a more open growth pattern or to rejuvenate a plant by allowing for more vigorous new growth.

TILL – To work soil by plowing, spading, harrowing, hoeing, etc.; cultivate

TILTH – The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and ability for seedling emergence and root penetration. Tilth is a result of tillage.

TOPSOIL – The upper layer of naturally occurring soil containing organic matter and suited for plant survival and growth. It is usually of the A soil horizon.

TRAINING – The art of shaping plants by slight pruning, tying, or bracing.

TRANSPIRATION – Loss of water from a plant in the form of vapor, usually through stomatal openings on the upper or lower surface of its leaves.

TRANSPLANTING – The harvesting, moving and installing of plants from one place or container to another.

TRAVEL LANE – The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

TREE – A woody plant, usually with a single stem, above 12 to 15 feet in height at maturity.

TRIM – To prune lightly to establish a desirable shape or form.

TURF – The surface mat of grasses and plant roots growing closely together as in a lawn, pasture or prairie.

TURGID – A condition of plant tissues, especially leaves, having adequate moisture or in other words, not wilted.

TURN LANE – An auxiliary lane for left or right turning vehicles.

TWIG – The end most section of branch representing the growth of the current growing season.

UNDERCUT – 1. The deep notch cut into the base of a tree to govern the direction in which it is to fall and also to prevent splitting. 2. A cross-cut made on the underside of a branch, so as to prevent splitting in cases where the piece on one or both sides of the cut must drop after severance without tearing the bark off the trunk.

VARIETY – Subdivision of a species having a distinct though often inconspicuous difference, and breeding true to that difference. Generally refers to clones. Charles Joly Lilac's scientific name is Syringa vulgaris 'Charles Joly'. 'Charles Joly' is the variety.

VIABLE (VIABILITY) – Capable of living and developing normally.

VIGOR – The capacity for healthy growth.

VINE – A plant with a slender non-rigid stem which climbs or trails by tendrils, aerial roots, or by twisting about another plant or object.

VIRUS – A minute organism resembling certain molecules of proteins, often causing systematic diseases.

WARM-SEASON PLANT – A plant which produces most or all of its growth during the spring and summer, flowering in the summer or fall.

WATERLOGGED – See SATURATED

WATER-SPROUT – A rapid-growing suckering shoot arising from either a latent or adventitious bud on the lower part of the trunk or large branch of a tree.

WATER TABLE – The upper surface of groundwater; that level below which the soil is saturated with water.

WATER TABLE, PERCHED – The surface of a local zone of saturation held above the main body of groundwater by an impermeable layer, usually clay or rock, and separated from the main body of groundwater by an unsaturated zone.

WATERS OF THE STATE – All streams, lakes, ponds, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, and all other bodies or accumulations of water, surface or underground, natural or man-made, public or private.

WEED – Any plant considered undesirable and troublesome especially when found growing where it is not wanted.

WHORL – An arrangement of leaves, leaflets, or petioles around a given node, usually arranged in a circle or semicircle.

WILT – To become limp, loss of turgor.

WITCH'S-BROOM – Tufts of shoots or stems resulting from an infection by fungi, an infestation by insects or salt spray damage.

WOODY – A plant that uses wood as its structural tissue such as trees, shrubs and vines.

WORK – The furnishing of all labor, materials, equipment, and incidentals necessary or convenient to the successful completion of the project.

WORK ORDER – A written order, signed by the Engineer, of a contractual status requiring performance or other action by the Contractor without negotiation of any sort.

WOUND – An injury that causes a disruption of plant tissues leaving an opportunity for infection.

WOUND DRESSING – Latex paint or shellac sprayed or brush on wounded or cut branches, roots, or trunks of oak trees applied during oak wilt season (typically April, May, and June).

Appendix G

Special provisions may be included with landscape contracts and contain information that is specific to that project. Special provisions supersede the Standard Specifications and Plan for the specified project. Read the special provisions to make sure you understand the contract specific changes to the standard specifications.

Appendix H

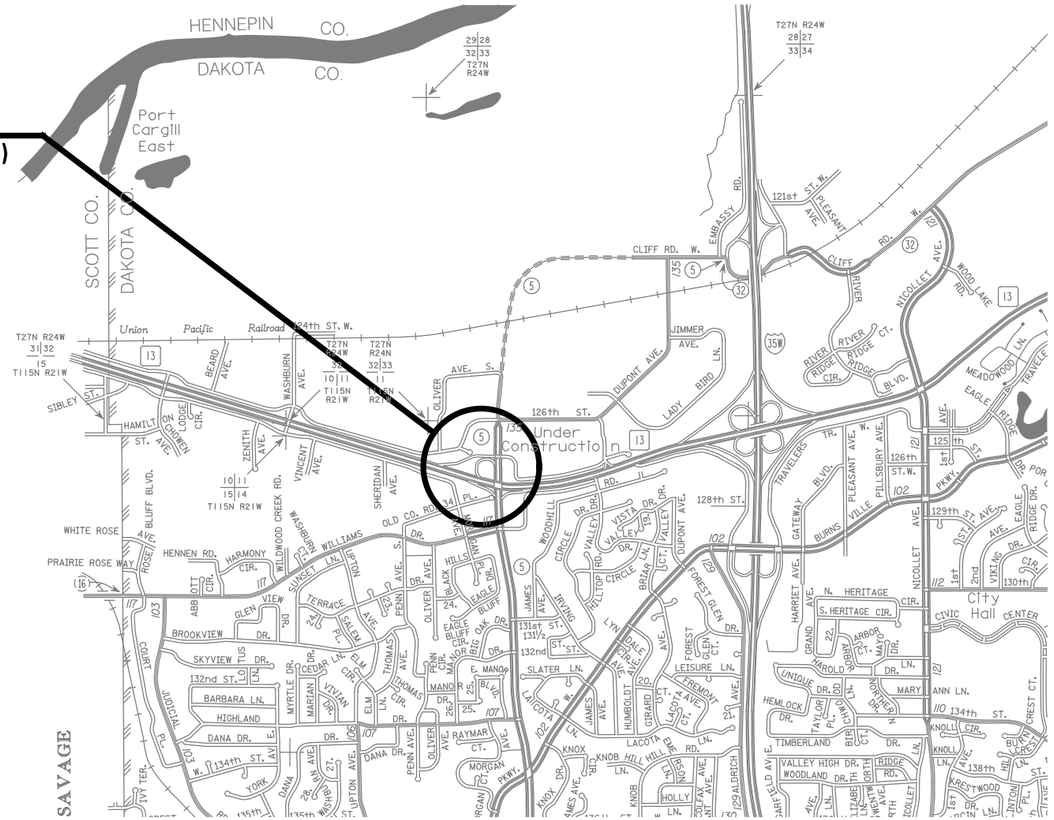
MINNESOTA DEPARTMENT OF TRANSPORTATION

CONSTRUCTION PLAN FOR LANDSCAPING

LOCATED ON T.H.13 AT CSAH 5 INTERCHANGE IN THE CITY OF BURNSVILLE

STATE PROJ. NO. SP 1901–171
MINN. PROJ. NO. _____
GROSS LENGTH _____ FEET _____ MILES
BRIDGES–LENGTH _____ FEET _____ MILES
EXCEPTIONS–LENGTH _____ FEET _____ MILES
NET LENGTH _____ FEET _____ MILES
REF. POINT _____ TO REF. POINT _____

PROJECT LOCATION
SP 1901–171 (TH 13 & CSAH 5)



N

PLAN REVISIONS		
DATE	SHEET NO.	APPROVED BY

DESIGN DESIGNATION – TIER NO. _____

PROJECT LOCATION
COUNTY: DAKOTA
DISTRICT: METRO

FOR PLANS & UTILITIES SYMBOLS SEE TECHNICAL MANUAL

PROJ. NO	CHARGE IDENTIFIER
SP 1901–171	

FED. PROJ. NO.
STATE FUNDS

GOVERNING SPECIFICATIONS

THE 2014 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR CONSTRUCTION" AND THE 2014 EDITION OF THE "MATERIALS LAB SUPPLEMENTAL SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.

INDEX

THIS PLAN CONTAINS 9 SHEETS

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL LANDSCAPE ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA.

DATE _____ LIC. NO. _____ _____

PROJECT L.A. DAVID LARSON, LANDSCAPE ARCHITECT _____

PROJECT DESIGNERS PHILIP ZENGE _____

RECOMMENDED FOR APPROVAL BY: _____ 20____
DISTRICT TRANSPORTATION ENGINEER

RECOMMENDED FOR APPROVAL BY: _____ 20____
PRINCIPAL LANDSCAPE ARCHITECT

RECOMMENDED FOR APPROVAL BY: _____ 20____
STATE PRE–LETTING ENGINEER

OFFICE OF LAND MANAGEMENT APPROVAL BY: _____ 20____
DIRECTOR, OFFICE OF LAND MANAGEMENT

APPROVED _____ 20___ _____
STATE DESIGN ENGINEER

I HEREBY CERTIFY THAT THE FINAL FIELD REVISIONS, IF ANY, OF THIS PLAN WERE MADE BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINT NAME: _____ LIC. NO.: _____

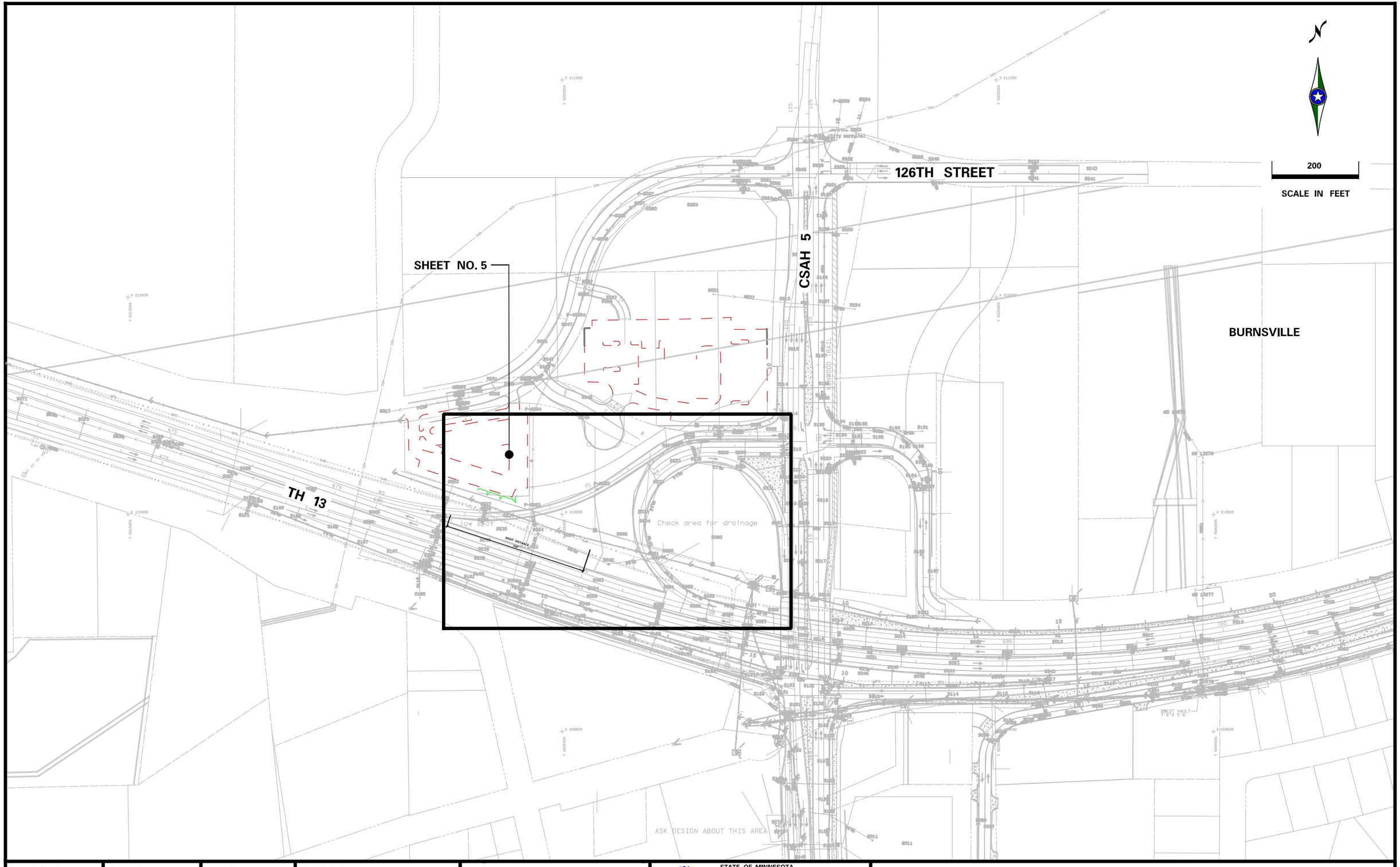
DATE: _____ SIGNATURE: _____

DATE PRINTED: 6/2/2015	TIME PRINTED: 1:24:27 PM	INDEX MAP	NO SCALE	SCALES IN FEET	ADT (Current Year) 35,000 = 2013
		GENERAL LAYOUT	0 500		Design Speed 55 MPH
		PLAN	0 50		

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
OFFICE OF ENVIRONMENTAL STEWARDSHIP
ENV. PLANNING AND DESIGN UNIT
TRANSPORTATION BUILDING
ST. PAUL, MINNESOTA 55155–1899

TITLE SHEET

STATE PROJECT SP 1901–171 (T.H. 13 = 117) SHEET NO. 1 OF 9 SHEETS



DATE PRINTED: 6/2/2015	TIME PRINTED: 11:25:04 AM	PROJECT MANAGER PHILIP ZENGE	DRAWN BY PHILIP ZENGE	DATE _____ LIC. NO._____	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION OFFICE OF ENVIRONMENTAL STEWARDSHIP ENV. PLANNING AND DESIGN UNIT TRANSPORTATION BUILDING ST. PAUL, MINNESOTA 55155–1899	**GENERAL LAYOUT**
			CHECKED BY ANTHONY WOTZKA	SIGNATURE_____ LICENSED PROFESSIONAL LANDSCAPE ARCHITECT		**STATE PROJECT SP 1901–171 (T.H. 13) SHEET NO. 2 OF 9 SHEETS**

STATEMENT OF ESTIMATED QUANTITIES			
ITEM No.	DESCRIPTION	UNITS	ESTIMATED
			S.P.1901-171
2563.601	TRAFFIC CONTROL	LUMP SUM	1
2571.501	CONIFEROUS TREE 5' HT B&B	TREE	8
2571.502	DECIDUOUS TREE 1.25" CAL BR	TREE	12
2571.503	ORNAMENTAL TREE 1.25" CAL BR	TREE	31
2571.505	DECIDUOUS SHRUB 18" HT BR	SHRUB	282

GENERAL NOTES:

A. OPERATE TILLING EQUIPMENT A MINIMUM OF 10' CLEAR OF EXISTING TREES, UNLESS AUTHORIZED BY THE ENGINEER/LANDSCAPE ARCHITECT/LANDSCAPE DESIGNER.

B. COMPLETE ALL TILLING USING A SPADE TYPE TILLER (SPADING MACHINE).

C. SEE THE PLANT STOCK TABULATION TABLE FOR INDIVIDUAL PLANT QUANTITIES.

D. RESTORE ALL DAMAGED TURF AT THE CONTRACTORS EXPENSE, TO PRE-LANDSCAPE INSTALLATION CONDITIONS.

UTILITIES TABULATION
COMPANY
CENTURYLINK
INTEGRA TELECOMMUNICATIONS OF MINNESOTA, INCORPORATED
WINDSTREAM COMMUNICATIONS
ZAYO GROUP, LLC

UTILITY NOTES:

1. NO UTILITIES WILL BE AFFECTED BY THIS PROJECT.

2. THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA".

DATE PRINTED: 6/23/2015	TIME PRINTED: 12:22:56 PM	PROJECT MANAGER PHILIP ZENGE	DRAWN BY PHILIP ZENGE	DATE _____ LIC. NO._____	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION OFFICE OF ENVIRONMENTAL STEWARDSHIP ENV. PLANNING AND DESIGN UNIT TRANSPORTATION BUILDING ST. PAUL, MINNESOTA 55155–1899	ESTIMATED QUANTITIES
			CHECKED BY ANTHONY WOTZKA	SIGNATURE_____ LICENSED PROFESSIONAL LANDSCAPE ARCHITECT		STATE PROJECT SP 1901–171 (T.H. 13) SHEET NO. 3 OF 9 SHEETS

PLANT STOCK TABULATION S.P. 1901-171

KEY	SPECIES	Minimum Acceptable Dimensions	Units	TOTAL QUANTITY
	CONIFEROUS TREE 5' HT B&B	4.5' Ht., 2.5' Spread, 20" root spread & 13.5" depth	**TOTAL**	**8**
BHS	SPRUCE, BLACK HILLS		TREE	8
	Picea glauca densata			
	DECIDUOUS TREE 1.25" CAL BR	1.10" Cal., 5.5' Ht., 20" root spread	**TOTAL**	**12**
CLM	MAPLE, COLUMNAR NORWAY		TREE	9
	Acer platanoides (Columnare)			
BRO	OAK, BUR		TREE	3
	Quercus macrocarpa			
	ORNAMENTAL TREE 1.25" CAL BR	1.10" Cal., 5.5' Ht., 20" root spread	**TOTAL**	**31**
CSC	CHERRY, CANADA RED		TREE	6
	Prunus virginiana (Canada Red)			
HGC	CRABAPPLE, HARVEST GOLD		TREE	10
	Malus (Hargozam)			
VGC	CRABAPPLE, VANGUARD		TREE	6
	Malus (Vanguard)			
IPH	HONEYLOCUST, IMPERIAL		TREE	5
	Gleditsia triacanthos inermis (Impcole)			
AMP	PLUM, AMERICAN		TREE	4
	Prunus americana			
	DECIDUOUS SHRUB 18" HT BR	16.5" Ht., 10" root spread	**TOTAL**	**282**
GBC	CHOKEBERRY, GLOSSY BLACK		Shrub	26
	Aronia melonocarpa			
PHL	LILAC, PRINCE CHARMING		Shrub	57
	Syringa Bailming (Prince Charming)			
SLB	SILVERBERRY		Shrub	72
	Elaeagnus commutata			
FGS	SUMAC, FRAGRANT		Shrub	38
	Rhus aromatica			
AWV	VIBURNUMN, ARROWWOOD		Shrub	89
	Viburnum dentatum			
			Total (Planting Material)	**333**

DATE PRINTED: 6/23/2015	TIME PRINTED: 12:22:57 PM	PROJECT MANAGER PHILIP ZENGE	DRAWN BY PHILIP ZENGE	DATE _____ LIC. NO._____	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION OFFICE OF ENVIRONMENTAL STEWARDSHIP ENV. PLANNING AND DESIGN UNIT TRANSPORTATION BUILDING ST. PAUL, MINNESOTA 55155–1899
			CHECKED BY ANTHONY WOTZKA	SIGNATURE_____ LICENSED PROFESSIONAL LANDSCAPE ARCHITECT	

PLANT STOCK TABULATIONS

(11) AWV_18" Ht._B.R.
(3) CSC_1.25" Cal._B.R.
(2) AMP_1.25" Cal._B.R.
(22) AWV_18" Ht._B.R.
(2) AMP_1.25" Cal._B.R.
(3) CSC_1.25" Cal._B.R.
(11) AWV_18" Ht._B.R.
(2) HGC_1.25" Cal._B.R.
(12) PHL_18" Ht._B.R.
(41) SLB_18" Ht._B.R.
(12) PHL_18" Ht._B.R.
(33) PHL_18" Ht._B.R.
(31) SLB_18" Ht._B.R.
(23) AWV_18" Ht._B.R.
(3) HGC_1.25" Cal._B.R.
(11) AWV_18" Ht._B.R.
(11) AWV_18" Ht._B.R.
(13) GBC_18" Ht._B.R.
(13) GBC_18" Ht._B.R.
(3) VGC_1.25" Cal._B.R.
(3) VGC_1.25" Cal._B.R.
(19) FGS_18" Ht._B.R.
(4) HGC_1.25" Cal._B.R.
(8) BHS_5' Ht._B&B
(1) HGC_1.25" Cal._B.R.
(3) BRO_1.25" Cal._B.R.
(4) IPH_1.25" Cal._B.R.
(9) CLM_1.25" Cal._B.R.
(19) FGS_18" Ht._B.R.
(1) IPH_1.25" Cal._B.R.

50
SCALE IN FEET

BEGIN PROJECT
STA. 686+00.50

END PROJECT
STA. 688+00.00

CSAH 5

TH 13

KEY	SPECIES	QUANT.	SPACING
BHS	SPRUCE, BLACK HILLS	8	AS SHOWN
CLM	MAPLE, COLUMNAR NORWAY	9	AS SHOWN
BRO	OAK, BUR	3	AS SHOWN
CSC	CHERRY, CANADA RED	6	AS SHOWN
HGC	CRABAPPLE, HARVEST GOLD	10	AS SHOWN
VGC	CRABAPPLE, VANGUARD	6	AS SHOWN
IPH	HONEYLOCUST, IMPERIAL	5	AS SHOWN
AMP	PLUM, AMERICAN	4	AS SHOWN
GBC	CHOKEBERRY, GLOSSY BLACK	26	5' O.C.
PHL	LILAC, PRINCE CHARMING	57	4' O.C.
SLB	SILVERBERRY	72	5' O.C.
FGS	SUMAC, FRAGRANT	38	5' O.C.
AWV	VIBURNUMN, ARROWWOOD	89	5' O.C.

DATE PRINTED: 6/22/2015	TIME PRINTED: 3:55:17 PM	PROJECT MANAGER PHILIP ZENGE	DRAWN BY PHILIP ZENGE	DATE _____ LIC. NO. _____	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION OFFICE OF ENVIRONMENTAL STEWARDSHIP ENV. PLANNING AND DESIGN UNIT TRANSPORTATION BUILDING ST. PAUL, MINNESOTA 55155-1899	LANDSCAPE PLAN
			CHECKED BY ANTHONY WOTZKA	SIGNATURE _____ LICENSED PROFESSIONAL LANDSCAPE ARCHITECT		STATE PROJECT SP 1901-171 (T.H. 13) SHEET NO. 5 OF 9 SHEETS

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

1) PROJECT DESCRIPTION/LOCATION: THE PROJECT IS LOCATED AT THE INTERCHANGE OF TRUNK HIGHWAY 13 AND CSAH 5 IN THE CITY OF BURNSVILLE, MINNESOTA IN DAKOTA COUNTY.

THIS PROJECT WILL DISTURB PERENNIAL VEGETATED SOILS TO CONSTRUCT STABILIZED LANDSCAPE PLANTING BEDS. SOILS LIKELY CONSIST OF ALL SOIL TEXTURAL TYPES.

THE EXPECTED AREA DISTURBED WILL BE LESS THAN 1 ACRE (0.67 ACRES), AND IS A FUNCTION OF LANDSCAPE CONTRACTOR OPERATIONS OF THE ULTIMATE SOIL DISTURBANCE, INCLUDING SLOPE ACCESS, STAGING OF MATERIALS AND EQUIPMENT. THERE WILL BE NO CHANGE IN PERVIOUS OR IMPERVIOUS SURFACES.

THE ULTIMATE RECEIVING WATER IS MINNESOTA RIVER BY DIRECT AND INDIRECT DISCHARGE, DITCHES, CURB AND GUTTER INLETS, STORM WATER PONDS, CARVER LAKE AND UNNAMED WETLAND. THERE ARE NO SPECIAL STREAMS, LAKES, FENS, SNA, OR TROUT STREAMS WITHIN 1 MILE OF THIS PROJECT.

THE ARE NO IMPAIRED WATERS WITHIN 1 MILE OF THIS PROJECT: MINNESOTA RIVER IS ABOUT 1.5 MILES NORTH OF THE PROJECT SITE.

THE POTENTIAL POLLUTANTS GENERATED FROM THIS WORK INCLUDE THE FOLLOWING: SEDIMENTS, FERTILIZERS, TRASH, CONSTRUCTION DEBRIS, AND VEHICLE/EQUIPMENT CHEMICALS.

2) POND AND DRAINAGE SYSTEMS: GENERALLY SPEAKING, DO NOT IMPEDE OR CHANGE FLOW CHARACTERISTICS, DRIVE VEHICLES OR OPERATE EQUIPMENT IN PONDS, DITCHES AND OTHER CONTRIBUTING DRAINAGE AREAS DURING CONSTRUCTION AND OVER THE LIFE OF THE PROJECT. WHEN ACCESS IS NECESSARY TO CONSTRUCT THE WORK, SCHEDULE OPERATIONS TO OCCUR DURING LOW FLOW CONDITIONS AND LIMIT DISTURBANCE TO AREAS THAT CAN BE REPAIRED EASILY IN ORDER TO MINIMIZE EROSION AND SEDIMENT POLLUTION. DO NOT DRIVE VEHICLES AND EQUIPMENT IN POND BOTTOMS UNDER ANY CIRCUMSTANCE. RESTORE CRITICAL AREAS, SUCH AS POND CORNERS AND EDGES, DITCH FLOWLINES AND STORM DRAIN INLETS TO PRE-EXISTING CONDITIONS WITHIN 24 HOURS.

AREAS WITHIN 10 FEET OF PONDS DISTURBED BY THE WORK SHALL BE PLANTED AND MULCHED WITHIN 24 HOURS. AREAS WHICH CAN-NOT BE COMPLETED WITHIN 24 HOURS, SHALL BE TEMPORARILY MULCHED AND PROTECTED WITH TEMPORARY SEDIMENT CONTROL DEVICES SUCH AS BALE BARRIERS AND FILTER LOGS AS REQUIRED TO PREVENT EROSION AND SEDIMENT CONTROL UNTIL PLANTING AND PERMANENT MULCHING CAN BE COMPLETED.

DITCHES AND OTHER DRAINAGE SYSTEMS WHICH MUST BE DISTURBED TO CONSTRUCT THE WORK, INCLUDING RUTTING, SHALL BE RESTORED TO PRE-EXISTING CONDITIONS WITHIN 3 DAYS.

3) STORM DRAIN INLETS: BEST MANAGEMENT PRACTICES (BMP'S) AND DEVICES, INCLUDING INLET DIAPERS, FILTER LOGS AND SEDIMENT MATS SHALL BE INSTALLED FOR STORM DRAIN INLET AND CULVERT PROTECTION AS REQUIRED TO PROTECT SEDIMENTATION INTO AND THROUGH UNDERGROUND DRAINAGE SYSTEMS.

4) STEEP SLOPES: THIS PROJECT CONTAINS AREAS REQUIRING PLANT INSTALLATION ON ROADWAY EXCAVATIONS AND EMBANKMENTS WITHIN THE RIGHT OF WAY AND EASEMENTS. SLOPES WITH GRADIENTS 1 VERTICAL: 3 HORIZONTAL AND GREATER DISTURBED BY THE WORK SHALL BE PLANTED AND MULCHED WITHIN 24 HOURS. AREAS WHICH CANNOT BE COMPLETED WITHIN 24 HOURS, SHALL BE TEMPORARILY MULCHED AND PROTECTED WITH TEMPORARY SEDIMENT CONTROL DEVICES SUCH AS SILT FENCES, SAND BAGS AND FILTER LOGS AS REQUIRED TO PREVENT EROSION AND SEDIMENT CONTROL UNTIL PLANTING AND PERMANENT MULCHING CAN BE COMPLETED. FILTER LOGS ARE REQUIRED AT EACH TREE LOCATION AND SHRUB BED LOCATED ON SLOPES WITH GRADIENTS 1 VERTICAL: 3 HORIZONTAL AND GREATER ADJACENT TO PONDS OR AS DIRECTED BY THE ENGINEER.

5) TIMING OF BMP INSTALLATION: EROSION AND SEDIMENT CONTROL BMP'S SHALL BE INSTALLED AS REQUIRED TO MINIMIZE EROSION FROM DISTURBED SURFACES AND CAPTURE SEDIMENT ONSITE IN ACCORDANCE WITH MNDOT 2573.

6) VEHICLE TRACKING: REMOVE TRACKED SEDIMENT FROM PAVED SURFACES IN ACCORDANCE WITH MNDOT 2573.

7) PERMITS REQUIRED: NO REQUIRED NPDES/SDS GENERAL STORMWATER PERMIT FOR CONSTRUCTION ACTIVITY.

8) LOCATION OF SWPPP REQUIREMENTS: BMP'S AND DEVICE LOCATIONS SHALL BE ON AN AS NEEDED BASIS, DETERMINED BY THE CONTRACTOR AND THE PROJECT ENGINEER AND SHALL BE INCIDENTAL TO THE PROJECT.

9) PROJECT CONTACTS: THE ENGINEER AND CONTRACTOR ARE RESPONSIBLE FOR IMPLEMENTATION OF THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND INSTALLATION, INSPECTION AND MAINTENANCE OF THE EROSION AND SEDIMENT CONTROL BMP'S DURING CONSTRUCTION AND OVER THE LIFE OF THE PROJECT. MNDOT METRO DISTRICT AND MNDOT OFFICE OF ENVIRONMENTAL STEWARDSHIP STAFF ARE ALSO AVAILABLE FOR ASSISTANCE AS DESCRIBED BELOW:

NAME	AGENCY	TELEPHONE
STEVE KORDOSKY	MNDOT CONSTRUCTION -METRO DISTRICT	651-366-5904
PAUL ERDMANN	MNDOT WATER RESOURCES -METRO DISTRICT	651-757-2883
DWAYNE STENLUND	MNDOT EROSION CONTROL/WATER QUALITY - SUPPORT	651-366-3625
CONTRACTOR	EC SUPERVISOR	
DAVID LARSON	MNDOT LANDSCAPE ARCHITECT	651-366-4617
PHILIP ZENGE	MNDOT LANDSCAPE DESIGN SPECIALIST	651-366-4652
PETER LEETE	MN/DNR TRANSPORATION HYDROLOGIST	651-366-3634
SHAWN NELSON	MPCA	651-757-2604
STATE DUTY OFFICER		800-422-0798

DATE PRINTED: 6/2/2015	TIME PRINTED: 1:05:14 PM	PROJECT MANAGER PHILIP ZENGE	DRAWN BY PHILIP ZENGE	DATE _____ LIC. NO._____	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION OFFICE OF ENVIRONMENTAL STEWARDSHIP ENV. PLANNING AND DESIGN UNIT TRANSPORTATION BUILDING ST. PAUL, MINNESOTA 55155–1899	SWPPP
			CHECKED BY ANTHONY WOTZKA	SIGNATURE_____ LICENSED PROFESSIONAL LANDSCAPE ARCHITECT		STATE PROJECT SP 1901–171 (T.H. 13) SHEET NO. 6 OF 9 SHEETS

GENERAL NOTES

SEE SPECIAL PROVISIONS FOR SPECIFIC PROJECT REQUIREMENTS.

REFER TO MnDOT SPECIFICATIONS 2571, 3861, AND THE "2015" INSPECTION AND CONTRACT ADMINISTRATION MANUAL FOR MnDOT LANDSCAPE PROJECTS" FOR GENERAL REQUIREMENTS.

COMPLETE PREPARATORY WORK BEFORE STARTING INITIAL PLANTING OPERATIONS.

ACCEPT ALL PLANT STOCK IN ACCORDANCE WITH (MnDOT 3861) PRIOR TO PLANTING.

THE CONTRACTOR WILL DEMONSTRATE COMPETENCY FOR SOIL CULTIVATION OPERATIONS IN ACCORDANCE WITH (MnDOT 2571.3D2 STEP 4)

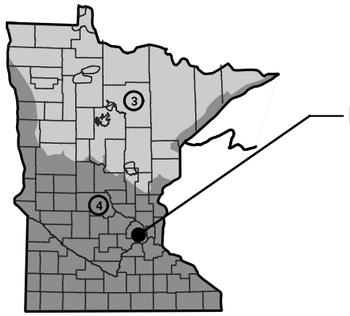
THE CONTRACTOR WILL DEMONSTRATE COMPETENCY FOR ALL PLANT INSTALLATION OPERATIONS IN ACCORDANCE WITH (MnDOT 2571.3F1)

RODENT PROTECTION	SEE SPECIAL PROVISIONS AND STANDARD PLANTING DETAILS (C)
FERTILIZER	SEE SPECIAL PROVISIONS
COMPOST	MnDOT 3890 GRADE 2 UNLESS OTHERWISE SPECIFIED.
MULCH MATERIAL	MnDOT 3882 TYPE 6 UNLESS OTHERWISE SPECIFIED.
MASS PLANTING BEDS	PREPARE MASS PLANTING BEDS FOR PLANTS PLACED AT 15' OR LESS, UNLESS OTHERWISE SPECIFIED ON SHEETS. PLANT BEDS IN STAGGERED ROWS ON THE PERIMETER FIRST, THEN UNIFORMLY FILL IN WITH REMAINING PLANTS. USE TRIANGULAR SPACING, UNLESS SPECIFIED OTHERWISE. PROVIDE 5' RADIUS CLEAR OF SHRUBS AROUND EACH DECIDUOUS TREE AND 8' CLEAR RADIUS AROUND EACH CONIFER TREE. RADIUS WILL BE MEASURED FROM THE CENTER OF THE TREE TO THE CENTER OF THE SHRUB. NOTIFY ENGINEER OF GROSS PLANT QUANTITY SURPLUS OR DEFICIENCY IMMEDIATELY. MULCH ENTIRE MASS PLANTING BED. SEE STANDARD PLANTING DETAILS (C)
TREE PAINTING (FROST CRACK PREVENTION)	PAINT OAK, LINDEN, LOCUST, MAPLE, CRABAPPLE AND MOUNTAIN ASH. ONLY UNDILUTED EXTERIOR WHITE LATEX PAINT IS ACCEPTABLE. PAINT TREE CIRCUMFERENCE FROM GROUND LINE TO FIRST MAJOR BRANCH.
PLANTING PLAN DIMENSIONS	STATED DIMENSIONS SUPERCEDE SCALING FROM PLAN.

WATERING GUIDELINES (MnDOT 2571.3G)

PLANT TYPE	AVERAGE GALLONS OF WATER PER APPLICATION
MACHINE TRANSPLANTED TREES	50–100
BALLED AND BURLAPPED TREES	20
BARE ROOT AND CONTAINER TREES	15
BALLED AND BURLAPPED SHRUBS	10
BARE ROOT AND CONTAINER SHRUBS	7
WOODY SEEDLINGS	4
PERENNIALS AND VINES	3

IT IS THE CONTRACTOR'S RESPONSIBILITY TO MONITOR AND MAINTAIN SOIL MOISTURE AT ADEQUATE BUT NOT EXCESSIVE LEVELS. THE AMOUNTS LISTED ABOVE ARE GUIDELINES, NOT REQUIREMENTS.



PROJECT LOCATION

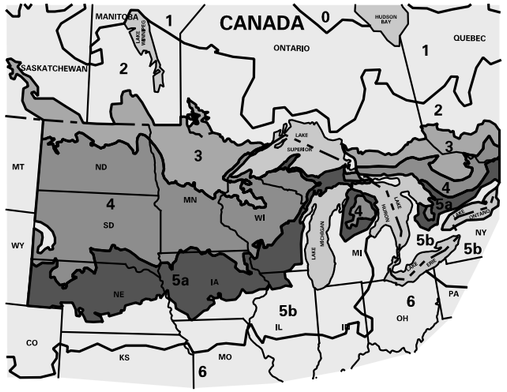
1. BARE ROOT PERENNIALS MUST BE INSTALLED IN THE SPRING NO LATER THAN JUNE 1ST OR FOLLOW THE FALL DECIDUOUS PLANTING DATES.
2. ACTUAL DATES MAY CHANGE DEPENDING UPON SEASONAL CONDITIONS, AS DETERMINED BY THE ENGINEER.
3. FALL PLANTING IS NOT ALLOWED FOR BARE ROOT FORM OF THE FOLLOWING SPECIES: HAWTHORN, DOGWOOD, POPLAR, HACKBERRY, LINDEN, IRONWOOD, HONEYLOCUST, BIRCH, MOUNTAIN ASH, MAPLE, WILLOW, CRABAPPLE, PLUM/CHERRY, OAKS, AND SUMAC.
4. ALL REPLACEMENT PLANTS MUST BE INSTALLED DURING THE MONTH OF MAY (SPRING PLANTING) AND SEPTEMBER (FALL PLANTING) DURING THE FIRST YEAR OF THE PLANT ESTABLISHMENT PERIOD.
5. MACHINED MOVED PLANTING DATES WILL BE SPECIFIED IN THE SPECIAL PROVISIONS.

PLANTING DATES BY ZONE

			③	④
SPRING	DECIDUOUS	BARE ROOT	APRIL 21 TO JUNE 1	APRIL 7 TO JUNE 1
		CONTAINER B&B	APRIL 21 TO JUNE 30	APRIL 7 TO JUNE 30
	CONIFEROUS		APRIL 21 TO JUNE 1	APRIL 7 TO MAY 17
	PERENNIALS		MAY 1 TO JUNE 30	MAY 1 TO JUNE 30
	SEEDLINGS		APRIL 21 TO JUNE 1	APRIL 7 TO JUNE 1
FALL	DECIDUOUS	BARE ROOT	OCT. 1 TO NOV. 1	OCT. 10 TO NOV. 15
		CONTAINER B&B	AUG. 25 TO OCT. 15	AUG. 25 TO NOV. 1
	CONIFEROUS		AUG. 25 TO SEPT. 15	AUG. 25 TO SEPT. 15
	PERENNIALS		AUG. 25 TO SEPT. 15	AUG. 25 TO SEPT. 15

PLANT INSTALLATION PERIOD

(MnDOT 2571.3F2)



ACCEPTABLE ZONES		
ZONES	LEGEND	MIN. TEMP.
3		–34.4° TO –40° F
4		–28.9° TO –34.4° F
5a		–26.1° TO –28.9° F

UNACCEPTABLE ZONES	
ZONES	LEGEND
0, 1, 2, 5b and 6	

FOR ALL PLANT STOCK, DOCUMENT ACCEPTABILITY FOR HARDINESS IN THE MINNESOTA ZONE WHERE THE PROJECT SITE IS LOCATED, AS FOLLOWS:

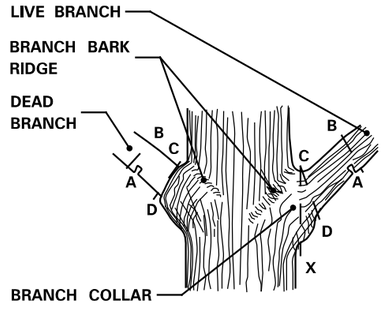
A. PLANT STOCK CONTINUOUSLY GROWN FOR AT LEAST THE LAST TWO YEARS WITHIN THE ACCEPTABLE LIMITS SHOWN.

OR

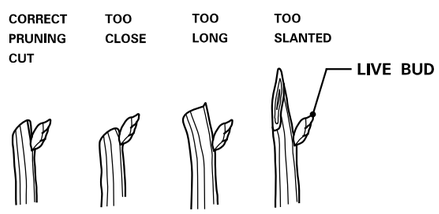
B. PLANT STOCK, GROWN OUTSIDE THE ACCEPTABLE GROWING RANGE LIMITS, HAVING SEED SOURCE OR ROOT AND GRAFT STOCK ORIGINATING FROM THE ACCEPTABLE LIMITS SHOWN.

ACCEPTABLE PLANT STOCK GROWING RANGE LIMITS

SOURCE: USDA PLANT HARDINESS ZONE MAP (MnDOT 3861.2C)



BRANCHES PRUNED AT TRUNK
(SHIGO METHOD)



BRANCHES PRUNED TO LIVE BUD

STEPS TO PRUNING WITH PRUNING SAW:
1. CUT PART WAY THROUGH THE BRANCH AT POINT A.
2. CUT COMPLETELY THROUGH BRANCH FROM POINT B TO A.
3. AT BRANCH COLLAR CUT FROM POINT C TO D.

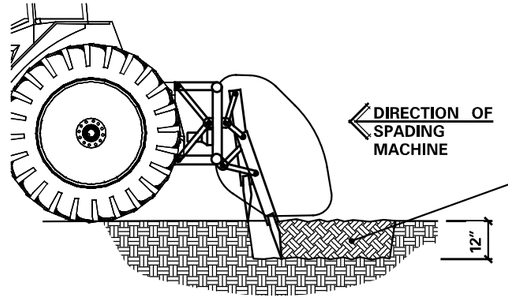
INCORRECT CUT FROM POINT C TO X (TOO CLOSE) WILL RESULT IN DISCONTINUOUS CALLUS FORMATION AFTER ONE SEASON OF GROWTH.

CORRECT CUT FROM POINT C TO D (LEAVING BRANCH COLLAR BUT NOT THE STUB FROM POINT B TO A) WILL RESULT IN CONTINUOUS DOUGHNUT SHAPED CALLUS FORMATION AFTER ONE SEASON OF GROWTH.

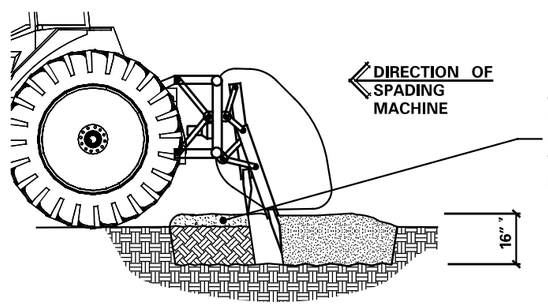
PRUNING NOTES:
1. PRUNE USING CLEAN AND SHARP SCISSOR–TYPE PRUNER OR PRUNING SAW.
2. THE BEST TIME TO PRUNE IS LATE DORMANT SEASON OR EARLY SPRING.
3. AVOID PRUNING OAKS IN APRIL, MAY, JUNE OR JULY.
4. IF PRUNING IS NECESSARY OR IF WOUNDS OCCUR TO OAK TREES IN APRIL, MAY, JUNE OR JULY, IMMEDIATELY PAINT CUT SURFACE OR WOUND WITH LATEX PAINT OR SHELLAC.

PRUNING

(MnDOT 2571.3K2a9 and 2571.3E1)



PRIMARY TILLAGE – PASS 1



INCORPORATION TILLAGE – PASS 2

PLANTING SOIL

(MnDOT 2571.3D2)

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PROJECT MANAGER
DAVID LARSON

DRAWN BY
OFFICE OF ENVIRONMENTAL STEWARDSHIP

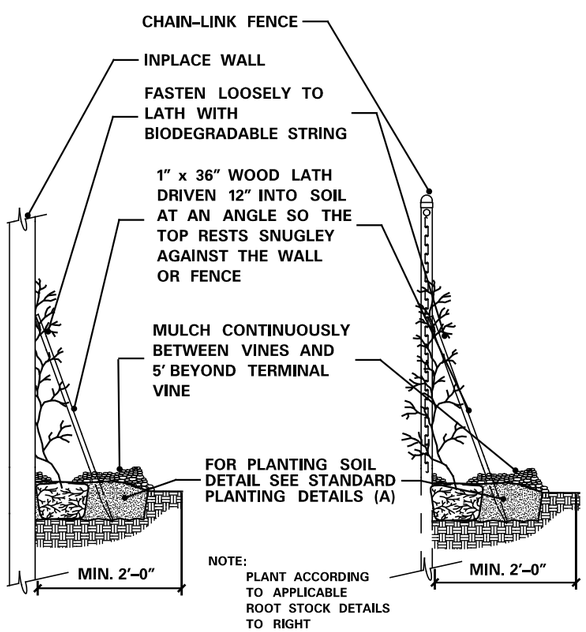
STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
OFFICE OF ENVIRONMENTAL STEWARDSHIP
ENV. PLANNING AND DESIGN UNIT
TRANSPORTATION BUILDING
ST. PAUL, MINNESOTA 55155–1899

STANDARD PLANTING DETAILS (A)

PLANTING HOLE DIMENSIONS

HOLE DEPTH FOR B&B AND CONTAINER PLANTS SHALL NOT EXCEED MEASUREMENT FROM ROOT FLAIR TO BOTTOM OF SOIL BALL.

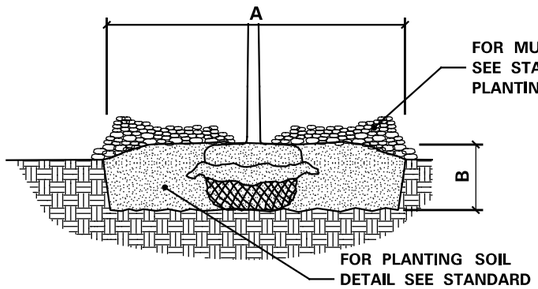
PLANT TYPE	PLANT SIZE UP TO AND INCLUDING	(A) MINIMUM HOLE WIDTH	(B) APPROXIMATE HOLE DEPTH
DECIDUOUS & ORNAMENTAL TREES	3' B.R.	46"	13"
	4' B.R	46"	14"
	5' B.R.	48"	14"
	6' B.R.	54"	15"
	7' B.R	60"	16"
	8' B.R.	66"	19"
	0.75" B.R.	48'	12"
	1" B.R.	54"	14"
	1.25" B.R.	60"	14"
	1.5 B.R.	66"	15"
	1.75" B.R	72"	16"
	2" B.R.	84"	19"
	4' B.B.	42"	11"
	5' B.B.	48"	12"
	6' B.B.	52"	14"
	8' B.B.	66"	16"
	10' B.B.	66"	16"
	12' B.B.	48"	16"
	1" B.B.	54"	14"
	1.25" B.B.	56"	15"
	1.5" B.B.	61"	15"
	1.75" B.B.	66"	16"
	2" B.B.	72"	16"
	2.5" B.B.	84"	19"
	3" B.B.	96"	20"
	3.5" B.B.	114"	23"
	4" B.B.	126"	25"
DECIDUOUS SHRUBS, ROSES AND PERENNIALS PERENNIAL HOLE DEPTH AND WIDTH SHALL BE BASED UPON ON-CENTER SPACING IN A CONTINUOUS TRENCH.	12" B.R.	24"	7"
	15" B.R.	28"	8"
	18" B.R.	30"	8"
	2' B.R.	33"	9"
	3' B.R.	42"	11"
	4' B.B.	48"	12"
	5' B.R.	54"	14"
	6' B.R.	60"	14"
	18" B.B.	27"	7"
	2' B.B.	30"	8"
	3' B.B.	36"	9"
	4' B.B.	42"	11"
	5' B.B.	48"	12"
	6' B.B.	54"	14"



WALL INSTALLATION

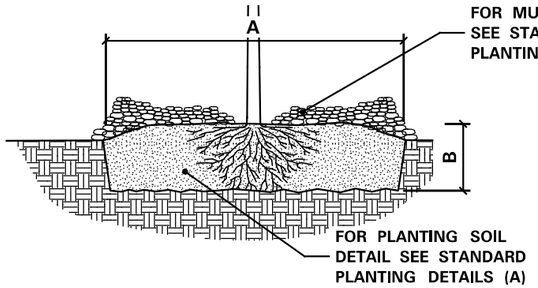
FENCE INSTALLATION

INSTALLATION OF VINES



1. SCARIFY SIDES AND BOTTOM OF HOLE.
2. PROCEED WITH CORRECTIVE PRUNING.
3. SET PLANT ON UNDISTURBED NATIVE SOIL OR THOROUGHLY COMPACTED PLANTING SOIL. INSTALL PLANT SO THE ROOT FLARE IS AT OR UP TO 2" ABOVE THE FINISHED GRADE WITH BURLAP AND WIRE BASKET, (IF USED), INTACT.
4. SLIT REMAINING TREATED BURLAP AT 6" INTERVALS.
5. BACKFILL TO WITHIN APPROXIMATELY 12" OF THE TOP OF THE ROOTBALL, THEN WATER PLANT.
6. REMOVE THE TOP 1/3 OF THE BASKET OR THE TOP TWO HORIZONTAL RINGS WHICHEVER IS GREATER. REMOVE ALL BURLAP AND NAILS FROM THE TOP 1/3 OF THE BALL. REMOVE ALL TWINE. REMOVE OR CORRECT STEM GIRDLING ROOTS.
7. PLUMB AND BACKFILL WITH PLANTING SOIL.
8. WATER THOROUGHLY WITHIN 2 HOURS TO SETTLE PLANTS AND FILL VOIDS.
9. BACK FILL VOIDS AND WATER A SECOND TIME.
10. PLACE MULCH WITHIN 48 HOURS OF THE SECOND WATERING UNLESS SOIL MOISTURE IS EXCESSIVE.

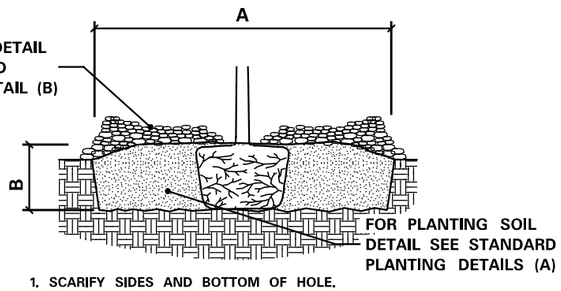
BALLED & BURLAPPED STOCK



1. SOAK ROOTS IN WATER FOR AT LEAST ONE HOUR BUT NOT MORE THAN 24 HOURS PRIOR TO PLANTING.
2. SCARIFY SIDES AND BOTTOM OF HOLE.
3. PROCEED WITH CORRECTIVE PRUNING OF THE TOP AND ROOTS.
4. TRANSFER PLANT DIRECTLY FROM WATER TO HOLE. SET PLANT SO THE ROOT FLARE IS AT THE FINISHED SOIL ELEVATION. SPREAD ROOTS OUT EVENLY. PLUMB AND IMMEDIATELY BACKFILL WITH PLANTING SOIL.
5. WATER THOROUGHLY WITHIN 2 HOURS TO SETTLE PLANTS AND FILL VOIDS.
6. BACK FILL VOIDS AND WATER A SECOND TIME.
7. PLACE MULCH WITHIN 48 HOURS OF THE SECOND WATERING UNLESS SOIL MOISTURE IS EXCESSIVE.

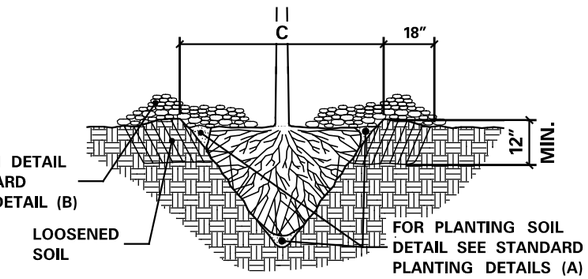
BARE ROOT STOCK

INSTALLATION OF PLANTS



1. SCARIFY SIDES AND BOTTOM OF HOLE.
2. PROCEED WITH CORRECTIVE PRUNING OF TOP AND ROOT.
3. REMOVE CONTAINER AND SCORE OUTSIDE OF SOIL MASS TO REDIRECT AND PREVENT CIRCLING FIBROUS ROOTS. REMOVE OR CORRECT STEM GIRDLING ROOTS.
4. SET PLANT ON UNDISTURBED NATIVE SOIL OR THOROUGHLY COMPACTED PLANTING SOIL. INSTALL PLANT SO THE TOP OF THE ROOT FLARE IS AT OR UP TO 2" ABOVE THE FINISHED GRADE.
5. PLUMB AND BACKFILL WITH PLANTING SOIL.
6. WATER THOROUGHLY WITHIN 2 HOURS TO SETTLE PLANT AND FILL VOIDS.
7. BACK FILL VOIDS AND WATER A SECOND TIME.
8. PLACE MULCH WITHIN 48 HOURS OF THE SECOND WATERING UNLESS SOIL MOISTURE IS EXCESSIVE.

CONTAINER STOCK



1. SCARIFY SIDES AND BOTTOM OF HOLE.
2. PROCEED WITH CORRECTIVE PRUNING.
3. SET PLANT ON NATIVE SOIL AT SAME DEPTH AS IT WAS PREVIOUSLY GROWN.
4. PLUMB AND BACKFILL WITH PLANTING SOIL.
5. AFTER PLANTING, LOOSEN THE SOIL IMMEDIATELY ADJACENT TO THE ROOT BALL TO A MINIMUM DISTANCE OF 18" AND A MINIMUM DEPTH OF 12".
6. WATER THOROUGHLY WITHIN 2 HOURS TO SETTLE PLANT AND FILL VOIDS.
7. BACK FILL VOIDS AND WATER A SECOND TIME.
8. PLACE MULCH WITHIN 48 HOURS OF THE SECOND WATERING UNLESS SOIL MOISTURE IS EXCESSIVE.

MINIMUM TREE SPADE SIZE REQUIREMENTS

(C) SPADE DIAMETER SIZE	OAK TREE, CALIPER	DECIDUOUS/ ORNAMENTAL TREE,CALIPER	CONIFEROUS TREE, HEIGHT
42"	1" to 1.5"	2" to 3"	5' to 7'
60"	1.5" to 2.5"	3" to 4"	7' to 9'
78"	2.5" to 3.5"	4" to 6"	9' to 14'
85"	3.5" to 5"	6" to 8"	14' to 18'

MACHINE MOVED STOCK

PLANTING HOLE DIMENSIONS

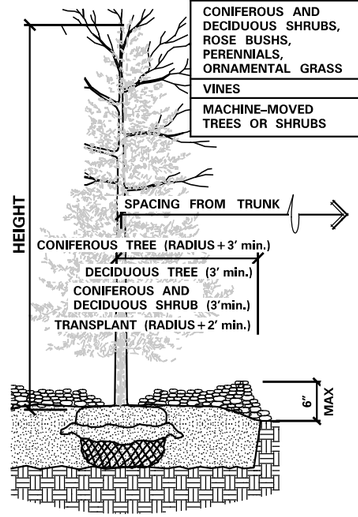
HOLE DEPTH FOR B&B AND CONTAINER PLANTS SHALL NOT EXCEED MEASUREMENT FROM ROOT FLAIR TO BOTTOM OF SOIL BALL.

PLANT TYPE	PLANT SIZE UP TO AND INCLUDING	(A) MINIMUM HOLE WIDTH	(B) APPROXIMATE HOLE DEPTH
CONIFEROUS TREES AT LEAST 2/3 OF ALL CONIFER BRANCHES WILL CONTAIN TERMINAL BUDS	2' B.B	36"	10"
	3' B.B	42"	11"
	4' B.B	51"	13"
	5' B.B	60"	13"
	6' B.B	66"	15"
	7' B.B	72"	16"
	8' B.B	81"	18"
	9' B.B	90"	20"
	10' B.B	102"	21"
	12' B.B	114"	24"
CONIFEROUS SHRUBS (UPRIGHT)	18" B.B.	24"	7"
	3' B.B.	48"	12"
CONIFEROUS SHRUBS (SPREADING)	18" SPR B.B.	30"	8"
	2' SPR B.B.	36"	9"
CONTAINER GROWN PLANTS	CELLPACKS / PLUGS	6"	2.5"
	2.25" CONT.	7"	3"
	3.5" CONT.	10"	3"
	4" CONT.	11"	4"
	4.5" CONT.	13"	4"
	6"/1 QT CONT.	15"	5.5"
	1# CONT.	18"	6"
	2# CONT.	23"	7.5"
	3# CONT.	29"	8.5"
	5# CONT.	30"	11"
	7# CONT.	37"	11"
	15# CONT.	44"	14"
	10# CONT.	45"	15"
	20# CONT.	60"	16"
	25# CONT.	72"	17"
SEEDLINGS	6" SEEDLING	15"	14"
	9" SEEDLING	18"	14"
	12" SEEDLING	23"	16"
	18" SEEDLING	30"	16"
	2' SEEDLING	36"	18"
VINES	1 YR. MED B.R.	15"	11"
	1 YR. NO. 1 B.R.	17"	14'
	2 YR. MED. B.R.	33"	12"
	2 YR. NO. 1 B.R.	42"	15"

MULCH AREA CALCULATOR

TYPE OF PLANT	SQ. FT. PER PLANT
CONIFEROUS TREES	$\left[\left(\frac{3/5 \times \text{HEIGHT}}{2}\right)+3\right]^2 \times \pi$
DECIDUOUS AND ORNAMENTAL TREES	$3^2 \times \pi$
CONIFEROUS AND DECIDUOUS SHRUBS, ROSE BUSHS, PERENNIALS, ORNAMENTAL GRASS	SPACING x SPACING
VINES	SPACING x 2
MACHINE-MOVED TREES OR SHRUBS	$\left[\left(\frac{\text{SPADE DIAMETER}}{2}\right)+1\right]^2 \times \pi$

π = 3.1416



1. PULL MULCH BACK NO LESS THAN 3" AND NO MORE THAN 6" FROM TREES AND SHRUBS AT THE TRUNK OR MAIN STEM.
2. SUBSIDING OR DETERIORATING MULCH IS ACCEPTABLE THROUGHOUT THE ESTABLISHED PERIOD IF THE MULCH DEPTH IS MAINTAINED AT A MINIMUM 3" DEPTH.
3. ADD MULCH WHEN BELOW THE 3" MINIMUM DEPTH, DO NOT EXCEED THE 6" MAXIMUM DEPTH.
4. MULCH CONTAMINATED WITH SOIL MUST BE REMOVED AND REPLACED.

MULCH PLACEMENT

(MnDOT 2571.3H)

(MnDOT 2571.3F)

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PROJECT MANAGER
DAVID LARSON

DRAWN BY
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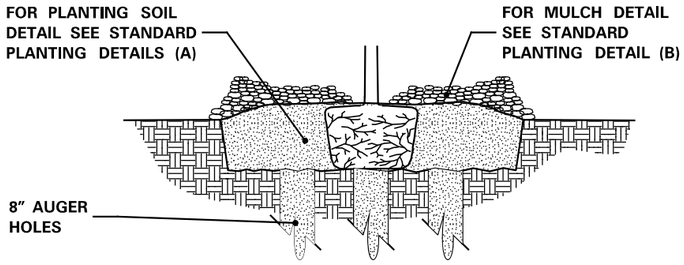
ENV. PLANNING AND DESIGN UNIT
TRANSPORTATION BUILDING
ST. PAUL, MINNESOTA 55155-1899

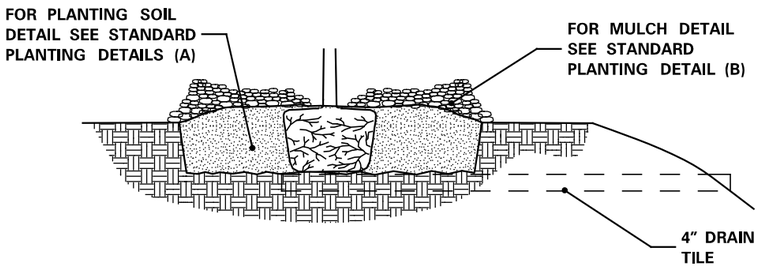
STANDARD PLANTING DETAILS (B)

STATE PROJECT SP 1901-171 (T.H. 13) SHEET NO. 8 OF 9 SHEETS



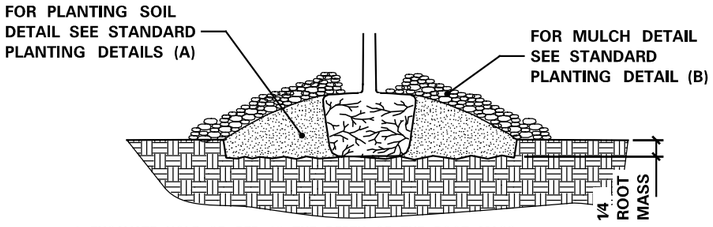
1. EXCAVATE HOLE OR BED TO ALLOW PLACING THE TOP OF ROOT MASS 1"–3" HIGHER THAN FINISHED GRADE.
2. AUGER 8" DIAMETER HOLES ENTIRELY THROUGH IMPERVIOUS OR POORLY DRAINED HARD PAN SOIL LAYER TO ADEQUATELY DRAIN SUBSOIL.
3. TEST FOR POSITIVE DRAINAGE. RE–AUGER AN ADDITIONAL 8" IF NECESSARY FOR POSITIVE DRAINAGE.
4. THOUROUGHLY BACKFILL AUGER HOLES WITH A UNIFORM INCORPORATED MIXTURE OF 50% SAND AND 50% INPLACE SOIL.
5. COMPLETE PLANTING ACCORDING TO ROOT TYPE. SEE STANDARD PLANTING DETAILS (B).

INSTALL GRANULAR FILTER



1. EXCAVATE HOLE OR BED TO ALLOW PLACING THE TOP OF THE ROOT MASS 1"–3" HIGHER THAN FINISHED GRADE.
2. INSTALL 4" MINIMUM DIAMETER DRAIN TILE DAYLIGHTING AT A LOWER GRADE.
3. COMPLETE PLANTING ACCORDING TO ROOT TYPE. SEE STANDARD PLANTING DETAILS (B).

INSTALL TILE DRAINAGE



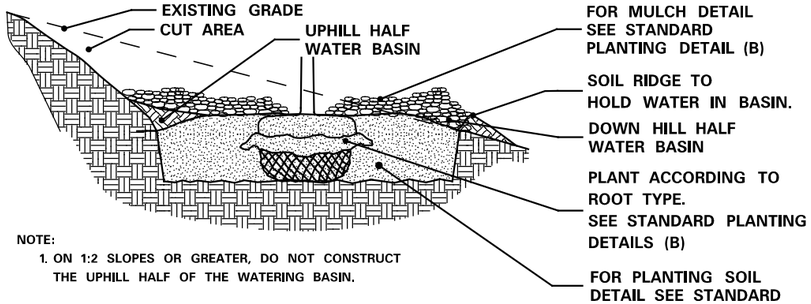
1. EXCAVATE HOLE OR BED 1/4 THE DEPTH OF THE ROOT MASS.
2. SET ROOT MASS IN HOLE.
3. CONSTRUCT BERM WITH PLANTING SOIL. EXTEND THE BERM BASE TO A WIDTH OF 3 TIMES THE BERM HEIGHT.
4. COMPLETE PLANTING ACCORDING ROOT TYPE. SEE STANDARD PLANTING DETAILS (B).

INSTALL MINI–BERM

NOTE:
1. THE NEED FOR USING PLANTING DETAILS FOR POORLY DRAINED SOILS AND WHICH TYPE TO USE ARE DETERMINED BY THE CONTRACTOR, SUBJECT TO ENGINEER APPROVAL.

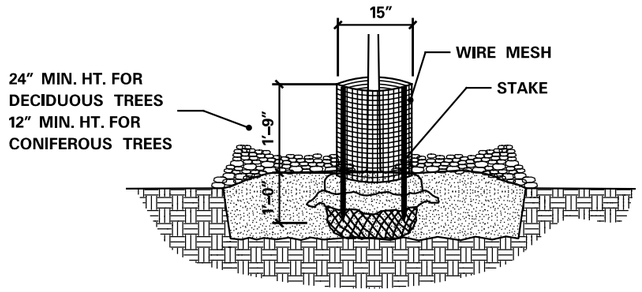
PLANTING DETAIL FOR POORLY DRAINED SOILS

(MnDOT 2571.3D2 (STEP 8)



NOTE:
1. ON 1:2 SLOPES OR GREATER, DO NOT CONSTRUCT THE UPHILL HALF OF THE WATERING BASIN.

PLANTING ON SLOPES

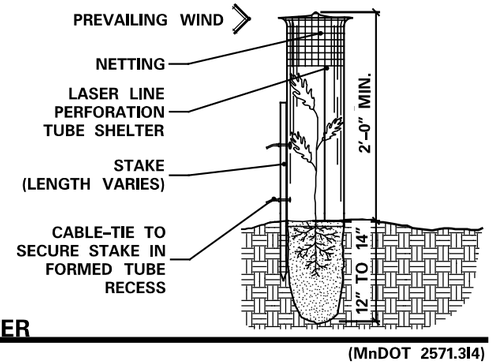


1. FORM A DOUBLE–LAYERED CYLINDER USING 0.25" GRID GALVANIZED WELDED WIRE MESH (HARDWARE CLOTH). OVERLAP THE CUT END 2".
2. DRIVE TWO 1" x 1" OPPOSING HEARTWOOD WHITE OAK STAKES INTO THE GROUND, 7" FROM THE CENTER OF THE TREE STEM.
3. SECURE THE MESH CYLINDER TO THE OUTSIDE OF THE STAKES USING EITHER, SCREWS AND WASHERS OR CABLE–TIES ALONG THE OVERLAP. SPACE APPROXIMATELY 4" ON CENTER ALONG THE OVERLAP.
   a. SCREWS SHALL BE ROUND HEAD GALVANIZED 1/8" DIA. x 3/4" LONG WITH WASHERS.
   OR
   b. CABLE–TIES SHALL BE NYLON, AT LEAST 8" LONG AND BETWEEN 75LB TO 120LB TENSILE STRENGTH.
4. EMBED THE LOWER EDGE OF THE MESH CYLINDER 1" BELOW THE SOIL SURFACE WITHOUT DISTURBING THE TREE ROOTS.
5. CUT EDGES WILL NOT BE PERMITTED AT THE TOP OF THE CYLINDER. STAKE WILL BE FLUSH WITH THE TOP OF THE CYLINDER.
6. MULCH WITHIN THE CYLINDER SHALL NOT EXCEED 3" DEPTH AND SHALL BE PULLED BACK FROM THE TRUNK AS SPECIFIED IN MULCH PLACEMENT DETAIL.
7. THE BOTTOM WHORL OF PINE AND LARCH BRANCHES MAY HAVE TO BE REMOVED TO PERMIT INSTALLATION OF 12" MIN. HEIGHT RODENT GUARDS.
8. INSTALL ON ALL DECIDUOUS, PINE AND LARCH TREES, DO NOT PLACE ON SPRUCE TREES.

RODENT PROTECTION

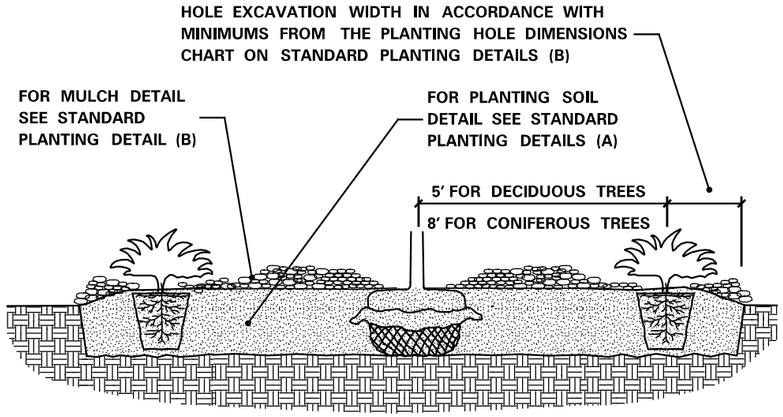
(MnDOT 2571.3I2)

1. USE SEAMLESS, EXTRUDED, TWIN–WALL, RIGID AND SEMI TRANSLUCENT POLYPROPYLENE TUBES WITH A LASER LINE PERFORATION AND AN OUTWARD–FLARED TOP RIM.
2. SECURE SHELTER WITH NYLON CABLE–TIES ATTACHED TO A 1" x 1" WHITE OAK STAKE TO PREVENT DISLODGING OR TWISTING.
3. EMBED THE BOTTOM OF THE TUBE A MINIMUM OF 1" BELOW THE SOIL SURFACE WITHOUT DISTURBING THE TREE ROOTS.
4. INSTALL A PLASTIC PHOTODEGRADABLE NETTING COVER AND SLEEVE OVER THE TOP OF THE TUBE. PULL NETTING DOWN AS SHOWN.

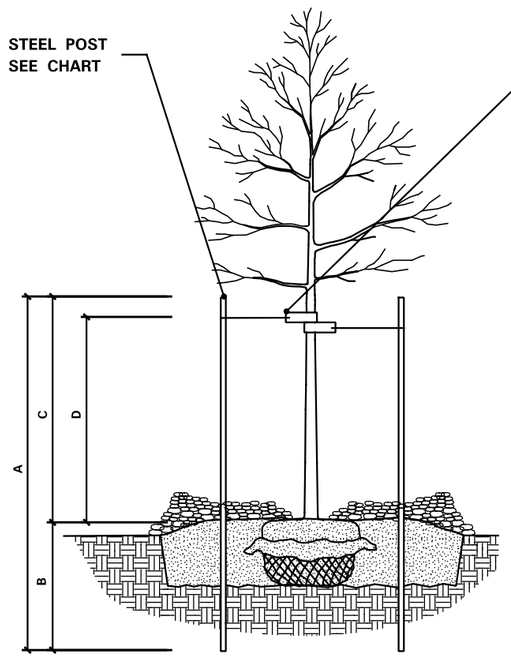


SEEDLING TREE SHELTER

(MnDOT 2571.3I4)



PLANT SPACING IN MASS BEDS



1. STEEL POSTS TO BE NOTCHED OR DRILLED TO RETAIN GUY WIRES. PLACE OUTSIDE OF ROOT BALL. DRIVE PLUMB REGARDLESS OF GROUND SLOPE.
2. REQUESTS TO SUBSTITUTE RUBBER HOSE AND WIRE GUYING SYSTEMS WILL NOT BE APPROVED.
3. TREE STAKING IS NOT REQUIRED UNLESS SPECIFIED OR NECESSARY TO MAINTAIN TREES IN A PLUMB CONDITION WHERE VANDALISM, SOIL, OR WIND CONDITIONS ARE A PROBLEM, OR AS DIRECTED BY THE ENGINEER.
4. REMOVE WITHIN ONE YEAR.

STEEL POST SIZING

CALIPER	STEEL POST TYPE	A	B	C	D
LESS THEN 4 INCHES	ROLLED STEEL FENCE POST (MnDOT 3403) OR APPROVED EQUAL.	7'–0"	3'–0" MIN.	4'–0"	3'–0"
GREATER THEN 4 INCHES	10', 2.2 LB. FLANGED CHANNEL STEEL SIGN POST (MnDOT 3401) OR APPROVED EQUAL.	10'–0"	4'–0" MIN.	6'–0"	5'–0"

STAKING AND GUYING

(MnDOT 2571.3I1)

DATE PRINTED:
REVISED – JANUARY /01/2014

PROJECT MANAGER
DAVID LARSON

DRAWN BY
OFFICE OF ENVIRONMENTAL STEWARDSHIP

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
OFFICE OF ENVIRONMENTAL STEWARDSHIP
ENV. PLANNING AND DESIGN UNIT
TRANSPORTATION BUILDING
ST. PAUL, MINNESOTA 55155–1899

STANDARD PLANTING DETAILS (C)

STATE PROJECT SP 1901–171 (T.H. 13) SHEET NO. 9 OF 9 SHEETS

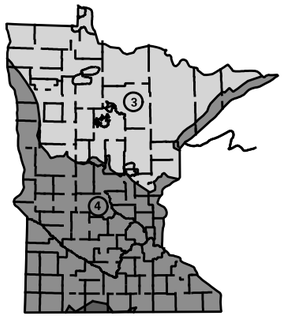
GENERAL NOTES

SEE SPECIAL PROVISIONS FOR SPECIFIC PROJECT REQUIREMENTS.	
REFER TO MnDOT SPECIFICATIONS 2571, 2572, 3861, FOR GENERAL REQUIREMENTS.	
COMPLETE PREPARATORY WORK BEFORE STARTING INITIAL PLANTING OPERATIONS.	
ACCEPT ALL PLANT STOCK IN ACCORDANCE WITH (MnDOT 3861) PRIOR TO PLANTING.	
THE CONTRACTOR WILL DEMONSTRATE COMPETENCY FOR SOIL CULTIVATION OPERATIONS IN ACCORDANCE WITH (MnDOT 2571.3D.2)	
THE CONTRACTOR WILL DEMONSTRATE COMPETENCY FOR ALL PLANT INSTALLATION OPERATIONS IN ACCORDANCE WITH (MnDOT 2571.3F1)	
RODENT PROTECTION	SEE SPECIAL PROVISIONS AND STANDARD PLANTING DETAILS (3 OF 3)
FERTILIZER	SEE SPECIAL PROVISIONS
COMPOST	MnDOT 3890 COMPOST GRADE 2 UNLESS OTHERWISE SPECIFIED.
MULCH MATERIAL	MnDOT 3882 MULCH MATERIAL TYPE 6 UNLESS OTHERWISE SPECIFIED.
MASS PLANTING BEDS	PREPARE MASS PLANTING BEDS FOR PLANTS PLACED AT 15' OR LESS, UNLESS OTHERWISE SPECIFIED ON SHEETS. PLANT BEDS IN STAGGERED ROWS ON THE PERIMETER FIRST, THEN UNIFORMLY FILL IN WITH REMAINING PLANTS. USE TRIANGULAR SPACING, UNLESS SPECIFIED OTHERWISE. PROVIDE 5' RADIUS CLEAR OF SHRUBS AROUND EACH DECIDUOUS TREE AND 8' CLEAR RADIUS AROUND EACH CONIFER TREE. RADIUS WILL BE MEASURED FROM THE CENTER OF THE TREE TO THE CENTER OF THE SHRUB. NOTIFY ENGINEER OF GROSS PLANT QUANTITY SURPLUS OR DEFICIENCY IMMEDIATELY. MULCH ENTIRE MASS PLANTING BED. SEE STANDARD PLANTING DETAILS (3 OF 3)
TREE PAINTING (FROST CRACK PREVENTION)	PAINT OAK, LINDEN, LOCUST, MAPLE, CRABAPPLE AND MOUNTAIN ASH. ONLY UNDILUTED EXTERIOR WHITE LATEX PAINT IS ACCEPTABLE. PAINT TREE CIRCUMFERENCE FROM GROUND LINE TO FIRST MAJOR BRANCH.
PLANTING PLAN DIMENSIONS	STATED DIMENSIONS SUPERCEDE SCALING FROM PLAN.

WATERING GUIDELINES (MnDOT 2571.3G)

PLANT TYPE	AVERAGE GALLONS OF WATER PER APPLICATION
MACHINE TRANSPLANTED TREES	50–100
BALLED AND BURLAPPED TREES	20
BARE ROOT AND CONTAINER TREES	15
BALLED AND BURLAPPED SHRUBS	10
BARE ROOT AND CONTAINER SHRUBS	7
WOODY SEEDLINGS	4
PERENNIALS AND VINES	3

IT IS THE CONTRACTOR'S RESPONSIBILITY TO MONITOR AND MAINTAIN SOIL MOISTURE AT ADEQUATE BUT NOT EXCESSIVE LEVELS. THE AMOUNTS LISTED ABOVE ARE GUIDELINES, NOT REQUIREMENTS.

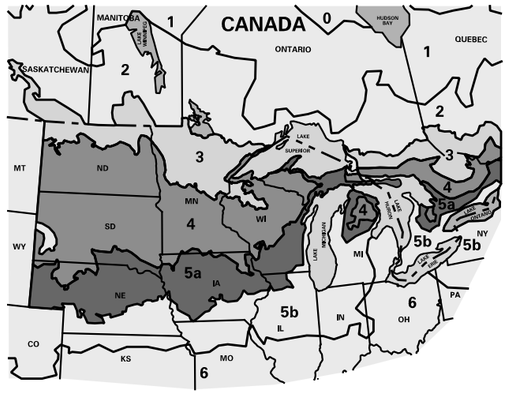


1. BARE ROOT PERENNIALS MUST BE PLACED IN THE SPRING NO LATER THAN JUNE 1ST OR FOLLOW THE FALL DECIDUOUS PLANTING DATES.
2. ACTUAL DATES MAY CHANGE DEPENDING UPON SEASONAL CONDITIONS, AS DETERMINED BY THE ENGINEER.
3. FALL PLANTING IS NOT ALLOWED FOR BARE ROOT FORM OF THE FOLLOWING SPECIES: HAWTHORN, DOGWOOD, POPLAR, HACKBERRY, LINDEN, IRONWOOD, HONEYLOCUST, BIRCH, MOUNTAIN ASH, MAPLE, WILLOW, CRABAPPLE, PLUM/CHERRY, OAKS, AND SUMAC.
4. ALL REPLACEMENT PLANTS MUST BE PLACED DURING THE MONTH OF MAY (SPRING PLANTING) AND SEPTEMBER (FALL PLANTING) DURING THE FIRST YEAR OF THE PLANT ESTABLISHMENT PERIOD.
5. MACHINE MOVED PLANTING DATES WILL BE SPECIFIED IN THE SPECIAL PROVISIONS.

PLANTING DATES BY ZONE

			③	④
SPRING	DECIDUOUS	BARE ROOT	APRIL 21 TO JUNE 1	APRIL 7 TO JUNE 1
		CONTAINER B&B	APRIL 21 TO JUNE 30	APRIL 7 TO JUNE 30
	CONIFEROUS		APRIL 21 TO JUNE 1	APRIL 7 TO MAY 17
	PERENNIALS		MAY 1 TO JUNE 30	MAY 1 TO JUNE 30
	SEEDLINGS		APRIL 21 TO JUNE 1	APRIL 7 TO JUNE 1
FALL	DECIDUOUS	BARE ROOT	OCT. 1 TO NOV. 1	OCT. 10 TO NOV. 15
		CONTAINER B&B	AUG. 25 TO OCT. 15	AUG. 25 TO NOV. 1
	CONIFEROUS		AUG. 25 TO SEPT. 15	AUG. 25 TO SEPT. 15
	PERENNIALS		AUG. 25 TO SEPT. 15	AUG. 25 TO SEPT. 15

PLANT INSTALLATION PERIOD



ACCEPTABLE ZONES		
ZONES	LEGEND	MIN. TEMP.
3		–34.4° TO –40 F
4		–28.9° TO –34.4 F
5a		–26.1° TO –28.9 F

UNACCEPTABLE ZONES	
ZONES	LEGEND
0, 1, 2, 5b and 6	

FOR ALL PLANT STOCK, DOCUMENT ACCEPTABILITY FOR HARDINESS IN THE MINNESOTA ZONE WHERE THE PROJECT SITE IS LOCATED, AS FOLLOWS:

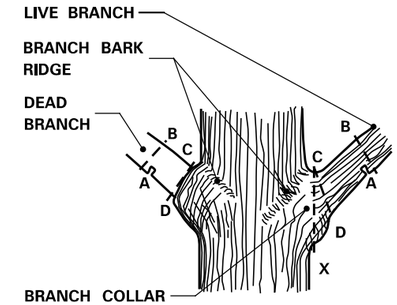
A. PLANT STOCK CONTINUOUSLY GROWN FOR AT LEAST THE LAST TWO YEARS WITHIN THE ACCEPTABLE LIMITS SHOWN.

OR

B. PLANT STOCK, GROWN OUTSIDE THE ACCEPTABLE GROWING RANGE LIMITS, HAVING SEED SOURCE OR ROOT AND GRAFT STOCK ORIGINATING FROM THE ACCEPTABLE LIMITS SHOWN.

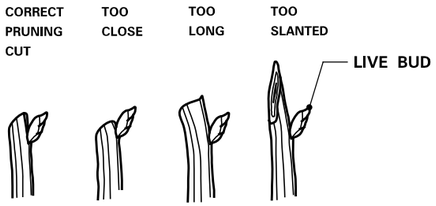
ACCEPTABLE PLANT STOCK GROWING RANGE LIMITS

SOURCE: USDA PLANT HARDINESS ZONE MAP (MnDOT 3861.2C)



BRANCHES PRUNED AT TRUNK

(SHIGO METHOD)



BRANCHES PRUNED TO LIVE BUD

STEPS TO PRUNING WITH PRUNING SAW:

1. CUT PART WAY THROUGH THE BRANCH AT POINT A.
2. CUT COMPLETELY THROUGH BRANCH FROM POINT B TO A.
3. AT BRANCH COLLAR CUT FROM POINT C TO D.

INCORRECT CUT FROM POINT C TO X (TOO CLOSE) WILL RESULT IN DISCONTINUOUS CALLUS FORMATION AFTER ONE SEASON OF GROWTH.

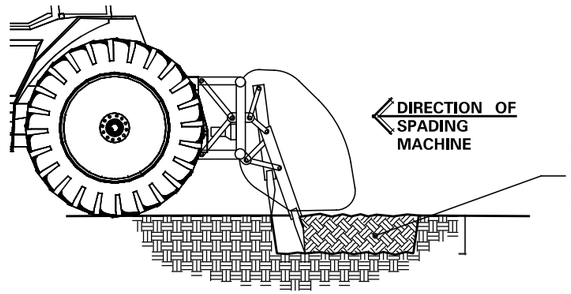
CORRECT CUT FROM POINT C TO D (LEAVING BRANCH COLLAR BUT NOT THE STUB FROM POINT B TO A) WILL RESULT IN CONTINUOUS DOUGHNUT SHAPED CALLUS FORMATION AFTER ONE SEASON OF GROWTH.

PRUNING NOTES:

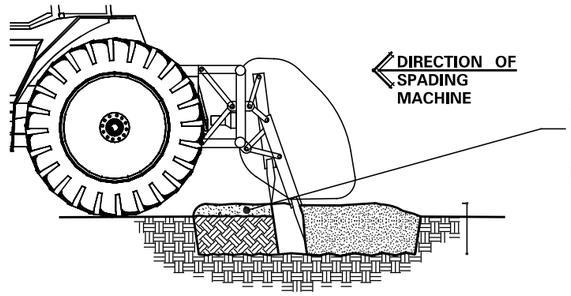
1. PRUNE USING CLEAN AND SHARP SCISSOR–TYPE PRUNER OR PRUNING SAW.
2. THE BEST TIME TO PRUNE IS LATE DORMANT SEASON OR EARLY SPRING.
3. AVOID PRUNING OAKS IN APRIL, MAY, JUNE OR JULY.
4. IF PRUNING IS NECESSARY OR IF WOUNDS OCCUR TO OAK TREES IN APRIL, MAY, JUNE OR JULY, IMMEDIATELY PAINT CUT SURFACE OR WOUND WITH LATEX PAINT OR SHELLAC.

PRUNING

(MnDOT 2571.3E.1 and 2571.3K.2.a(9))



PRIMARY TILLAGE – PASS 1



INCORPORATION TILLAGE – PASS 2

PLANTING SOIL

(MnDOT 2571.3D)

REVISION:

APPROVED: DECEMBER 11, 2015

CHIEF ENVIRONMENTAL OFFICER

REVISED:

APPROVED: 12-11-2015

STATE DESIGN ENGINEER

STANDARD PLANTING DETAILS

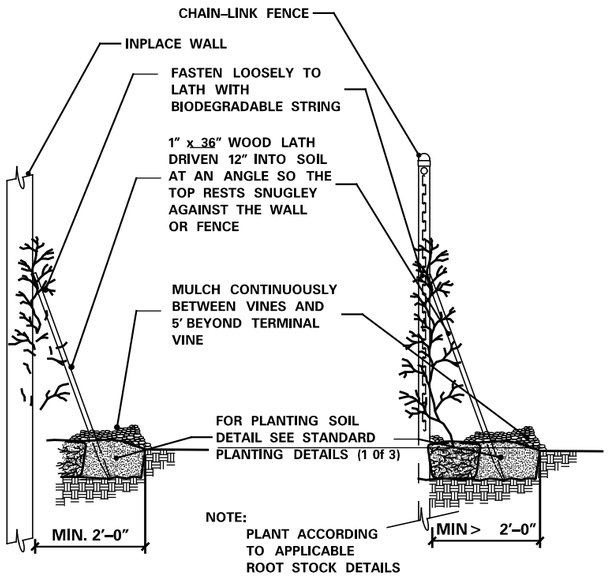
STANDARD PLAN 5-297.301 | 1 OF 3

PLANTING HOLE DIMENSIONS

HOLE DEPTH FOR B&B AND CONTAINER PLANTS SHALL NOT EXCEED MEASUREMENT FROM ROOT FLAIR TO BOTTOM OF SOIL BALL.

PLANT TYPE	PLANT SIZE UP TO AND INCLUDING	(A) MINIMUM HOLE WIDTH	(B) APPROXIMATE HOLE DEPTH
DECIDUOUS & ORNAMENTAL TREES	3' B.R.	46"	13"
	4' B.R	46"	14"
	5' B.R.	48"	14"
	6' B.R.	54"	15"
	7' B.R	60"	16"
	8' B.R.	66"	19"
	0.75" B.R.	48'	12"
	1" B.R.	54"	14"
	1.25" B.R.	60"	14"
	1.5 B.R.	66"	15"
	1.75" B.R	72"	16"
	2" B.R.	84"	19"
	4' B.B.	42"	11"
	5' B.B.	48"	12"
	6' B.B.	52"	14"
	8' B.B.	66"	16"
	10' B.B.	66"	16"
	12' B.B.	48"	16"
	1" B.B.	54"	14"
	1.25" B.B.	56"	15"
	1.5" B.B.	61"	15"
	1.75" B.B.	66"	16"
	2" B.B.	72"	16"
	2.5" B.B.	84"	19"
	3" B.B.	96"	20"
	3.5" B.B.	114"	23"
	4" B.B.	126"	25"
DECIDUOUS SHRUBS, ROSES AND PERENNIALS	12" B.R.	24"	7"
	15" B.R.	28"	8"
	18" B.R.	30"	8"
	2' B.R.	33"	9"
	3' B.R.	42"	11"
	4' B.B.	48"	12"
	5' B.R.	54"	14"
	6' B.R.	60"	14"
	18" B.B.	27"	7"
	2' B.B.	30"	8"
	3' B.B.	36"	9"
	4' B.B.	42"	11"
	5' B.B.	48"	12"
	6' B.B.	54"	14"

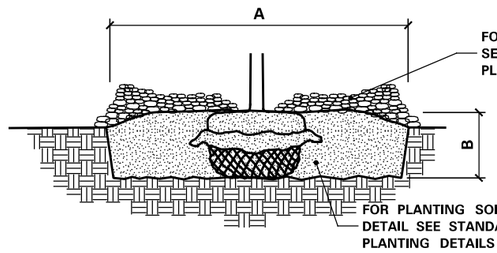
PERENNIAL HOLE DEPTH AND WIDTH SHALL BE BASED UPON ON-CENTER SPACING IN A CONTINUOUS TRENCH.



WALL INSTALLATION

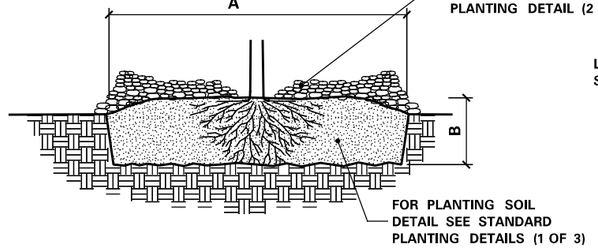
FENCE INSTALLATION

INSTALLATION OF VINES



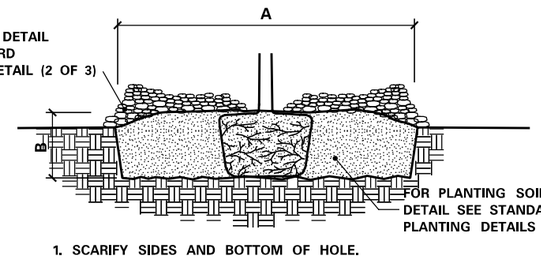
1. SCARIFY SIDES AND BOTTOM OF HOLE.
2. PROCEED WITH CORRECTIVE PRUNING.
3. SET PLANT ON UNDISTURBED NATIVE SOIL OR THOROUGHLY COMPACTED PLANTING SOIL. PLACE PLANT SO THE ROOT FLARE IS AT OR UP TO 2" ABOVE THE FINISHED GRADE WITH BURLAP AND WIRE BASKET, (IF USED), INTACT.
4. SLIT REMAINING TREATED BURLAP AT 6" INTERVALS.
5. BACKFILL TO WITHIN APPROXIMATELY 12" OF THE TOP OF THE ROOTBALL, THEN WATER PLANT.
6. REMOVE THE TOP 1/3 OF THE BASKET OR THE TOP TWO HORIZONTAL RINGS WHICHEVER IS GREATER. REMOVE ALL BURLAP AND NAILS FROM THE TOP 1/3 OF THE BALL. REMOVE ALL TWINE. REMOVE OR CORRECT STEM GIRDLING ROOTS.
7. PLUMB AND BACKFILL WITH PLANTING SOIL.
8. WATER THOROUGHLY WITHIN 2 HOURS TO SETTLE PLANTS AND FILL VOIDS.
9. BACK FILL VOIDS AND WATER A SECOND TIME.
10. PLACE MULCH WITHIN 48 HOURS OF THE SECOND WATERING UNLESS SOIL MOISTURE IS EXCESSIVE.

BALLED & BURLAPPED STOCK



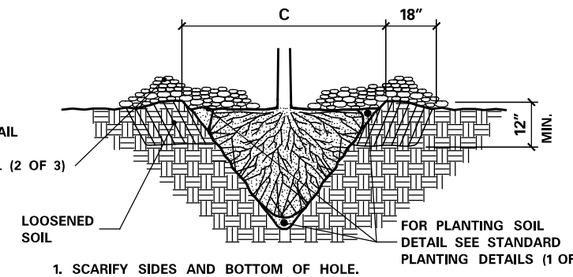
1. SOAK ROOTS IN WATER FOR AT LEAST ONE HOUR BUT NOT MORE THAN 24 HOURS PRIOR TO PLANTING.
2. SCARIFY SIDES AND BOTTOM OF HOLE.
3. PROCEED WITH CORRECTIVE PRUNING OF THE TOP AND ROOTS.
4. TRANSFER PLANT DIRECTLY FROM WATER TO HOLE. SET PLANT SO THE ROOT FLARE IS AT THE FINISHED SOIL ELEVATION. SPREAD ROOTS OUT EVENLY. PLUMB AND IMMEDIATELY BACKFILL WITH PLANTING SOIL.
5. WATER THOROUGHLY WITHIN 2 HOURS TO SETTLE PLANTS AND FILL VOIDS.
6. BACK FILL VOIDS AND WATER A SECOND TIME.
7. PLACE MULCH WITHIN 48 HOURS OF THE SECOND WATERING UNLESS SOIL MOISTURE IS EXCESSIVE.

BARE ROOT STOCK



1. SCARIFY SIDES AND BOTTOM OF HOLE.
2. PROCEED WITH CORRECTIVE PRUNING OF TOP AND ROOT.
3. REMOVE CONTAINER AND SCORE OUTSIDE OF SOIL MASS TO REDIRECT AND PREVENT CIRCLING FIBROUS ROOTS. REMOVE OR CORRECT STEM GIRDLING ROOTS.
4. SET PLANT ON UNDISTURBED NATIVE SOIL OR THOROUGHLY COMPACTED PLANTING SOIL. INSTALL PLANT SO THE TOP OF THE ROOT FLARE IS AT OR UP TO 2" ABOVE THE FINISHED GRADE.
5. PLUMB AND BACKFILL WITH PLANTING SOIL.
6. WATER THOROUGHLY WITHIN 2 HOURS TO SETTLE PLANT AND FILL VOIDS.
7. BACK FILL VOIDS AND WATER A SECOND TIME.
8. PLACE MULCH WITHIN 48 HOURS OF THE SECOND WATERING UNLESS SOIL MOISTURE IS EXCESSIVE.

CONTAINER STOCK



1. SCARIFY SIDES AND BOTTOM OF HOLE.
2. PROCEED WITH CORRECTIVE PRUNING.
3. SET PLANT ON NATIVE SOIL AT SAME DEPTH AS IT WAS PREVIOUSLY GROWN.
4. PLUMB AND BACKFILL WITH PLANTING SOIL.
5. AFTER PLANTING, LOOSEN THE SOIL IMMEDIATELY ADJACENT TO THE ROOT BALL TO A MINIMUM DISTANCE OF 18" AND A MINIMUM DEPTH OF 12".
6. WATER THOROUGHLY WITHIN 2 HOURS TO SETTLE PLANT AND FILL VOIDS.
7. BACK FILL VOIDS AND WATER A SECOND TIME.
8. PLACE MULCH WITHIN 48 HOURS OF THE SECOND WATERING UNLESS SOIL MOISTURE IS EXCESSIVE.

MACHINE MOVED STOCK

MINIMUM TREE SPADE SIZE REQUIREMENTS			
(C) SPADE DIAMETER SIZE	OAK TREE, CALIPER	DECIDUOUS / ORNAMENTAL TREE,CALIPER	CONIFEROUS TREE, HEIGHT
42"	1" to 1.5"	2" to 3"	5' to 7'
60"	1.5" to 2.5"	3" to 4"	7' to 9'
78"	2.5" to 3.5"	4" to 6"	9' to 14'
85"	3.5" to 5"	6" to 8"	14' to 18'

INSTALLATION OF PLANTS

(MnDOT 2571.3F)

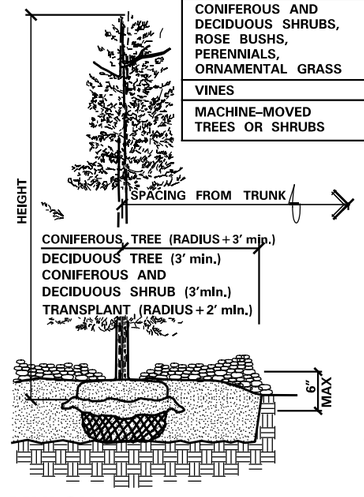
PLANTING HOLE DIMENSIONS

HOLE DEPTH FOR B&B AND CONTAINER PLANTS SHALL NOT EXCEED MEASUREMENT FROM ROOT FLAIR TO BOTTOM OF SOIL BALL.

PLANT TYPE	PLANT SIZE UP TO AND INCLUDING	(A) MINIMUM HOLE WIDTH	(B) APPROXIMATE HOLE DEPTH
CONIFEROUS TREES	2' B.B	36"	10"
	3' B.B	42"	11"
	4' B.B	51"	13"
	5' B.B	60"	13"
	6' B.B	66"	15"
AT LEAST 2/3 OF ALL CONIFER BRANCHES WILL CONTAIN TERMINAL BUDS	7' B.B	72"	16"
	8' B.B	81"	18"
	9' B.B	90"	20"
	10' B.B	102"	21"
	12' B.B	114"	24"
CONIFEROUS SHRUBS (UPRIGHT)	18" B.B.	24"	7"
	3' B.B.	48"	12"
CONIFEROUS SHRUBS (SPREADING)	18" SPR B.B.	30"	8"
	2' SPR B.B.	36"	9"
CONTAINER GROWN PLANTS	CELLPACKS / PLUGS	6"	2.5"
	2.25" CONT.	7"	3"
	3.5" CONT.	10"	3"
	4" CONT.	11"	4"
	4.5" CONT.	13"	4"
	6"/1 QT CONT.	15"	5.5"
	1# CONT.	18"	6"
	2# CONT.	23"	7.5"
	3# CONT.	29"	8.5"
	5# CONT.	30"	11"
	7# CONT.	37"	11"
	15# CONT.	44"	14"
	10# CONT.	45"	15"
	20# CONT.	60"	16"
	25# CONT.	72"	17"
SEEDLINGS	6" SEEDLING	15"	14"
	9" SEEDLING	18"	14"
	12" SEEDLING	23"	16"
	18" SEEDLING	30"	16"
	2' SEEDLING	36"	18"
VINES	1 YR. MED B.R.	15"	11"
	1 YR. NO. 1 B.R.	17"	14'
	2 YR. MED. B.R.	33"	12"
	2 YR. NO. 1 B.R.	42"	15"

MULCH AREA CALCULATOR	
TYPE OF PLANT	SQ. FT. PER PLANT
CONIFEROUS TREES	$\left[\left(\frac{3/5 \times \text{HEIGHT}}{2}\right)+3\right]^2 \times \pi$
DECIDUOUS AND ORNAMENTAL TREES	$3^2 \times \pi$
CONIFEROUS AND DECIDUOUS SHRUBS, ROSE BUSHS, PERENNIALS, ORNAMENTAL GRASS	SPACING x SPACING
VINES	SPACING x 2
MACHINE-MOVED TREES OR SHRUBS	$\left[\left(\frac{\text{SPADE DIAMETER}}{2}\right)+1\right]^2 \times \pi$

$\pi = 3.1416$



1. PULL MULCH BACK NO LESS THAN 3" AND NO MORE THAN 6" FROM TREES AND SHRUBS AT THE TRUNK OR MAIN STEM.
2. SUBSIDING OR DETERIORATING MULCH IS ACCEPTABLE THROUGHOUT THE ESTABLISHED PERIOD IF THE MULCH DEPTH IS MAINTAINED AT A MINIMUM 3" DEPTH.
3. ADD MULCH WHEN BELOW THE 3" MINIMUM DEPTH; DO NOT EXCEED THE 6" MAXIMUM DEPTH.
4. MULCH CONTAMINATED WITH SOIL MUST BE REMOVED AND REPLACED.

MULCH

(MnDOT 2571.3H)

REVISION:

APPROVED: DECEMBER 11, 2015

CHIEF ENVIRONMENTAL OFFICER

STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION

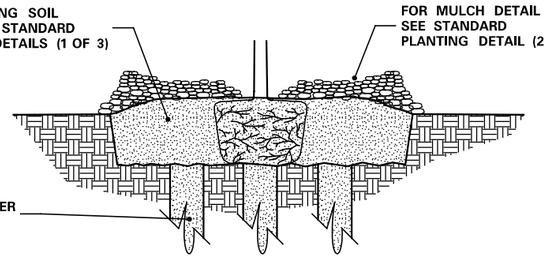
REVISED:

APPROVED: 12-11-2015

STATE DESIGN ENGINEER

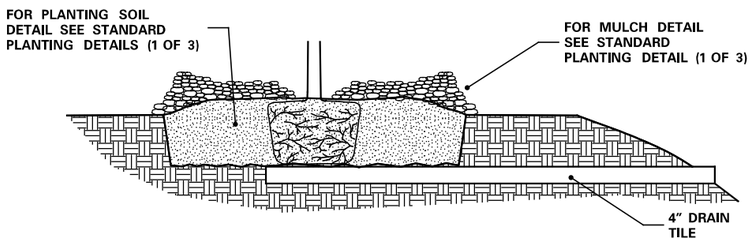
STANDARD PLANTING DETAILS

STANDARD PLAN 5-297.301 | 2 OF 3



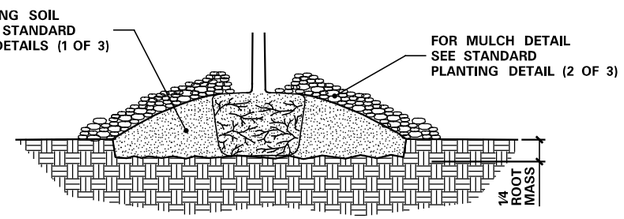
1. EXCAVATE HOLE OR BED TO ALLOW PLACING THE TOP OF ROOT MASS 1"–3" HIGHER THAN FINISHED GRADE.
2. AUGER 8" DIAMETER HOLES ENTIRELY THROUGH IMPERVIOUS OR POORLY DRAINED HARD PAN SOIL LAYER TO ADEQUATELY DRAIN SUBSOIL.
3. TEST FOR POSITIVE DRAINAGE. RE–AUGER AN ADDITIONAL 8" IF NECESSARY FOR POSITIVE DRAINAGE.
4. THOROUGHLY BACKFILL AUGER HOLES WITH A UNIFORM INCORPORATED MIXTURE OF 50% SAND AND 50% INPLACE SOIL.
5. COMPLETE PLANTING ACCORDING TO ROOT TYPE. SEE STANDARD PLANTING DETAILS (2 OF 3).

GRANULAR FILTER



1. EXCAVATE HOLE OR BED TO ALLOW PLACING THE TOP OF THE ROOT MASS 1"–3" HIGHER THAN FINISHED GRADE.
2. INSTALL 4" MINIMUM DIAMETER DRAIN TILE DAYLIGHTING AT A LOWER GRADE.
3. COMPLETE PLANTING ACCORDING TO ROOT TYPE. SEE STANDARD PLANTING DETAILS (2 OF 3).

TILE DRAINAGE



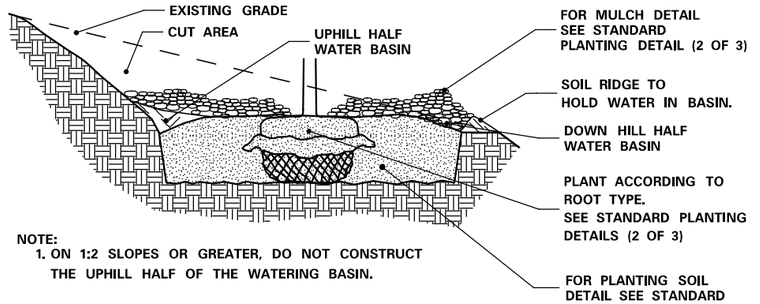
1. EXCAVATE HOLE OR BED 1/4 THE DEPTH OF THE ROOT MASS.
2. SET ROOT MASS IN HOLE.
3. CONSTRUCT BERM WITH PLANTING SOIL. EXTEND THE BERM BASE TO A WIDTH OF 3 TIMES THE BERM HEIGHT.
4. COMPLETE PLANTING ACCORDING ROOT TYPE. SEE STANDARD PLANTING DETAILS (2 OF 3).

MINI–BERM

NOTE:
1. THE NEED FOR USING PLANTING DETAILS FOR POORLY DRAINED SOILS AND WHICH TYPE TO USE ARE DETERMINED BY THE CONTRACTOR, SUBJECT TO ENGINEER APPROVAL.

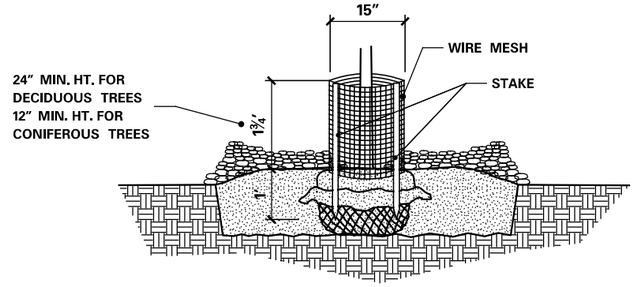
PLANTING DETAIL FOR POORLY DRAINED SOILS

(MnDOT 2571.3D.2(8))



NOTE:
1. ON 1:2 SLOPES OR GREATER, DO NOT CONSTRUCT THE UPHILL HALF OF THE WATERING BASIN.

PLANTING ON SLOPES

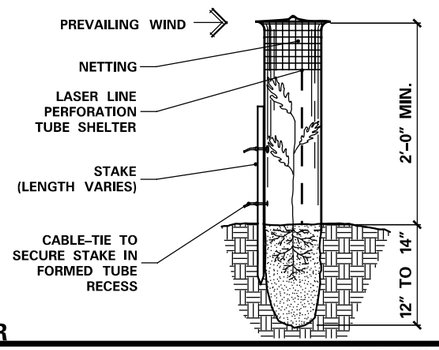


1. FORM A DOUBLE–LAYERED CYLINDER USING 0.25" GRID GALVANIZED WELDED WIRE MESH (HARDWARE CLOTH). OVERLAP THE CUT END 2".
2. DRIVE TWO 1" x 1" OPPOSING HEARTWOOD WHITE OAK STAKES INTO THE GROUND, 7" FROM THE CENTER OF THE TREE STEM.
3. SECURE THE MESH CYLINDER TO THE OUTSIDE OF THE STAKES USING EITHER, SCREWS AND WASHERS OR CABLE–TIES ALONG THE OVERLAP. SPACE APPROXIMATELY 4" ON CENTER ALONG THE OVERLAP.
   a. SCREWS SHALL BE ROUND HEAD GALVANIZED 1/8" DIA. x 3/4" LONG WITH WASHERS.
   OR
   b. CABLE–TIES SHALL BE NYLON, AT LEAST 8" LONG AND BETWEEN 75LB TO 120LB TENSILE STRENGTH.
4. EMBED THE LOWER EDGE OF THE MESH CYLINDER 1" BELOW THE SOIL SURFACE WITHOUT DISTURBING THE TREE ROOTS.
5. CUT EDGES WILL NOT BE PERMITTED AT THE TOP OF THE CYLINDER. STAKE WILL BE FLUSH WITH THE TOP OF THE CYLINDER.
6. MULCH WITHIN THE CYLINDER SHALL NOT EXCEED 3" DEPTH AND SHALL BE PULLED BACK FROM THE TRUNK AS SPECIFIED IN MULCH PLACEMENT DETAIL.
7. THE BOTTOM WHORL OF PINE AND LARCH BRANCHES MAY HAVE TO BE REMOVED TO PERMIT INSTALLATION OF 12" MIN. HEIGHT RODENT GUARDS.
8. INSTALL ON ALL DECIDUOUS, PINE AND LARCH TREES, DO NOT PLACE ON SPRUCE TREES.

RODENT PROTECTION

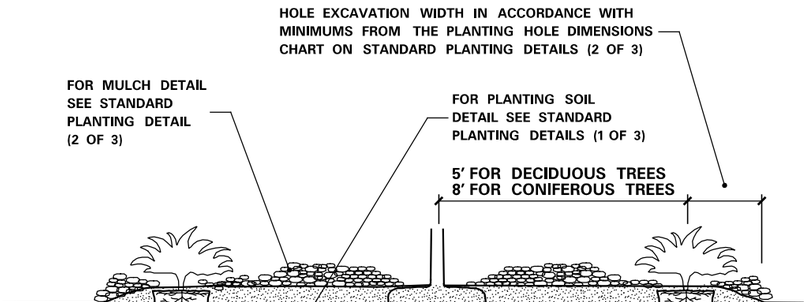
(MnDOT 2571.3I.2)

1. USE SEAMLESS, EXTRUDED, TWIN–WALL, RIGID AND SEMI TRANSLUCENT POLYPROPYLENE TUBES WITH A LASER LINE PERFORATION AND AN OUTWARD–FLARED TOP RIM.
2. SECURE SHELTER WITH NYLON CABLE–TIES ATTACHED TO A 1" x 1" WHITE OAK STAKE TO PREVENT DISLODGING OR TWISTING.
3. EMBED THE BOTTOM OF THE TUBE A MINIMUM OF 1" BELOW THE SOIL SURFACE WITHOUT DISTURBING THE TREE ROOTS.
4. PLACE A PLASTIC PHOTODEGRADABLE NETTING COVER AND SLEEVE OVER THE TOP OF THE TUBE. PULL NETTING DOWN AS SHOWN.

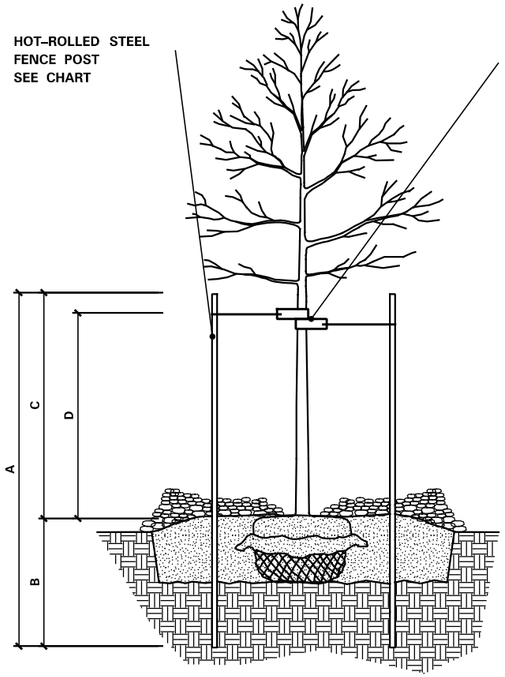


SEEDLING TREE SHELTER

(MnDOT 2571.3I.4)



PLANT SPACING IN MASS BEDS



1. STEEL POSTS TO BE NOTCHED OR DRILLED TO RETAIN GUY WIRES. PLACE OUTSIDE OF ROOT BALL. DRIVE PLUMB REGARDLESS OF GROUND SLOPE.
2. REQUESTS TO SUBSTITUTE RUBBER HOSE AND WIRE GUYING SYSTEMS WILL NOT BE APPROVED.
3. TREE STAKING IS NOT REQUIRED UNLESS SPECIFIED OR NECESSARY TO MAINTAIN TREES IN A PLUMB CONDITION WHERE VANDALISM, SOIL, OR WIND CONDITIONS ARE A PROBLEM, OR AS DIRECTED BY THE ENGINEER.
4. REMOVE WITHIN ONE YEAR.

STEEL POST SIZING

CALIPER	STEEL POST TYPE	A	B	C	D
LESS THAN 4 INCHES	HOT–ROLLED STEEL FENCE POST (MnDOT 3403) OR APPROVED EQUAL.	7'–0"	3'–0" MIN.	4'–0"	3'–0"
GREATER THAN 4 INCHES	10' 2.2 LB. FLANGED CHANNEL SIGN POST (MnDOT 3401) OR APPROVED EQUAL.	10'–0"	4'–0" MIN.	6'–0"	5'–0"

STAKING AND GUYING

(MnDOT 2571.3I.1)

REVISION:

APPROVED: DECEMBER 11, 2015

CHIEF ENVIRONMENTAL OFFICER

DEPARTMENT OF TRANSPORTATION — STATE OF MINNESOTA

REVISED:

STATE DESIGN ENGINEER

APPROVED: 12-11-2015

STANDARD PLANTING DETAILS

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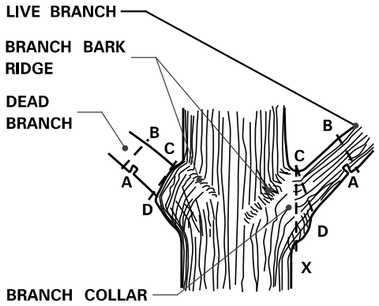
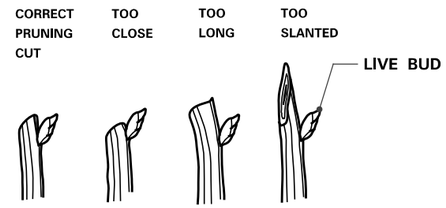


BRANCHES PRUNED AT TRUNK

(SHIGO METHOD)



BRANCHES PRUNED TO LIVE BUD

STEPS TO PRUNING WITH PRUNING SAW:

1. CUT PART WAY THROUGH THE BRANCH AT POINT A.
2. CUT COMPLETELY THROUGH BRANCH FROM POINT B TO A.
3. AT BRANCH COLLAR CUT FROM POINT C TO D.

INCORRECT CUT FROM POINT C TO X (TOO CLOSE) WILL RESULT IN DISCONTINUOUS CALLUS FORMATION AFTER ONE SEASON OF GROWTH.

CORRECT CUT FROM POINT C TO D (LEAVING BRANCH COLLAR BUT NOT THE STUB FROM POINT B TO A) WILL RESULT IN CONTINUOUS DOUGHNUT SHAPED CALLUS FORMATION AFTER ONE SEASON OF GROWTH.

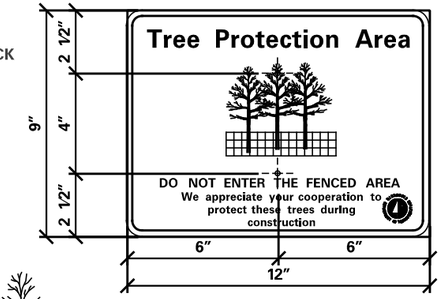
PRUNING NOTES:

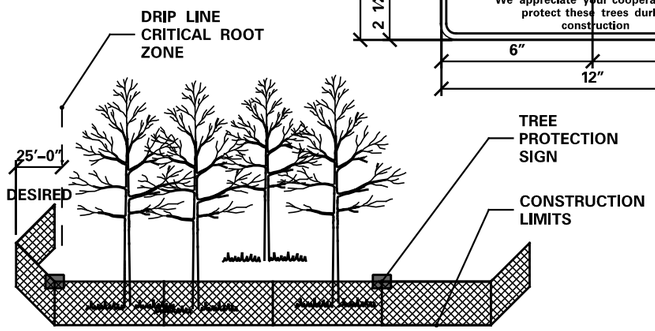
1. PRUNE USING CLEAN AND SHARP SCISSOR–TYPE PRUNER OR PRUNING SAW.
2. THE BEST TIME TO PRUNE IS LATE DORMANT SEASON OR EARLY SPRING.
3. AVOID PRUNING OAKS IN APRIL, MAY, JUNE OR JULY.
4. IF PRUNING IS NECESSARY OR IF WOUNDS OCCUR TO OAK TREES IN APRIL, MAY, JUNE OR JULY, IMMEDIATELY PAINT CUT SURFACE OR WOUND WITH LATEX PAINT OR SHELLAC.

PRUNING

(MnDOT 2571.3E.1 and 2571.3K.2.a(9))

1. FABRICATE 12″ X 9″ X 3⁄8″ SIGN WITH 0.75″ RADIUS CORNERS.
2. SIGN SHALL BE WHITE WITH BLACK LETTERING.
3. ATTACH SIGN TO POST USING 1″ LENGTH WOOD SCREWS.

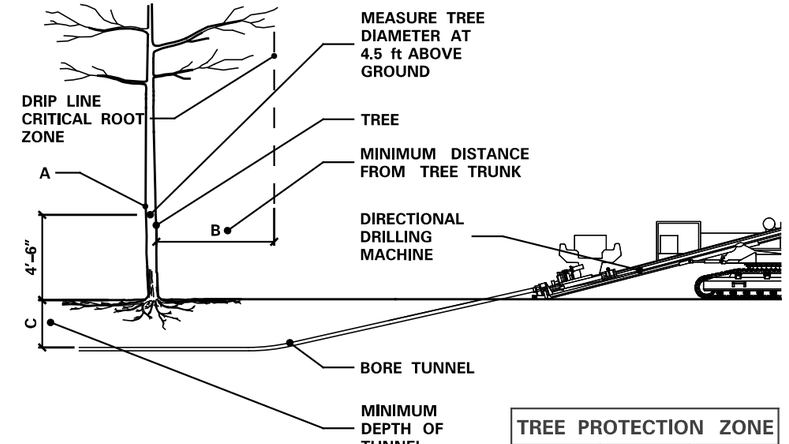




1. FURNISH AND INSTALL TEMPORARY FENCE AT THE TREE'S DRIPLINE OR CONSTRUCTION LIMITS AS SPECIFIED, PRIOR TO ANY CONSTRUCTION.
2. WHEN POSSIBLE PLACE FENCE 25 FEET BEYOND THE DRIP LINE.
3. PLACE TREE PROTECTION SIGNS ALONG FENCE AT 50′ INTERVALS.

TEMPORARY FENCE

(MnDOT 2572.3A.1)



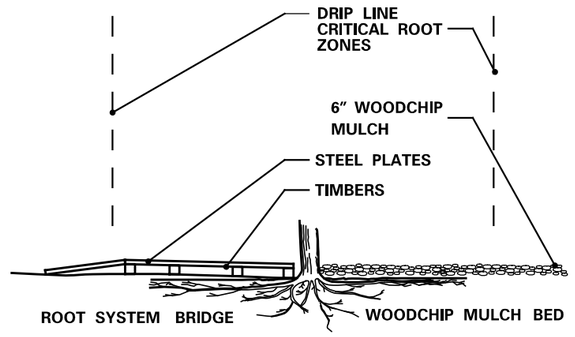
NOTE:

1. (A) IS THE DIAMETER OF TREES MEASURED 4′–6″ FEET ABOVE THE GROUND AND IS TERMED THE "DIAMETER AT BREAST HEIGHT," (DBH).
2. USING A TREE DIAMETER TAPE, WRAP THE TAPE AROUND THE GIRTH OF THE TREE, AT THE DBH, BEING CAREFUL NOT TO TWIST THE TAPE.

TREE PROTECTION ZONE		
A	B	C
< 2″	2′	2′
2–4″	4′	2.5′
> 4–9″	6′	2.5′
> 9–14″	10′	3′
> 14–19″	12′	3.25′
> 19″	15′	4′

UTILITY CONSTRUCTION

(MnDOT 2572.3A.5)



IF CONSTRUCTION VEHICLES MUST PASS OVER ROOT ZONES, THE CONTRACTOR MUST EITHER:

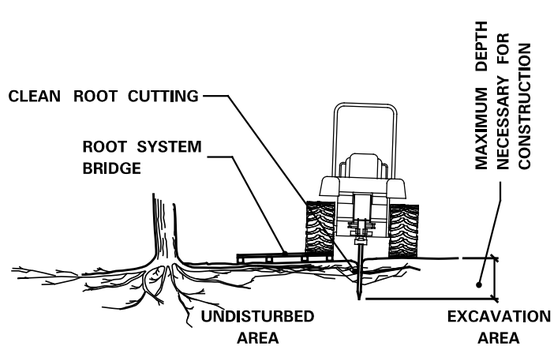
1. CONSTRUCT ROOT SYSTEM BRIDGES WITH STEEL PLATE SUPPORTED ON WOOD TIMBERS PLACED RADIALLY TO THE TREE TRUNK.

OR

2. PLACE A 6 INCH LAYER OF WOODCHIP MULCH OVER A TYPE III GEOTEXTILE (MnDOT 3733).

OTHER VEGETATION PROTECTION MEASURES

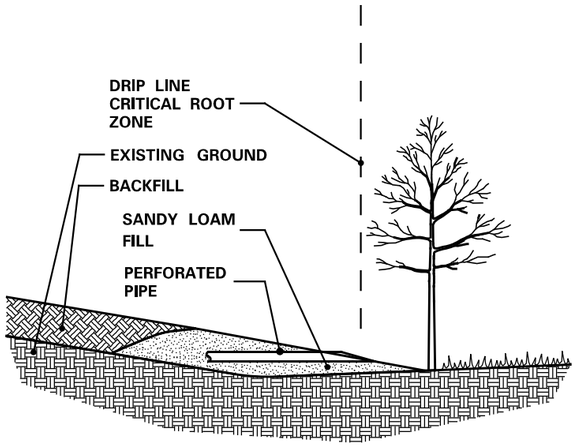
(MnDOT 2572.3A.12)



1. WHEN DESIGNATED IN THE PLAN OR DIRECTED BY THE ENGINEER, PRIOR TO EXCAVATION, ALL TREE ROOTS WILL BE CLEANLY CUT BY A VIBRATORY PLOW OR OTHER APPROVED ROOT CUTTER.
2. THE TREE ROOTS WILL BE CUT CLEANLY TO THE MINIMUM DEPTH NECESSARY FOR CONSTRUCTION.
3. IMMEDIATELY, AND CLEANLY CUT DAMAGED AND EXPOSED ROOTS.
4. ROOT ENDS EXPOSED BY EXCAVATION ACTIVITIES SHALL BE IMMEDIATELY COVERED WITH A 6″ LAYER OF ADJACENT SOIL.
5. EXPOSED CUT OAK ROOTS SHALL BE IMMEDIATELY (WITHIN 5 MINUTES) TREATED WITH A WOUND DRESSING MATERIAL CONSISTING OF LATEX PAINT OR SHELLAC.

CLEAN ROOT CUTTING

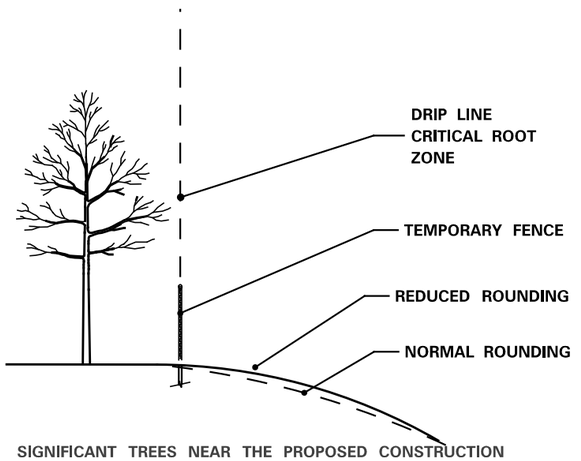
(MnDOT 2572.3A.2)



1. ANY FILL REQUIRED WITHIN THE DRIP LINE OF TREES, IS UNCOMPACTED ROOTING TOPSOIL BORROW.
2. EXCESSIVE FILL MAY REQUIRE PLACING PERFORATED PIPE WITH AT LEAST ONE DAYLIGHTED END OPENING AS AN AERATION SYSTEM.

ROOTING TOPSOIL BORROW

(MnDOT 2572.3A.4)



SIGNIFICANT TREES NEAR THE PROPOSED CONSTRUCTION LIMITS WILL BE IDENTIFIED IN THE PLAN OR BY THE ENGINEER AND WILL BE PRESERVED BY THE CONTRACTOR.

1. PLACE THE TEMPORARY FENCE.
2. REDUCE SLOPE ROUNDING WHERE ROOT ZONES ARE DISTURBED BY NORMAL SLOPE ROUNDING.
3. VARY BACKSLOPE STEEPNESS TO AVOID TREE LOSS OR UNNECESSARY ROOT DAMAGE.

SLOPE ROUNDING

REVISION:

APPROVED: DECEMBER 11, 2015

CHIEF ENVIRONMENTAL OFFICER

MINNESOTA DEPARTMENT OF TRANSPORTATION

REVISED:

APPROVED:

STATE DESIGN ENGINEER

12-11-2015

PROTECTION AND RESTORATION OF VEGETATION

STANDARD PLAN 5-297.302 | 1 OF 1