PARKS & OPEN SPACES SECTION

STANDARDS AND SPECIFICATIONS

2016 EDITION

INFRASTRUCTURE & OPERATIONS DEPARTMENT
ENGINEERING AND OPERATIONS DIVISION
PARKS & OPEN SPACES SECTION
THUNDER BAY, ONTARIO

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Additions to the 2016 Parks & Open Spaces Section Standards and Specifications

1. A recommendation has been added to the 2016 Parks & Open Spaces Section Standards and Specifications to hire an International Society of Arboriculture Certified Arborist to select trees at their source nursery and verify compliance. This recommendation applies to the following sections:

Section 1	Tree Planting Approval Procedure 1.6 Approval of Tree Stock 1. It is recommended that the service of an International Society of Arboriculture (ISA) Certified Arborist in good standing is to be secured by the Developer/Contractor to select trees at the source nursery and verify their suitability according to Item 1.10 Healthy Tree Acceptance Criteria. The contractor will bear all costs associated with hiring the Arborist. Tree Stock Approval documentation is to be provided to the City Forester with the Arborist's name, contact information and current ISA certification number. Names of Arborists located in the same area as the source nursery can be found through the ISA website at www.isa-arbor.com and by selecting "Find an Arborist'.
Section 02950	Planting of Trees and Shrubs 1.5 QUALITY ASSURANCE .1 Tree Selection at Source .1 It is recommended that the services of an ISA Certified Arborist be used to verify plant material at source nursery compliant with specification as detailed in 1.10 Healthy Tree Acceptance Criteria in the Parks & Open Spaces Section Standards Document. 2.1 PLANT MATERIAL .1.4 Trees are to be verified at source nursery in writing by an ISA Certified Arborist that specifications are met as outlined in Standards Section 1.10 Healthy Tree Acceptance Criteria in the Parks & Open Spaces Section Standards Document.

2. The requirement to submit an As-Planted Tree List before final acceptance inspection will be conducted has been added to the 2016 Parks & Open Spaces Section Standards and Specifications. This additional requirement applies to the following section:

Section 02950	Planting of Trees and Shrubs 1.4 SUBMITTALS .1.3 For Subdivision planting projects complete and submit As-Planted Tree List Sheet found in Appendix D upon planting completion. An electronic version can be found on the Parks & Open Spaces Section web page. Parks & Open Spaces Section will not conduct final acceptance inspection until the As-Planted Tree List has been submitted.

3. A criterion that trees must be foliated with leaves and viable buds to a minimum of 85% of the crown has been added to the 2016 Parks & Open Spaces Section Standards and Specifications. This additional requirement applies to the following section:

Section 1	Tree Planting Approval Procedure 1.10 Healthy Tree Acceptance Criteria .2.7 Trees must be foliated with leaves and viable buds to a minimum of 85% of the crown.

Infrastructure & Operations Department
Engineering and Operations Division
Parks & Open Spaces Section

PARKS & OPEN SPACES SECTION
STANDARDS AND SPECIFICATIONS

INTRODUCTION

The City of Thunder Bay requires that all landscape work in City Parks and all trees and shrubs planted on municipal lands must be planted in accordance with the following standards and specifications approved by the Manager. These standards and specifications have been prepared to provide Developers and Contractors with the necessary approvals and submittals process information as well as construction details in order to avoid delays and facilitate the approval process, while at the same time ensuring the long term sustainability of the City's Green Infrastructure.

It will be the responsibility of the Developer/Contractor to retain a competent Landscape Contractor with Landscape Ontario Certified Landscape Technician (CLT) Designation in Softscape Installation, an International Society of Arboriculture (ISA) Certified Arborist or a minimum of 10 years demonstrated tree planting experience, and if required, a licensed Landscape Architect (OALA) or Landscape Ontario Certified Landscape Designer (CLD) to ensure that the current City specifications associated with these standards are verified and adhered to in every detail. Prior to any planting being undertaking, proof of certification and/ or experience must be submitted to the Parks & Open Spaces Section.

In this document, reference to Manager indicates either:

a. Manager – Parks & Open Spaces Section or his designate for Subdivision Development Agreements, or
b. Project Manager or designate for all other municipal projects that involve tree planting.

This document provides the following information to Developers and Contractors:

1. Tree Planting Approval Procedure
2. Tree Planting Standards
3. Tree Protection Standards
4. Landscape Specifications
5. Tree Planting Checklist

This document is to be read in conjunction with the City of Thunder Bay Engineering Tree Planting Details found in Appendix E and listed below:

1. Engineering Standard Drawing M-104-1 Deciduous Tree Bare Root Planting
2. Engineering Standard Drawing M-104-2 Coniferous Tree Planting
3. Engineering Standard Drawing M-104-3 Deciduous Tree Planting
4. Engineering Standard Drawing M-104-4 Tree Protection Barriers
5. Engineering Standard Drawing M-104-4.1 Tree Root Protection
6. Engineering Standard Drawing M-104-6 Shrub Planting
7. Engineering Standard Drawing M-104-7 Root Barrier Detail

Section 1. TREE PLANTING APPROVAL PROCEDURE

The approval procedure applies to tree planting on all municipal lands, which includes:

- planting through Subdivision Development Agreements
- planting through Engineering Construction projects
- planting through all other municipal projects

Item 1.1 applies only to Subdivision Development Agreements, whereas Items 1.2 to 1.10 inclusive, apply to all municipal tree planting projects.

1.1 Subdivision Plan Approval

1. Prior to the commencement of any construction, The Developer shall submit to the Engineering Division a Street Planting Plan, clearly indicating the details as listed below. This plan must be prepared by a Landscape Architect registered to practice in Ontario (OALA) or a Landscape Ontario Certified Landscape Designer (CLD).
2. Generally, one boulevard tree shall be planted in front of each lot as well as two along the flankage of corner lots. In road frontages adjacent to Park Blocks, one tree per 12m of frontage shall be planted in the boulevard to the satisfaction of the Parks & Open Spaces Section.
3. Where park land has been created through Park Land Dedication, one tree minimum per lot of subdivision shall be planted in the park land to the satisfaction of the Parks & Open Spaces Section.
4. Where walkway blocks have been created, two columnar trees at a minimum shall be planted adjacent to each side yard between the lot line fence and the walkway to the satisfaction of the Parks & Open Spaces Section.
5. A review by the Manager - Parks & Open Spaces Section will not be undertaken unless all of the details listed have been provided and are conforming to Item 2.2: Tree Planting Locations and Item 2.3: Tree Planting Soil Volume Requirements.

    1. Location of curbs and boulevards
    2. Location of public sidewalks
    3. Location of private driveways
    4. Location of underground structures
    5. Location of above ground structures
    6. Proposed location of boulevard trees
    7. Proposed species Botanical Name of boulevard trees
    8. Proposed tree planting soil volume and location
    9. Proposed location and extent of Root Barriers adjacent to sidewalks, curbs and driveways

6. After Plan approval has been received, the Developer shall provide the Manager – Parks & Open Spaces Section with a final copy of the approved Street Tree Planting Plan.

1.2 Utility Locates

1. The Developer/Contractor, at their own expense, if any, shall obtain utility locates prior to marking tree locations.
2. For Parks & Open Spaces Section Planting projects Contractor to submit Parks & Open Spaces Section Utilities Locates Summary Sheet, found in Appendix C, as per Specification Section 02950 Item 1.4.1.2.

1.3 Marking of Tree & Root Barrier Locations

1. The Developer/Contractor shall mark or stake tree and root barrier locations on municipal property while conforming to Section 2.2: Tree Planting Locations and then request an on-site inspection by the Manager.
2. The Developer/Contractor shall be responsible for the layout of all work areas, in accordance with the drawings, and shall take care to protect all base lines or control points until construction is completed.

1.4 Approval of Tree & Root Barrier Locations

1. The Manager will inspect the staked tree and root barrier locations in a timely manner and notify the Developer/Contractor of any revisions that may be required, or will approve the proposed tree and root barrier locations as staked.
2. After approval has been received, the Developer/Contractor shall proceed with the excavation for the required soil volume in accordance with the approved plans and specifications.

1.5 Approval of Tree Soil Volume & Quality

1. The Manager will receive and approve a standardized City of Thunder Bay Parks & Open Spaces Section topsoil quality report as per Specification Section 02921 prior to any topsoil being used for planting. Sample topsoil quality report can be found in Appendix B. Should initial topsoil report deem the soil to be unacceptable, soil must be amended, retested and a new report resubmitted for approval prior to being used for planting.
2. The Manager will inspect the soil volumes area prior to backfilling with topsoil in a timely manner and notify the Developer/Contractor of any revisions that may be required, or will tentatively approve the proposed volume as created.
3. In addition, the Developer/ Contractor shall have an Engineer or Landscape Architect certify that the soil volume and soil quality meets or exceeds the required specifications in order to receive final approval.
4. After approval has been received, the Developer/Contractor shall proceed with the planting project in accordance with the approved plans and specifications provided that plant material stock has been approved as per item 1.6 below.

1.6 Approval of Tree Stock

1. It is recommended that the service of an International Society of Arboriculture (ISA) Certified Arborist in good standing be secured by the Developer/Contractor to select trees at the source nursery and verify their suitability according to Item 1.10 Healthy Tree Acceptance Criteria. The contractor will bear all costs associated with hiring the Arborist. Tree

Stock Approval documentation is to be provided to the City Forester with the Arborist's name, contact information and current ISA certification number. Names of Arborists located in the same area as the source nursery can be found through the ISA website at www.isa-arbor.com and by selecting "Find an Arborist'.

2. Approval of all plant material shall be obtained from Project Manager prior to any planting being undertaken.
3. The name and location of nursery grower, as well as genetic origin and hardiness of root stock or seed source is required to be submitted at time of tree stock approval.
4. Imported plant material must be accompanied with necessary permits and import licenses and Conform to Federal, Provincial or Territorial regulations.
5. All trees to retain original nursery tags indicating full botanical name until acceptance inspection.

1.7 Notification of Planting and Planting Installation Demonstration

The Developer/Contractor shall provide the Manager with:

1. A minimum 7 day notification of the start of a planting project to facilitate inspections during the process.
2. An on-site demonstration (mock-up) of a complete tree installation in the presence of the Manager or designate. Approval of the demonstration installation is required prior to the planting of any other trees.
3. Notification of completion of planting and submittal of as-built tree species with full Botanical name.
4. Verification that Contractor has delivered to each adjacent home owner a newly planted tree information document provided by the City of Thunder Bay that outlines care and maintenance of the newly planted tree.

1.8 Acceptance Inspection

1. A digital As-Planted Tree List (Appendix D) shall be completed and submitted to the City Forester upon completion of the plant prior to a request for an acceptance inspection.
2. Upon planting completion notification, plant material will be inspected and accepted by the Project Manager 60 days after planting operation is completed. All trees must meet each of the healthy tree criteria as per Item 1.10 Healthy Tree Acceptance Criteria.
3. Plant material installed less than 60 days prior to frost will be accepted the following spring, 30 days after start of growing season provided that acceptance conditions are fulfilled.

1.9 End of Warranty Inspection

1. Prior to expiration of the Developer/Contractor's maintenance and warranty period (2 years or as amended), the Manager will inspect the

trees and notify the Developer/Contractor of any replacements required or other deficiencies, which may require correction.

2. All trees must meet each of the healthy tree criteria as per Item 1.10 Healthy Tree Acceptance Criteria. Upon satisfactory completion, the Manager will issue a letter of acceptance, which will release the Developer/Contractor of all further responsibilities for the municipal trees planted.

1.10 Healthy Tree Acceptance Criteria

A healthy tree shall be as typical for the species/cultivar. An inspection for the following criteria is to be utilized for evaluation by the Manager (photographic representation of acceptable healthy tree criteria can be found below):

Glossary of Terms

ANSI: American Nationals Standards Institute. Z60.1 is the national standard for nursery stock.

Caliper: Trunk diameter is measured 150mm from the ground; if the caliper is greater than 100mm, the measurement is taken at 300mm from the ground.

Central Leader, also referred to as **Leader** or the **Dominant Leader:** A continuation of the main trunk located more or less in the centre of the crown, beginning at the lowest main scaffold branch and extending to the top of the tree.

Circling Root(s): One or more roots whose diameter is greater than 10% of the trunk caliper circling more than one/third of the trunk. Circling roots are unacceptable.

Clear Trunk: The portion of the trunk below the main crown which may include shortened temporary branches.

Co-dominant: Two or more vigorous, upright branches or stems of relatively equal diameter that originate from a common point, usually where the leader was lost or removed. Co-dominant stems are unacceptable.

Crown: The portion of a tree comprised of both leaves and branches beginning at the lowest main scaffold branch extending to the top of the tree. On younger trees, the crown may be comprised of temporary branches.

Cultivar: A named plant selection from which nearly identical plants can be produced, usually by vegetative propagation or cloning.

Included Bark: Bark embedded in the union between a branch and the trunk or between two or more stems that prevents the formation of a normal bark ridge. Included bark is unacceptable.

Kinked Root: A main root that sharply bent. Kinked Roots are unacceptable.

Root Collar, also referred to as the **Root Flare**: The base of a tree where the main roots and trunk meet.

Scaffold Branches. Large main branches that form the main structure of the crown.

Stem-girdling Root: A circling, bent, or straight root that touches or rests on the trunk or root flare that can be become a permanent root.

Temporary Branch: A small branch that is temporarily retained along the lower trunk of young trees.

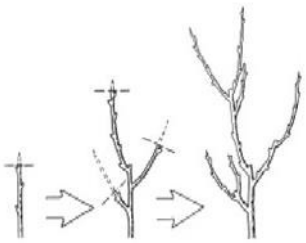
Trunk: The main stem of a tree, beginning at the root collar and ending at the lowest main scaffold branch.

Taper: The thickening of a trunk or branch toward its base.

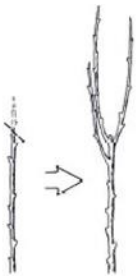
1. Tree Pests/ Disease
   .1 Trees shall be free of pests (insects, pathogens, nematodes or other injurious organisms)

2. Tree Crown
   .1 The form or shape of the crown is typical for a young specimen of the species/cultivar. The crown is not significantly deformed by wind, pruning practices, pests or other factors.
   .2 Trees shall have a single straight central leader and tapered trunk, free of co-dominant stems and vigorous, upright branches that compete with the central leader. If the original leader has been headed, a new leader at least ½ the diameter of the original leader shall be present.

Maintaining a single, central leader is preferable.

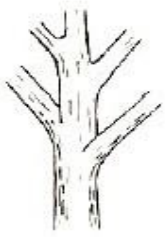


Heading and retaining a leader is acceptable.



Heading without retaining a leader is unacceptable.

   .3 Main branches (scaffolds) shall be in healthy condition, well spaced and distributed radially around and vertically along the trunk, forming a generally symmetrical crown typical for the species.



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.4 Shoot growth (length and diameter) throughout the crown is typical for the age/size of the species/cultivar. Trees do not have dead, diseased, broken, distorted or other serious branch injuries.

.5 Scaffold branches attachment: shall be free of included bark.




preferable	unacceptable	preferable	unacceptable

.6 Branch diameter: shall be no greater than 2/3 the diameter of the trunk, measured 2.5 cm above the branch.

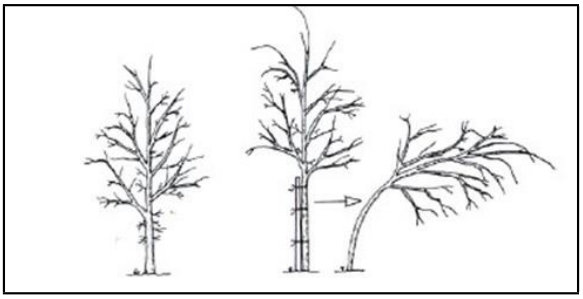



preferable	unacceptable	preferable	unacceptable

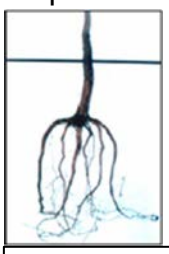
.7 Trees must be foliated with leaves and viable buds to a minimum of 85% of the crown.

preferable

3. Tree Trunk
   .1 The tree trunk shall be straight, vertical and free of wounds (except properly-made pruning cuts), sunburned areas, conks, wood cracks, bleeding areas, signs of boring insects, galls, cankers/lesions and girdling ties.
   .2 Tree height and trunk diameter are typical for the age, species/cultivar and container size.
   .3 Trunk diameter and taper shall be sufficient so that the tree will remain vertical without the support of a nursery stake.

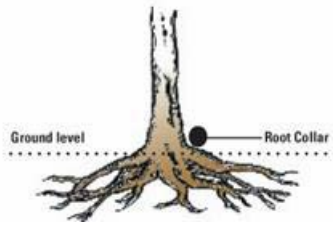


4. Tree Roots
   .1 The root system is free of injury from biotic and abiotic agents.
   .2 Root distribution is uniform throughout the soil mix or growth media and growth is typical for the species/cultivar. At least 2 structural roots shall be within 25 to 76mm of the soil surface.
   .3 The trunk, root collar and large roots shall be free of circling and/or kinked roots. Soil removal near the root collar may be necessary to inspect for circling and/or kinked roots.



preferable unacceptable unacceptable

   .4 The tree shall be well rooted in the soil mix. When the container is removed, the rootball shall remain intact. When the trunk is carefully lifted both the trunk and root system shall move as one.
   .5 The upper-most roots or root collar shall be within 2.5 cm above, or at soil level.

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   .6 The rootball periphery should be free of large circling and bottom – matted roots

Section 2 TREE PLANTING STANDARDS

2.1 Acceptable Tree Species for Boulevard and Park Planting

1. It is recommended that a variety of tree species be planted on boulevards to encourage biodiversity in neighbourhoods and generally help to increase the health of the urban forest. No more than 20% of a single genus is to be planted, and no more than 10% of a single species is to be planted within a subdivision development.
2. Large-stature trees are greater than 15m in height; medium-stature trees are between 7.5m and 15m in height; small-stature trees are less than 7.5m in height.
3. The default tree stature size for subdivision street tree planting is to be large and medium stature.
4. Small-stature trees shall only be selected for planting under utility wires (both street wires and service wires to the lot), in proximity to light standards and in small planting spaces.
5. Depending on the width of the existing or proposed boulevard, an appropriate species shall be chosen by selecting a smaller- to medium-sized species for narrow boulevards (generally less than 2 m) and a larger species for wider boulevards (generally greater than 2 m).
6. Deciduous trees shall have the minimum caliper size specified. Coniferous trees shall have the minimum height size specified. All trees shall be machine dug into wire basket.
7. The following is a list of tree species and their minimum planting sizes, which are acceptable for boulevard and park planting:

1. **Large-stature Trees:**

Suitable for Subdivision Planting

Common Name	Botanical Name	Size	Condition
Silver Cloud Silver Maple	*Acer saccharinum* 'Silver Cloud'	60 mm	Wire basket
Delta Hackberry	*Celtis occidentalis* 'Delta'	60 mm	Wire basket
Northwest Poplar	*Populus x jaackii* 'Northwest'	60 mm	Wire basket
Bur Oak	*Quercus macrocarpa*	60 mm	Wire basket
Red Oak	*Quercus rubra*	60 mm	Wire basket
American Linden/ Basswood	*Tilia americana*	60 mm	Wire basket
Boulevard Linden	*Tilia americana* 'Boulevard'	60 mm	Wire basket
Norlin Linden	*Tilia cordata* 'Norlin'	60 mm	Wire basket
Dropmore Linden	*Tilia flavescens* 'Dropmore'	60 mm	Wire basket
Prairie Expedition Elm	*Ulmus americana* 'Lewis & Clark'	60 mm	Wire basket
Accolade Elm	*Ulmus* 'Morton'	60 mm	Wire basket

Suitable to Park Planting: In addition to above species

Sensation Manitoba Maple	*Acer negundo* 'Sensation'	60 mm	Wire basket
Laurel Leaf Willow	*Salix pentandra*	60 mm	Wire basket
White Spruce	*Picea glauca*	1500 – 1750mm	Wire basket
Blue Spruce	*Picea pungens*	1500 – 1750mm	Wire basket
Red Pine	*Pinus resinosa*	1500 – 1750mm	Wire basket
Larch/Tamarack	*Larix laricina*	1500 – 1750mm	Wire basket
American White Cedar	*Thuja occidentalis*	1500 – 1750mm	Wire basket

2. **Medium-stature Trees:**

Suitable for Subdivision Planting

Common Name	Botanical Name	Size	Condition
Northwood Red Maple	*Acer rubrum* 'Northwood'	60 mm	Wire basket
Unity Sugar Maple	*Acer saccharum* 'Jefcan'	60 mm	Wire basket
Northern Acclaim Honeylocust	*Gleditsia triacanthos* 'Harve'	60 mm	Wire basket
Glenleven linden	*Tilia x flavescens* 'Glenleven'	60 mm	Wire basket

Suitable to Park Planting: In addition to above species

Ohio Buckeye	*Aesculus glabra*	60 mm	Wire basket
Butternut	*Juglans cinerea*	60 mm	Wire basket
Amur Corktree	*Phellodendron amurense*	60 mm	Wire basket
Tower Poplar	*Populus x canescens* 'Tower'	60 mm	Wire basket
Jack Pine	*Pinus banksiana*	1500 – 1750mm	Wire basket
Discovery Elm	*Ulmus davidiana* 'Discovery'	60 mm	Wire basket

3. **Small-stature Trees:**

Suitable for Subdivision and Park Planting

Common Name	Botanical Name	Size	Condition
Amur Maple	*Acer ginnala*	60 mm	Wire basket
Tatarian Maple	*Acer tataricum*	60 mm	Wire basket
Goldrush Amur Chokecherry	*Prunus maackii* 'Jefree'	60 mm	Wire basket
Starlite Crabapple	*Malus x* 'Jeflite'	60 mm	Wire basket

Spring Snow Crabapple	*Malus* x 'Spring Snow'	60 mm	Wire basket
Pink Spires Crabapple	*Malus x adstringens* 'Pink Spires'	60 mm	Wire basket
Japanese Tree Lilac	*Syringa reticulata* 'Ivory Silk'	60 mm	Wire basket
Russian Mountain Ash	*Sorbus aucuparia* 'Rossica'	60 mm	Wire basket
Nannyberry (tree form)	*Viburnum lentago*	60 mm	Wire basket

N.B. Other tree species may be acceptable to the Manager but require prior approval before using. All plants, trees, and their rootstocks shall meet the criteria set out by the "Plant Research Institute of Agriculture Canada" and be proven hardy for Zones 3A or 3B. The genetic origin and hardiness of root stock or seed source will be required.

2.2 Tree Planting Locations

1. When trees are planted in a boulevard between sidewalk and curb, the trees shall be planted as close as possible to the centre line of the boulevard while respecting setbacks identified in 2.2.3 and 2.2.4. They should be located at least 1.7 m from back of curb, whenever possible, unless otherwise specified by the Manager - Parks & Open Spaces Section.
2. When trees are planted on the lot side of the sidewalk, they should be located at least 1.0 m from sidewalk whenever possible, unless otherwise specified by the Manager – Parks & Open Spaces Section.
3. In general, boulevard trees shall be planted at equal intervals, which may vary depending on their ultimate size, in accordance with the following schedule:
    1. Large-stature trees 13-16 m apart
    2. Medium-stature trees 10-13 m apart
    3. Small-stature trees 7-10 m apart

4. Boulevard and park trees shall be planted at minimum distances from above ground structures as indicated below:
    1. Minimum distance from street intersections 9 m
    2. Minimum distance from light standards 3 m
    3. Minimum distance from private approaches 3 m w/o root barrier
    4. Minimum distance from private approaches 1.5 m w/ root barrier
    5. Minimum distance from hydrants 3 m
    6. Minimum distance from hydro poles 3 m
    7. Minimum distance from manholes 3 m
    8. Minimum distance from water valves 3 m
    9. Minimum distance from stop or yield sign 15 m
    10. Minimum distance from traffic signals 30 m

5. Boulevard and park trees shall be planted at minimum distances from below ground structures as indicated below:

1.	Minimum distance from sewer and water	3 m
2.	Minimum distance from fibre optics	2 m
3.	Minimum distance from gas	1 m
4.	Minimum distance from hydro	1 m
5.	Minimum distance from telephone	1 m

6. Under certain situations the minimum distances indicated above may be adjusted with the approval of the Parks & Open Spaces Section.

2.3 Tree Planting Soil Volume Requirements

1. All street trees within the municipal road allowances require 15 m^3 of soil volume for adequate tree growth and development.
2. All trees within other municipal lands and parks require 30m^3 of soil volume.
3. The soil volumes of 15m^3 and 30m^3 shall be based on a soil depth of a minimum of 500mm and a maximum of 1000mm of approved topsoil conforming to specification section 02921, above a well-drained sub soil or drainage layer.
4. Groups of trees can share soil volume, for example, through the use of continuous soil planters. The use of soil cells and root pathways is encouraged to increase soil volume areas and link non-continuous soil areas. The extent of volume sharing is to be reviewed with the Manager
5. In the case of engineered structural soils, only the soil portion (20 percent) is counted towards the minimum soil volume requirement.

2.4 Tree Maintenance Requirements

1. It is the responsibility of the Developer/ Contractor to maintain all newly planted trees planted on Municipal lands as per item 3.10 in specification section 02950 from the date of initial acceptance to the end of the two year warranty period.
2. Required maintenance per tree is to include:
   - .1 Water to maintain soil moisture conditions to a depth of 300 mm min. for optimum growth and health of plant material without causing erosion.
   - .2 Supply water bags as per specification section 02950 and maintain in good repair. Fill a minimum of one time per week from May 1st to June 30th and September 1st to October 31st. Fill a minimum of two times per week from July 1st to August 31st.
   - .3 Reform damaged soil saucers.
   - .4 Remove weeds as required.
   - .5 Replace or respread damaged, missing or disturbed mulch. Ensure mulch depth at end of warranty period is 75mm.
   - .6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Project Manager prior to application.

.7 Apply fertilizer in early spring as indicated by soil test.
.8 Remove dead, broken or hazardous branches from plant material.
.9 Keep tree supports in proper repair and adjustment.
.10 Remove tree supports and remaining species labels at the end of the warranty period.
.11 Level soil saucers at the end of the warranty period.
.12 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
.13 Conduct a structural prune as required by a Certified Arborist to the satisfaction of the City Forester at the end of the warranty period.

.14 Submit monthly written reports to Project Manager identifying:
- .1 Maintenance work carried out.
- .2 Development and condition of plant material.
- .3 Preventative or corrective measures required which are outside Contractor's responsibility.

2.5 Adjacent Lot Owner Notification Requirements

1. It is the responsibility of the Developer/ Contractor to deliver to each adjacent lot owner of a newly planted municipal tree, within 3 days of planting, a newly planted tree information document that outlines the care and maintenance of the newly planted tree that the Contractor will undertake for the two year warranty period. This document will provide to the Developer/ Contractor in the required numbers by the City of Thunder Bay Parks & Open Spaces Section and is to be requested a minimum of 14 days prior to planting.

2. After the two year warranty period is complete it is the responsibility of the Developer/ Contractor to deliver to each adjacent lot owner of the planted municipal tree, within 3 days of end of warranty, a tree information document that outlines the future care and maintenance of the planted tree that will now be assumed by the City and can be assisted by the land owner. This document will provide to the Developer/ Contractor in the required numbers by the City of Thunder Bay Parks & Open Spaces Section and is to be requested a minimum of 14 days prior to end of warranty date.

Section 3 TREE PROTECTION STANDARDS

3.1 Introduction

The maintenance and enhancement of the urban forest is an important goal in both Thunder Bay's Strategic Plan and Urban Forest Management Plan. Trees are a tangible and valuable part of the total assets found in the City of Thunder Bay. Their protection and care during all construction activities have become an important objective of the City's Administration.

The following standards have been developed to ensure protection of this infrastructure. The construction planning stage shall include the protection of trees early on in the process in order to increase the chances for tree survival in an area of construction. All persons, including homeowners and contractors, conducting approved construction on municipal property will be responsible for implementing these standards to ensure protection of existing trees within the construction zone. Anyone failing to adhere to the Tree Protection Standards will be financially responsible for any resulting damage to trees and may be charged under the provisions of the Thunder Bay Public Tree By-law 008-2005.

These Tree Protection Standards are to be read in conjunction with Parks & Open Spaces Section Specification Sections 02905 Tree and Shrub Preservation and 02117 Tree Pruning, as well as Engineering Division Standard Drawings M 104- 4 and M104-4.1

No additional compensation will be paid for the protection of trees in the work zone.

3.2 The Tree Protection Zone

1. The minimum required size and location of the Tree Protection Zone is as follows:
    1. The Tree Protection Zone will be established around each tree involved within and immediately adjacent to any proposed construction area.
    2. The Tree Protection Zone will extend to at least the "dripline" of the tree or a minimum 3.0 m radius from the stem of the tree.
    3. In areas with rows of trees or grouping of trees, a continuous Tree Protection Zone is encouraged rather than individual protection zones for each tree.
    4. Final approval of the Tree Protection Zone must be obtained from the City Forester prior to the start of any construction activity.
    5. See Engineering Standard detail M-104-4 for further information.

2. Within a Tree Protection Zone there must be:
    1. No construction.
    2. No equipment or materials shall be allowed to hit, abrade or otherwise damage the trunk or branches of a tree.

3. No vehicles, machinery or equipment shall be driven over the Tree Protection Zone.
4. No vehicles, machinery or equipment shall be parked or stored in the Tree Protection Zone.
5. No soil or construction materials, waste or debris shall be piled over or stored in the Tree Protection Zone.
6. No disposal of any liquid such as concrete sleuth gas and oil shall occur within the Tree Protection Zone.
7. No rigging cables shall be wrapped around or installed in trees.
8. No burning of construction materials in the Tree Protection Zone.
9. No changes to the grade by adding fill, excavating or scraping shall occur within the Tree Protection Zone.
10. No trenching shall occur within the Tree Protection Zone, however, where excavation and backfill must occur, approval must be received from the Parks Manager (in the case of approved construction on municipal boulevards by homeowners) or the Contract Administrator (in the case of tendered contracts). Low-impact methods such as the hydrovac system and trenchless methods such directional drilling under existing trees will be the recommended method of underground installations. Open trenches at the base of trees are not acceptable. Destroying roots in this zone will make the tree structurally unsound and subject to toppling. Backfilling within the Tree Protection Zone to a depth of 300mm of the finished grade shall be with a 1:1:1 soil mix of approved topsoil, sand and peat moss to allow for proper root regeneration.

3.3 Tree Protection Barriers

1. The Tree Protection Zone is to be demarcated with a fencing system composed of 38x38mm metal t-rail posts, 1000mm high Welded Wire Farm Fence and 1200mm high orange plastic snow fencing constructed as per Specification Section 02905 Tree and Shrub Preservation and Engineering Standards Detail M 104-4. In certain site specific circumstances, the City Forester in consultation with the Contractor may issue written authorization waiving the requirements for the tree protection fencing. All requirements of the Tree Protection zone however, still apply.
2. In cases where it has been deemed that the Tree Protection Fencing is not required by written authorization, the trunk of all trees within the tree protection zone shall require strapping or a double wrap of wood slat snow fencing, or other suitable wood planks strapped to the tree trunk to completely protect the tree trunk from impact damage. The minimum size of strapping will be 25 x 150 x 2440mm. Alternatively, 200 litre polyethylene drums may be utilized to protect the trunk for the extent of the tree bole.
3. Where approved work must occur within the designated tree protection zone and the resulting work will expose tree roots a root curtain system must be utilized consisting of 50 x50mm wood posts, Welded Wire Fabric and type 2 Filter Fabric, as well as a mix of fertilizer, organic material and parent material constructed as per Specification Section 02905 Tree and Shrub Preservation and Engineering Standards Detail M 104-4.1.

4. Tree Protection Barriers shall be maintained in good repair for the entire length of the construction project.
5. During the course of construction, the homeowner or Contractor is to inform the Parks Manager or Contract Administrator of any damage to a tree. Article 8 of the Public Tree By-Law applies.

3.4 Tree Branch and Root Pruning

1. Where required, the Parks & Open Spaces Section will provide for the pruning of tree branches and/ or roots which is to be conducted solely by staff of the Parks & Open Spaces Section or by a qualified Arborist that is subject to the approval of the Parks & Open Spaces Section. The Arborist and all work are to conform to Parks & Open Spaces Section Specifications Section 02117 Tree Pruning.
2. Adequate notice of 14 days, as per Project Specifications, must be given to the City of Thunder Bay Parks & Open Spaces Section to schedule pruning work. In the case of required root pruning, adjacent curbs, if applicable, must be retained in place until root pruning is completed.
3. Tree branch and root pruning is to be included as a line item in the project construction schedule provided by the Contractor to the Project Manager prior to the start of construction.

Section 4 SPECIFICATIONS

This section contains the following technical specifications that must be adhered to for all trees and shrub planting on Municipal lands as well as all landscape work within Municipal Parks:

1.	Section 02117	Tree Pruning
2.	Section 02210	Rough Grading
3.	Section 02315	Excavation, Trenching and Backfilling
4.	Section 02905	Tree and Shrub Protection
5.	Section 02921	Topsoil for Planting
6.	Section 02931	Mechanical Seeding
7.	Section 02934	Hydraulic Seeding
8.	Section 02938	Sodding
9.	Section 02950	Planting of Trees and Shrubs & Groundcovers

TREE PRUNING

1 GENERAL

1.1 RELATED SECTIONS

.1 none

1.2 REFERENCES

.1 American National Standard Institute (ANSI)
- .1 ANSI A300 (Part 1) - 2008, for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices (Pruning) (revision of ANSI A300 (Part 1) – 2001.
- .2 ANSI A300 (Part 2) – 2011, for Tree Care Operations – Standard Practices (Soil Management a. Modification, b. Fertilization, and c. Drainage) (revision of ANSI A300 (Part 2) – 2004 Fertilization).
- .3 ANSI A300 (Part 3) – 2006, Tree, Shrub and Other Wood Plant Maintenance – Standard Practices (Supplemental Support Systems) (revision of ANSI A300 (Part 3) - 2000).
- .4 ANSI A300 (Part 5)-2012, Tree, Shrub, and Other Woody Plant Management (Management of Trees and Shrubs During Site Planning, Site Development, and Construction) (revision of ANSI A300 (Part 5)- 2005

.2 Canadian Nursery Landscape Association (CNLA)

.3 International Society of Arboriculture (ISA)

.4 Ontario Ministry of Agriculture, Food and Rural Affairs
- .1 Publication 483-2004, Pruning Ornamentals.

1.3 DEFINITIONS

.1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.

.2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.

.3 Crown Raising: consists of removal of lower tree branches to provide clearance.

.4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.

.5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.

.6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.4 QUALITY ASSURANCE

.1 Certification: provide International Society of Arboriculture or Canadian Nursery Landscape Association or Ministry of Training, Colleges and Universities certification.

.2 Field Samples: do sample pruning in manner to enable City Forester to identify:
- .1 Knowledge of target areas including branch bark ridge and branch collars.
- .2 Technique for selection process and pruning used to establish desired form and shape for each species.

.3 Acceptance of Work will be determined by City Forester from field sample.

.4 Health and Safety Requirements: all construction occupational health and safety to be in accordance with standard Thunder Bay District Health Unit Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with local regulations.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Dispose of unused disinfectant at official hazardous material collections site approved by Project Manager. Ensure emptied containers are sealed and stored safely.

.4 Divert wood materials from landfill to facility for recycling or composting as approved by Project Manager.

1.6 TOOL MAINTENANCE

.1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.

.2 Disinfect tools before each tree is pruned.

.3 On diseased plant material disinfect tools before each cut.

2 PRODUCTS

2.1 DISINFECTANT

.1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 GENERAL

.1 Prune in accordance with OMAFRA Pruning Ornamentals and ANSI A300, and as directed by City Forester. Where discrepancies occur between standard and specifications, specifications govern.

.2 Notify immediately City Forester of conditions detrimental to health of plant material or operations. Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.

.3 Retain natural form and shape of plant species.

.4 Do not:
- .1 Flush cut branches.
- .2 Crush or tear bark.
- .3 Cut behind branch bark ridge.
- .4 Damage branch collars.
- .5 Damage branches to remain.

3.3 PRUNING

.1 Remove dead, dying, diseased and weak growth from plant material to provide: crown cleaning, crown thinning, crown raising, crown reduction, vista pruning or crown restoration as designated by City Forester in order to promote healthy growth.

.2 Remove live branches that:
- .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.

.2 Are of weak structure including narrow crotches.
.3 Obstruct development of more structurally important branches.
.4 Are broken.

.3 Remove live branches to re-establish natural species form including:
.1 One or more developing leaders.
.2 Multiple growth due to previous topping.
.3 Branches extending outward from natural form.
.4 Undesirable sucker growth.

.4 Remove loose branches, twigs and other debris lodged in tree.

.5 Remove vines.

.6 For branches under 50 mm in diameter:
.1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
.2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
.3 Do not cut leader branches unless directed by City Forester.

.7 For branches greater than 50 mm in diameter:
.1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.
.2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
.3 Make final cut adjacent to and outside branch collar.

.8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal. Repair areas which are damaged, or remove damaged area back to next branch collar.

.9 Remove additional growth designated by City Forester.

3.4 ROOT GIRDLING

.1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.

.2 Remove exposed portion of girdling root as directed by City Forester after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.5 CARE OF WOUNDS

.1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.6 CLEAN-UP

.1 Collect and compost/recycle whenever applicable pruned material daily and remove from site.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

ROUGH GRADING

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02315 - Excavation, Trenching and Backfilling.

.2 Section 02905 – Tree and Shrub Preservation.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D698-91(1998), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m ^{3}).

1.3 EXISTING CONDITIONS

.1 Examine subsurface investigation report which is available for inspection bound into specification.

.2 Known underground and surface utility lines and buried objects are as indicated on site plan.

.3 Refer to dewatering in Section 02315 - Excavating Trenching and Backfilling.

1.4 PROTECTION

.1 Protect and/or transplant existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement and surface or underground utility lines which are to remain as directed by Project Manager. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

2 PRODUCTS

2.1 MATERIALS

.1 Fill material: in accordance with of Section 02315 - Excavating, Trenching and Backfilling.

.2 Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by Project Manager.

3 EXECUTION

3.1 STRIPPING OF TOPSOIL

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Project Manager.

.2 Commence topsoil stripping of areas as indicated after area has been cleared and removed from site.

.3 Strip topsoil to depths as directed by Project Manager. Rototill and retain as topsoil on site. Avoid mixing topsoil with subsoil.

.4 Stockpile in locations as directed by Project Manager. Stockpile height not to exceed 4 m.

.5 Dispose of unused topsoil off site.

3.2 GRADING

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Rough grade to following depths below finish grades:

- .1 100 mm for grassed areas.
- .2 300 mm for annual or perennial beds.
- .3 450 mm for shrub beds.
- .4 To depth specified on details for paving surfaces

.3 Slope rough grade away from building 1:50 minimum.

.4 Grade ditches to depth as indicated.

.5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.6 Compact filled and disturbed areas to corrected maximum dry density to ASTM D698, as follows:

- .1 85% under landscaped areas.
- .2 98 % under paved and walk areas.

.7 Do not disturb soil within Tree Protection Zone of trees or shrubs to remain as per section 02905 Tree and Shrub Preservation.

3.3 TESTING

.1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by ULC. Costs of tests will be paid by Contractor.

.2 Submit testing procedure and laboratory, frequency of tests and testing reports as designated by ULC or certified testing personnel to Project Manager for approval.

3.4 SURPLUS MATERIAL

.1 Remove surplus material and material unsuitable for fill, grading or landscaping off site.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02210 - Rough Grading.

.2 Section 02905 – Tree and Shrub Protection.

1.2 REFERENCES

.1 OPSS 01010

1.3 DEFINITIONS

.1 Common excavation: excavation of materials of whatever nature.

.2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.3 Waste material: excavated material unsuitable for use in work or surplus to requirements.

1.4 PROTECTION OF EXISTING FEATURES

.1 Existing buried utilities and structures:

.1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.2 Prior to commencing excavation work, notify applicable owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures that are not scheduled to be removed. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.

.3 Confirm locations of buried utilities by careful test excavations.

.4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered that are not scheduled for removal.

.2 Existing buildings, trees and surface features:

.1 Conduct, with Project Manager, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by work.

.2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Project Manager. All tree protection to conform to section 02905 – Tree and Shrub Protection.

1.5 QUALITY ASSURANCE

.1 Carry out the work of this Section in strict accordance with the requirements of the Ontario Trench Excavator's Protection Act (Section 4.2.5. of the Ontario Building Code) and applicable By-laws of the City of Thunder Bay. In addition, follow recommendations of Construction Safety Association brochure "Shoring and Timbering in Trenches, 1981", wherever applicable.

.2 An independent inspection and testing company may be appointed by the Project Manager. Upon request, submit to the Testing Company, representative samples of granular materials proposed for use. Coordinate backfilling and compaction to permit testing company to carry out tests.

.3 Shoring and trench timbering, in addition to requirements of local authorities, shall be carried out in accordance with requirements of The Occupational Health and Safety Act, specified herein for Construction Projects, and other applicable regulations of the Ontario Ministry of Labour. In addition, follow recommendations of Construction Safety Association brochure "Shoring and Timbering in Trenches, 1981", wherever applicable.

2 PRODUCTS

2.1 MATERIALS

.1 Granular “A” & “B”, as per OPSS 1010.
.2 Clear stone as per OPSS 1004.

3 EXECUTION

3.1 DEWATERING

.1 Keep excavations free of water while work is in progress.

.2 Protect open excavations against flooding and damage due to surface run off.

.3 Dispose of water in manner not detrimental to public and private property, or any portion of work completed or under construction.

3.2 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated.

.2 Excavation must not interfere with normal 45 degree splay of bearing from bottom of any footing.

.3 Dispose of surplus and unsuitable excavated material off site.

.4 Do not obstruct flow of surface drainage or natural watercourses.

.5 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.6 Notify Project Manager when bottom of excavation is reached.

.7 Obtain Project Manager approval of completed excavation.

.8 Remove unsuitable material from trench bottom to extent and depth as directed by Project Manager.

3.3 FILL TYPES AND COMPACTION

.1 Granular “B” under service area, roadways, and walkways 100% Standard Proctor Density.

3.4 BACKFILLING

.1 Do not proceed with backfilling operations until Project Manager has inspected and approved installations.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

3.5 RESTORATION

.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Project Manager.

.2 Reinstate pavement and sidewalks to elevation which existed before excavation.

.3 Clean and reinstate areas affected by work as directed by Project Manager.

END OF SECTION.

TREE AND SHRUB PROTECTION

1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation for fertilizing and preserving root systems of plants affected by changing grades or excavation or in the vicinity of construction.

.2 Related Sections:
- .1 Section 02117 - Tree Pruning.
- .2 Section 02921 – Topsoil for Planting.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CSA G30.5-[M1983(R1998)], Welded Steel Wire Fabric for Concrete Reinforcement.

.2 Department of Justice Canada (Jus).
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .2 Fertilizers Act (R.S. 1985, c. F-10).
- .3 Fertilizers Regulations (C.R.C., c. 666).
- .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.3 Health Canada - Pest Management Regulatory Agency (PMRA).
- .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Submit monthly written reports on maintenance during warranty period, to City Forester identifying:
- .1 Maintenance work carried out, including watering.
- .2 Development and condition of plant material.
- .3 Preventative or corrective measures required which are outside Contractor's responsibility.

1.4 QUALITY ASSURANCE

.1 Certification: provide International Society of Arboriculture or Canadian Nursery Landscape Association or Ministry of Training, Colleges and Universities certification.

.2 Health and Safety:

.1 Undertake construction occupational health and safety in accordance with City of Thunder Bay Health and Safety Policies and Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with local regulations.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling.
.4 Separate for reuse and recycling and place in designated containers.
.5 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Project Manager.
.6 Divert unused wood materials from landfill by composting or mulching approved by Project Manager.
.7 Divert unused stone and aggregate materials from landfill to local facility approved by Project Manager.
.8 Divert unused plastic materials from landfill to local recycling facility approved by Project Manager.
.9 Place materials defined as hazardous or toxic in designated containers.
.10 Dispose of unused fertilizer material at official hazardous material collections site approved by Project Manager.
.11 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.
.12 Do not dispose of unused fertilizer material into sewer system, into streams, lakes, onto ground or in any other location where they will pose health or environmental hazard.
.13 Ensure emptied containers are sealed and stored safely.
.14 Fold up metal banding, flatten and place in designated area for recycling.

1.6 SCHEDULING

.1 Obtain approval from City Forester of schedule indicating beginning of Work.

2 PRODUCTS

2.1 MATERIALS

.1 Peatmoss:
- .1 Derived from partially decomposed species of Sphagnum Mosses.
- .2 Elastic and homogeneous.
- .3 Free of wood and deleterious material which could prohibit growth.
- .4 Shredded minimum particle size: 5 mm.

.2 Fertilizer:
- .1 To Canada Fertilizer Act and Fertilizers Regulations.
- .2 Complete, commercial, slow release with 35 % of nitrogen content in water-insoluble form.
- .1 Fertilizer containing phosphorus may only be applied subsurface.
- .2 Surface application of fertilizer may only be conducted using phosphorus-free fertilizers and scheduled fertilizing may only be conducted using phosphorus-free fertilizers.

.3 Anti-desiccant: commercial, wax-like emulsion.

.4 Filter Cloth:
- .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m^2 mass.
- .2 Type 2: biodegradable burlap.

.5 Metal T-Bars: 38 x 38 x 2400 mm length, painted flat black.

.6 Wood Posts: 38 x 89 x 2400 mm length, untreated wood.

.7 Welded wire fabric (WWF) Farm Fence: 1000 mm high, MW 150 mm x MW 450 mm, to CSA G30.5.

.8 Concrete Reinforcing Mesh: MW 13.3 x MW 13.3 wire with 152 x 152mm opening

.9 Snow Fencing: Purpose made, synthetic plastic fencing, orange colour 1200 mm high.

3 EXECUTION

3.1 IDENTIFICATION AND PROTECTION

.1 Do construction occupational health and safety in accordance with City of Thunder Bay Health and Safety Policies and Procedures.

.2 Identify plants and limits of root systems to be preserved as approved by City Forester prior to installation of Tree Protection and the start of any construction.

.3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by City Forester.

.4 Ensure no pruning is done without approval from the City Forester. If pruning is required and approval given, then Contractor is to consult with a Qualified Arborist or Canadian Certified Horticultural Technician (CCHT) that is approved by City Forester.

3.2 PROTECTIVE FENCING SYSTEM

.1 Identify plants and limits of root systems to be preserved as approved by City Forester.

.2 Prune exposed roots cleanly during construction. Pruned ends to point obliquely downwards.

.3 Install metal T-bar posts and welded wire farm fence at dripline of vegetation to be retained.

.4 Securely attach orange snow fence to welded wire farm fence.

3.3 ROOT CURTAIN SYSTEM

.1 Identify limits for required construction excavation as approved by Project Manager.

.2 Prior to construction excavation, dig trench maximum 500 mm wide x 1500 mm deep, along perimeter of excavation limits.

.3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.

.4 Install wooden posts and welded wire fabric against construction edge of trench.

.5 Securely attach Type 2 filter fabric on plant side of wire mesh.

.6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
- .1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.
- .2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5 kg/m^3.

.7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.

.8 Protect root curtain from damage during construction operations.

.9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.

.10 Protect root curtain before and during backfill operations. Ensure root curtain is cut down to 300 mm below finished grade and remove cut material.

3.4 DURING CONSTRUCTION CARE

.1 Tree protection notes for trees to be retained in the vicinity of construction: Using the services of a qualified tree service firm under the direction of a Qualified Arborist to carry out the following program of care for the trees to be retained:

.1 Pre-construction Start-up:

.1 Prune only to remove dead, diseased or dying wood or to structurally improve the trees.
.2 Feed the trees by liquid injection (low pressure below grade deep watering) with Nitroform water-soluble slow release fertilizer. Calibrate feeding for each tree based upon caliper of tree and its requirement. The fertilizer is produced by Nutrite.
.3 Provide care and feeding for trees within drip line area.

.2 During Construction:

.1 Maintain protective fencing in place during the entire construction period.
.2 Do not store materials, place equipment, or move equipment over roots system or through set back protection area.
.3 No rigging cables shall be wrapped around or installed in trees.
.4 Do not burn construction materials in the Tree Protection Zone.
.5 No equipment or materials shall be allowed to hit, abrade or otherwise damage the trunk or branches of a tree.
.6 No vehicles, machinery or equipment shall be driven over Tree Protection Zone.
.7 No vehicles, machinery or equipment shall be parked or stored in the Tree Protection Zone.
.8 No soil or construction materials, waste or debris shall be piled over or stored in the Tree Protection Zone.
.9 No disposal of any liquid such as concrete sleuth gas and oil shall occur within the Tree Protection Zone.
.10 No changes to the grade by adding fill, excavating or scraping shall occur within the Tree Protection Zone.
.11 No trenching shall occur within the Tree Protection Zone, however, where excavation and backfill must occur, approval must be received from the Parks Manager (in the case of approved construction on municipal boulevards by homeowners) or the Contract Administrator (in the case of tendered contracts). Low-impact methods such as the hydrovac system and trenchless methods such directional drilling under existing trees will be the recommended method of underground installations. Open

trenches at the base of trees are not acceptable. Destroying roots in this zone will make the tree structurally unsound and subject to toppling. Backfilling within the Tree Protection Zone to a depth of 300mm of the finished grade shall be with a 1:1:1 soil mix of approved topsoil, sand and peat moss to allow for proper root regeneration.

.12 Monitor the requirements of the trees and provide water and maintenance care as may be required.

.13 Where limbs or portions of trees must be removed to accommodate construction, they will be removed carefully as approved by the City Forester.

3.5 PRUNING

.1 Prune in accordance with Section 02117 - Tree Pruning.

3.6 ANTI-DESICCANT

.1 Apply anti-desiccant to foliage where applicable and as directed by City Forester.

3.7 CLEAN UP

.1 Remove from site all tree protection material when construction is complete.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02950: Planting of Trees and Shrubs.

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada
  .1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment
  .1 PN1340-2005, Guidelines for Compost Quality.

.3 U.S. Environmental Protection Agency (EPA)/Office of Water
  .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Project Manager: Project Manager or designate

.2 Compost:
  .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
  .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
  .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 50, and contain no toxic or growth inhibiting contaminates).
  .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

.3 Native Soil: Soil excavated from the planting hole location; all stone, rubble and other deleterious material greater than 50mm shall be removed.

1.4 SUBMITTALS

.1 Provide submittals as required in accordance with drawings.

.2 Quality control submittals :
  .1 Soil testing: submit certified test reports, as well as an amendment plan if required, and re-tests if required, showing compliance with specified performance characteristics and physical properties, as described in PART 2.3 - SOURCE QUALITY CONTROL.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting, if required, to verify project requirements, installation instructions and warranty requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with local regulations.

.2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Project Manager.

.3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

2 PRODUCTS

2.1 TOPSOIL

.1 Topsoil for planting, seeded and sodded areas: mixture of mineral particulates, microorganisms and organic matter which provides suitable medium for supporting healthy plant growth.
- .1 Soil texture based on The Canadian System of Soil Classification, to consist of 45 % sand, 35 % silt, and 20 % clay by weight, with 5 to 10% organic matter.
- .2 PH value 6.5 to 8.0.
- .3 Contain no toxic elements or growth inhibiting materials.
- .4 Finished surface free from:
  - .1. Debris and stones over 50 mm diameter.
  - .2. Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  - .3. Couch or crabgrass rhizomes.
- .5 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer to be added as required to achieve the following minimum standards:
- .1 Fertility: major soil nutrients and micro-nutrients present in following amounts and balanced ratios to support germination and/or establishment of intended vegetation:
  - .1. Nitrogen (N): 20 to 40 grams of available N per kilogram of topsoil.
  - .2. Phosphorus (P): 40 to 50 grams of P per kilogram of topsoil.
  - .3. Potassium (K): 75 to 110 grams of K per kilogram of topsoil.

.4. Magnesium (Mg): 100 to 250 grams of Mg per kilogram of topsoil.
.5. Sodium (Na): less than 200 grams of Na per kilogram of topsoil.
.6. Calcium (Ca): 1000 to 4000 grams of Ca per kilogram of topsoil.
.7. Cation Exchange Capacity (CEC): greater than 9.0 centimole per kilogram of topsoil.
.8. Salts: less than 2.0 millisiemens per cm of topsoil

.2 PH value: 6.5 to 8.0.
.3 Fertilizer containing phosphorus may only be applied subsurface.
.4 Surface application of fertilizer may only be conducted using phosphorus-free fertilizers.

.2 Organic matter: compost Category A in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.3 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.

.4 Peatmoss:
.1 Derived from partially decomposed species of Sphagnum Mosses.
.2 Elastic and homogeneous, brown in colour.
.3 Free of wood and deleterious material which could prohibit growth.
.4 Shredded particle minimum size: 5 mm.

.5 Manure:
.1 Well-rotted and aged a minimum of three years.
.2 May be sheep or steer manure.

.6 Mushroom Compost

.7 Sand: washed coarse silica sand, medium to course textured.

.8 Limestone:
.1 Ground agricultural limestone containing minimum calcium carbonate equivalent of 85%.
.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.9 Bone Meal:
.1 Finely ground with a minimum analysis of 20% phosphoric acid.

2.3 SOURCE QUALITY CONTROL

.1 Advise Project Manager of sources of topsoil to be utilized with sufficient lead time for testing, a minimum of 7 days in advance of starting work.

.2 Contractor is responsible for soil analysis and requirements for amendments to supply topsoil as specified.

.3 Testing of topsoil will be carried out by testing laboratory approved by Project Manager.

.1 Soil sampling, testing and analysis to be in accordance with Provincial standards and done by a qualified laboratory holding a valid certificate from OMAFRA or CALA.

.4 Results are to be displayed as per the City of Thunder Bay Parks & Open Spaces Section Soil Test Reporting Sheet found in Appendix B prior to submission for approval.

.1 Currently the Forest Resources & Soil Testing (FoReST) Laboratory at Lakehead University Centre for Analytical Services (LUCAS) conducts a standardized topsoil test that follows the Soil Test Reporting Sheet for City projects and provides recommendations for soil amendments to be added to comply with the specification. Contact e-mail address: forestlab@lakeheadu.ca and phone number (807) 343-8639

.5 Soil testing by recognized testing facility for: soil texture, organic matter, pH, available nutrients of N, P & K, and micro-nutrients of Mg, Na & Ca, as well as CEC and total Salts.

.6 For any soil not complying with the specifications, soil amendments, as required to bring topsoil to compliance with the specifications must be displayed in the topsoil report as per the City of Thunder Bay Parks & Open Spaces Section Soil Test Reporting Sheet found in Appendix B.

.7 For any soil that has been amended as per the Soil Test Reporting Sheet a retest is required to be undertaken to verify compliance and receive approval.

3. EXECUTION

3.1 SURPLUS MATERIAL

.1 Dispose of materials, except topsoil not required, where directed by Project Manager off site.

3.2 CLEANING

.1 Ensure all excess material on hard surfaces to be cleaned and washed away.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

MECHANICAL SEEDING

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02210 - Rough Grading.

.2 Section 02921 - Topsoil Placement and Grading.

1.2 SUBMITTALS

.1 Product Data:
- .1 Provide product data for:
  - .1 Seed.
  - .2 Fertilizer.

1.3 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.4 SCHEDULING

.1 Schedule mechanical seeding to coincide with preparation of soil surface.

.2 Schedule mechanical seeding after frost has left the ground and before frost enters the ground.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with local by-laws

.2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Project Manager.

.3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

2 PRODUCTS

2.1 GRASS SEED

.1 Canada "Certified" seed, "Canada No. 1 Ground Cover Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.1 General All Purpose Mixture: "Certified", "Specialty Seed", "Canada No. 1" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.1 70 % Creeping Red Fescue
.2 20 % White Clover
.3 10 % Annual Rye Grass

.4 Rate of application to be 5 – 6 kg/100m2.

.2 In packages individually labeled in accordance with "Seeds Regulations" and indicating name of supplier.

2.2 WATER

.1 Free of impurities that would inhibit germination and growth.

.2 Supplied by Contractor at designated source.

2.3 FERTILIZER

.1 To Canada "Fertilizers Act" and "Fertilizers Regulations".

.2 Complete synthetic or organic, fertilizer with guaranteed minimum analysis as specified.

.3 Fertilizer containing phosphorus may only be applied subsurface prior to seeding.

.4 Surface application of fertilizer may only be conducted using phosphorus-free fertilizers and scheduled fertilizing may only be conducted using phosphorus-free fertilizers.

3 EXECUTION

3.1 QUALITY OF WORK

.1 Do not perform work under adverse field conditions as determined by Project Manager.

.2 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site to a

licensed contaminated soils disposal site.

3.2 SEED BED PREPARATION

.1 Verify that grades are correct. If discrepancies occur, notify Project Manager and do not commence work until instructed by Project Manager.

.2 Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated to tolerance of plus or minus10 mm, surface draining naturally.

.3 Cultivate fine grade approved by Project Manager to 25 mm depth immediately prior to seeding.

3.3 SEED PLACEMENT

.1 For mechanical seeding:
- .1 Use "Brillion" type mechanical landscape seeder which accurately places seed at specified depth and rate and rolls in single operation.
- .2 Use equipment and method acceptable to Project Manager.

.2 For manual seeding:
- .1 Use "Cyclone" type manually operated seeder.
- .2 Use manually operated, water ballast, landscaping type, smooth steel drum roller. Ballast as directed by Project Manager.
- .3 Use equipment and method acceptable to Project Manager.

.3 On cultivated surfaces, sow seed uniformly at rate of:
- .1 5-6 kg/ 100m^2.

.4 Blend applications 150 mm into previous applications to form uniform surfaces.

.5 Sow half of required amount of seed in one direction and remainder at right angles as applicable.

.6 Incorporate seed by light raking in cross directions.

.7 Consolidate mechanically seeded areas by rolling area if soil conditions warrant or if directed by Project Manager with equipment approved by Project Manager immediately after seeding.

3.4 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform the following operations from time of seed application until acceptance by Project Manager:
- .1 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.
- .2 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
- .3 Do not mow native grass area at any time.
- .4 Fertilize seeded areas after 10 weeks after germination provided plants have mature true leafs with 2:0:1 ratio fertilizer. Spread evenly at a rate of 0.5 kg of Nitrogen/ 100m^2. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
- .5 Control weeds by mechanical or manual means utilizing acceptable integrated pest management practices.

3.5 FINAL ACCEPTANCE

.1 Seeded areas will be accepted by Project Manager provided that:
- .1 Areas are uniformly established and native grass area is free of rutted, eroded, bare or dead spots and free of weeds.
- .2 Areas have been fertilized.

.2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.6 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period.
- .1 Water seeded area to maintain optimum soil moisture level for continued growth of grass. Control watering to prevent washouts.
- .2 Repair and reseed dead or bare spots to satisfaction of Project Manager.
- .3 Do not mow native grass area.
- .4 Control weeds by mechanical or manual means utilizing acceptable integrated pest management practices.

3.7 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

HYDRAULIC SEEDING

1 - GENERAL

1.1 RELATED WORK

.1 Section 02210 - Rough Grading.

.2 Section 02921: Topsoil and Finish Grading.

1.2 PRODUCT DATA

.1 Submit product data to Project Manager for approval.

.2 Provide product data for:
- .1 Seed.
- .2 Mulch.
- .3 Fertilizer.

.3 Submit in writing to Project Manager 7 days prior to commencing work:
- .1 Size of truck slurry tank in litres.
- .2 Amount of material to be used per tank based on size of slurry tank.
- .3 Number of tank loads required per hectare to achieve specified slurry mixture per hectare.

1.3 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.4 SCHEDULING

.1 Schedule hydraulic seeding to coincide with preparation of soil surface.

.2 Schedule hydraulic seeding after frost has left the ground and before frost enters the ground.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with local regulations.

.2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Project Manager.

.3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

2 - PRODUCTS

2.1 MATERIALS

.1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.
- .1 Grass mixture: "Certified", "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations"
  - .1 OSC: Low Maintenance Mixture or approved alternative composition:
    40% Creeping Red Fescue (*Festuca rubra*).
    20% Ecostar Hard Fescue (*Festuca longifolia*)
    20% Chewings Fescue (*Festuca rubra commutata*)
    20% Perennial Rye Grass (*Lolium perenne*).

.2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic water activated, green colouring, free of germination and growth inhibiting factors, with following properties:
- .1 Type 1 mulch:
  - .1 Made from wood cellulose fibre.
  - .2 Organic matter content: 95% plus or minus 0.5%.
  - .3 Value of pH: 6.0.
  - .4 Potential water absorption: 800-900%.

.3 Water:
- .1 Supply by Contractor at destination source.
- .2 Free of impurities that would inhibit germination and growth.

.4 Tackifier:
- .1 Water soluble vegetable carbohydrate powder.

.5 Fertilizer:
- .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
- .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.
- .3 Fertilizer containing phosphorus may only be applied subsurface prior to seeding.
- .4 Surface application of fertilizer may only be conducted using phosphorus-free fertilizers and scheduled fertilizing may only be conducted using phosphorus-free fertilizers.

.5 Inoculants: inoculant containers to be tagged with expiry date.

3 - EXECUTION

3.1 WORKMANSHIP

.1 Do not spray onto structures, signs, guiderails, fences, plant material, utilities and other than surfaces intended.

.2 Clean-up immediately, any material sprayed where not intended, to satisfaction of Project Manager.

.3 Do not perform work under adverse field conditions such as wind speeds over 20 km/h, frozen soil, excessively wet or dry or soil or soil covered with snow, ice or standing water.

.4 Protect seeded areas from trespass until plants are established.

3.2 PREPARATION OF SURFACES

.1 Verify that grades are correct and prepared in accordance with Section 02921 - Topsoil and Finish Grading. If discrepancies occur, notify Project Manager and do not commence work until instructed by Project Manager.

.2 Fine grade surface free of humps and hollows to smooth, even grade to contours and elevations indicated, to tolerance of plus or minus 10mm, for hydraulic seeded surface to drain naturally.

.3 Remove and dispose of weeds, debris, stones 50mm in diameter and larger, soil contaminated by oil, gasoline and other deleterious materials, off site.

.4 Cultivate fine grade approved by Project Manager to 25mm depth immediately prior to hydraulic seeding.

.5 Ensure areas to be seeded are moist to depth of 100mm before seeding.

3.3 FERTILIZATION

.1 Incorporate fertilizer directly into slurry mixture with a 3:0:2 ratio fertilizer. Ensure even distribution at a rate of 0.5 kg of nitrogen /100m^2.

3.4 PREPARATION

.1 Measure quantifies of materials by weight or weight - calibrated volume measurement satisfactory to Project Manager. Supply equipment required for this work.

.2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.

.3 After all materials are in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.5 SLURRY APPLICATION

.1 Hydraulic seeding equipment:
- .1 Slurry tank: minimum 1000 litres.
- .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and mechanical method.
- .3 Pumps capable of maintaining continuous non-fluctuating flow of solution.
- .4 Capable of seeding by 50 m hand operating hoses and appropriate nozzles.

.2 Slurry mixture applied:
- .1 Seed: 3 kg (OSC mix) /100m^2
- .2 Mulch: type I - 0.05 m^3 compressed /100m^2
- .3 Water: as required to fill tank
- .4 Fertilizer: 0.5 kg nitrogen /100m^2

.3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
- .1 Using correct nozzle for application.
- .2 Using hoses for surfaces difficult to reach and to control application.

.4 Blend application 300mm into adjacent grass areas or sodded areas and previous applications to form uniform surfaces.

.5 Reapply where application is not uniform.

.6 Remove slurry from items and areas not designated to be sprayed.

.7 Protect seeded areas from trespass satisfactory to Project Manager.

.8 Remove protection devises as directed by Project Manager.

3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform the following operations from time of seed application until acceptance by Project Manager:
- .1 Water seeded areas at to obtain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.
- .2 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
- .3 Mow grass to 50mm whenever it reaches a height of 75mm. Remove clippings that will smother grass.
- .4 Fertilize seeded areas ten weeks after germination provided plants have mature true leaves. with 2:0:1 ratio fertilizer. Spread evenly at a rate of 0.5 kg of nitrogen /100m^2 and water well.
- .5 Eliminate weeds by manual or mechanical means utilizing acceptable integrated pest management practices.

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3.7 ACCEPTANCE

.1 Seeded areas will be accepted by Project Manager provided that:
- .1 Seeded areas are properly established.
- .2 Seeded areas are free of rutted, eroded, bare and dead spots and free of weeds.
- .3 Seeded areas have been cut a minimum 2 times, and within 24 hours prior to acceptance.
- .4 Areas have been fertilized.

.2 Areas seeded in Fall will be accepted in the following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.8 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform the following operations from time of acceptance until end of warranty period:
- .1 Water seeded areas to maintain optimum soil moisture level to a depth of 100mm for continued growth. Control watering to prevent washouts.
- .2 Repair and reseed dead or bare spots to satisfaction of Project Manager.
- .3 Mow areas seeded and remove clippings that will smother grass to height as follows:
  - .1 50mm during normal growing conditions.
  - .2 65mm at end of growing season and during periods of high temperature and low precipitation.
  - .3 Cut grass to 50mm when it reaches a height of 75mm.
  - .4 Eliminate weeds by manual or mechanical means.

3.9 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION.

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02921 - Topsoil Placement and Grading.

1.2 SUBMITTALS

.1 Samples.
- .1 Submit samples to Project Manager.
- .2 Submit:
  - .1 Sod for each type specified.
  - .2 Install approved samples in one square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
  - .3 Obtain approval of samples by Project Manager.

1.3 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.4 SCHEDULING

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with local bylaws.

.2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Project Manager.

.3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

2 PRODUCTS

2.1 MATERIALS

.1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.

.2 Turf Grass Nursery Sod types:

- .1 Number One Kentucky Bluegrass - Fescue – Rye Sod: Nursery Sod grown solely from seed mixture of: 30% Kentucky Bluegrass cultivars, 40% Chewing Fescue or Creeping Red Fescue cultivars, and 30% Perennial Ryegrass cultivars.

.3 Turf Grass Nursery Sod quality:

- .1 Not more than 2 broadleaf weeds or 10 other weeds per 40 square metres.
- .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
- .3 Mowing height limit: 35 to 65 mm.
- .4 Soil portion of sod: 6 to 15 mm in thickness.

.4 Water:

- .1 Supplied by Contractor at designated source.
- .2 Potable, free of impurities.

.5 Fertilizer:

- .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
- .2 Complete, synthetic or organic, slow release with 65 % of nitrogen content in water-insoluble form.
- .3 Fertilizer containing phosphorus may only be applied subsurface prior to sodding.
- .4 Surface application of fertilizer may only be conducted using phosphorus-free fertilizers and scheduled fertilizing may only be conducted using phosphorus-free fertilizers.

2.2 SOURCE QUALITY CONTROL

.1 Obtain approval from Project Manager of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Project Manager.

3 EXECUTION

3.1 PREPARATION

.1 Verify that grades are correct and prepared in accordance with Section 02921 - Topsoil Placement and Grading. If discrepancies occur, notify Project Manager and do not commence work until instructed by Project Manager.

.2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

.3 Fine grade surface free of humps and hollows to smooth, even grade and elevations indicated, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod, surface to drain naturally.

.4 Remove and dispose of weeds; debris; stones 50mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

.5 Cultivate fine grade approved by Project Manager to 25mm depth immediately prior to sodding.

3.2 SOD PLACEMENT

.1 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

.2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.3 Roll sod as directed by Project Manager. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.3 SOD PLACEMENT ON SLOPES

.1 Start laying sod at bottom of slopes.

.2 Lay sod sections longitudinally, along contours of slopes.

3.4 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.

.2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100mm.

.3 Cut grass to 50mm when or prior to it reaching height of 75mm. Remove clippings which will smother grassed areas.

.4 Maintain sodded areas weed free to a minimum of 95%.

.5 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

3.5 ACCEPTANCE

.1 Turf Grass Nursery Sod areas will be accepted by Project Manager provided that:
- .1 Sodded areas are properly established.
- .2 Sod is free of bare and dead spots.
- .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50mm.
- .4 Sodded areas have been cut minimum 2 times prior to acceptance and within 24 hours prior to acceptance.

.2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.6 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:
- .1 Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.
- .2 Repair and resod dead or bare spots to satisfaction of Project Manager.
- .3 Cut grass and remove clippings that will smother grass to height as follows:
  - .1 50 mm during normal growing conditions.
  - .2 65 mm at end of growing season and during periods of high temperature and low precipitation.
- .4 Cut grass at intervals so that approximately one third of growth is removed in single cut.
- .5 Fertilize sodded areas one month after sodding with 2:0:1 ratio fertilizer. Spread evenly at a rate of 0.5kg of Nitrogen/ $100m^3$ and water well. Spread half of required amount of fertilizer in one direction and remainder at right angles.
- .6 Eliminate weeds by mechanical or manual means to extent acceptable to Project Manager.

3.7 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION.

1 GENERAL

1.1 SUMMARY

.1 Section Includes:
  .1 Materials and installation for plant material, accessories, mulch, planting, tree support, mulching and maintenance.

.2 Related Section:
  .1 Section 02921 – Topsoil for Planting

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada (AAFC).
  .1 Plant Hardiness Zones in Canada-2000.

.2 Canadian Nursery Landscape Association (CNLA).
  .1 Canadian Standards for Nursery Stock, 8th Edition.

.3 City of Thunder Bay Engineering Tree Planting Details (in effect at time of planting)

1.3 DEFINITIONS

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis enhances plant establishment in newly landscaped and imported soils. For this project, the MYKE Pro Landscape product from Premier Tech Biotechnologies or an equivalent approved by the Canadian Food Inspection Agency (CFIA) must be used. Note that this product has an expiration date and an application chart which must be respected.
.2 Healthy Trees: structurally sound with structure and habit typical of the species; well furnished with living foliage; have normal colour; show adequate annual growth and formation of buds; and free from blight of any description. Refer to Item 1.10 Healthy Tree Acceptance Criteria in the Standards Section.
.3 Project Manager: Project Manager or designate.

1.4 SUBMITTALS

.1 Make submittals as required.
  .1 Submit proof of Landscape Ontario Certified Landscape Technician (CIT) Softscape Installation, ISA Certified Arborist or documented 10 years in urban tree planting experience.
  .2 For Parks & Open Spaces Section planting projects submit proof of Utility Locates completion by completing the Utilities Locate Summary Sheet found in the Appendix C. An electronic version can be found on the Parks & Open Spaces Section web page.
  .3 For Subdivision planting projects complete and submit As-Planted Tree List Sheet found in Appendix D upon planting completion. An electronic version can be found on the Parks & Open Spaces Section web page. Parks & Open Spaces Section will not conduct final acceptance inspection until the As-Planted Tree List has been submitted.

.2 Submit product data for:
- .1 Documentation of name and location of nursery grower of plant material.
- .2 Documentation of genetic origin and hardiness of rootstock from the grower.
- .3 Documentation of full Botanical Name (by location in subdivision development)
- .4 Fertilizer.
- .5 Mycorrhiza: Proof of purchase is required to show that the appropriate quantity of product was obtained. The quantity required is established from the application chart and depends on the number and sizes of plants. Expiry date of product is also to be submitted and verified.
- .6 Guying assembly including stakes and jute.
- .7 Mulch.
- .8 Root Barrier.
- .9 Water Bag
- .10 Rodent Guard

1.5 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Conduct construction occupational health and safety in accordance with City of Thunder Bay Health and Safety Policies and Procedures.

.2 Tree Selection at Source
- .1 It is recommended that the services of an ISA Certified Arborist be used to verify plant material at source nursery compliant with specifications as detailed in 1.10 Healthy Tree Acceptance Criteria in the Parks & Open Spaces Section Standards Document.
- .2 Receive approval from City Parks & Open Spaces Section prior to shipment of plant material from source nursery.
- .3 If prior approval has not been obtained and plant material is not compliant with specifications detailed in 1.10 Healthy Tree Acceptance Criteria, the City Forester may require contractor to return unacceptable plant material to source nursery at contractor expense.

.3 Planting Installation Demonstration (mock-up):
- .1 Conduct a full tree planting installation in conformance with the Parks & Open Spaces Section Standards and Specifications in the presence of the Parks Manager or designate prior to the planting of any other trees.

1.6 STORAGE, PROTECTION AND TRANSPORTATION

.1 Store mycorrhizae product in an area to prevent freezing and intense heat.

.2 Protect plant material from frost and drying due to excessive heat, wind and sun during delivery.

.3 Immediately store and protect plant material which will not be installed within 1 hour after arrival at site in storage location approved by Project Manager. All trees that cannot be planted immediately upon arrival on the site shall be well

protected to prevent drying out and shall be kept moist until commencement of planting.

.4 Protect stored plant material from frost, wind and sun and as follows:
- .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sawdust or topsoil and watering to full depth of root zone.
- .2 For pots and containers, maintain moisture level in containers.
- .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Heel-in root balls using appropriate material, such as, but limited to, sawdust, soil or organic wood mulch to maintain moisture level in root zones.

.5 Protect plant material from damage during transportation:
- .1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
- .2 When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
- .3 Protect foliage and root balls using tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .4 Trees shall be transported with care taken to prevent tissue damage. Trees with damaged, broken or abraded trunks or branches, however caused, are not acceptable and will be rejected. No exceptions will be made in this respect.
  - .1 Branches shall be carefully tied in such a manner so as not to break or damage trunks.
  - .2 Points of contact with equipment shall be padded.
  - .3 Root balls are to be fully supported when tree is lifted during loading and unloading.

.6 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with local regulations.
- .2 Forward empty bags of the MYKE Pro Landscape to the Project Manager. Make sure that the lot number and the expiration date are readable.
- .3 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .4 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling.
- .5 Separate for reuse and recycling and place in designated containers Steel, Metal, and Plastic waste.
- .6 Place materials defined as hazardous or toxic in designated containers.
- .7 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.
- .8 Divert unused metal materials from landfill to metal recycling facility as approved by Project Manager.
- .9 Fold up metal and plastic banding, flatten and place in designated area for recycling.
- .10 Divert discarded plastic plant containers materials from landfill to plastic recycling facility approved by Project Manager.
- .11 Dispose of unused fertilizer at official hazardous material collection site approved by Project Manager.

.12 Divert unused wood and mulch materials from landfill to composting facility approved by Project Manager.

1.7 SCHEDULING

.1 Obtain approval from Project Manager of schedule14 days in advance of shipment of plant material.

.2 Schedule to include:
- .1 Quantity and type of plant material.
- .2 Shipping dates.
- .3 Arrival dates on site.
- .4 Planting dates, including installation demonstration (mock-up).

1.8 WARRANTY

.1 The Contractor hereby warrants that plant material as itemized on plant list will remain free of defects in accordance with General Conditions (GC) - CCDC GC 12.3, for **two full years** after initial acceptance and is to include the specified maintenance program.

.2 End-of-warranty inspection will be conducted by Project Manager.

.3 Project Manager reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

2 PRODUCTS

2.1 PLANT MATERIAL

.1 Type of root preparation, sizing, grading and quality: comply with Canadian Standards for Nursery Stock.
- .1 Source of plant material: grown in location no greater than Zone 4 in accordance with Plant Hardiness Zones in Canada.
- .2 Plant material must be planted in zone indicated as appropriate for its species and be proven hardy for Zones 3A or 3B.
- .3 Plant material planted in a location appropriate for its species.

.2 Plant material: free of disease, insects, rodent damage, sun scald, frost cracks and other abrasions or scars to the bark. Will be structurally sound with strong fibrous undamaged root system. All parts of the trees shall be moist and show live, green cambium tissue when cut.

.3 Plant material: root pruned regularly, but not later than one growing season prior to arrival on site.

.4 Trees: shall be nursery grown and of species and sizes indicated on the drawings(s), except that plants larger than specified may be used if approved by the Project Manager. Tree quality and referent measurements shall be in accordance with the Canadian Standards for Nursery Stock, 8th Edition. It is recommended that trees be verified at source nursery in writing by an ISA Certified Arborist that Specifications are met as outlined in Standards Section 1.10 Healthy Tree Acceptance Criteria in the Parks & Open Spaces Section Standards Document.

.5 Balled and burlap stock: all burlap and twine used shall be non-treated and 100% biodegradable.

.6 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or potted.

.7 Collected stock: maximum 40 mm in caliper, with well-developed crowns and characteristically branched; no more than 40% of overall height may be free of branches. The use of collected stock will not be permitted unless approved by the Project Manager.

.8 Specifications for deciduous trees: Relationship between caliper (measured 150 mm above ground level, or 300mm above ground level if the caliper is over 100mm), overall height (not exceeding the upper limit of the range), branching height, minimum number of branches in head and minimum root spread.

Caliper	Acceptable range of overall Height	Minimum Branching Height	Min. No. of Branches	Minimum Root Spread	Stock Type
60mm	2500 - 3500 mm	1500 mm	12	700 mm	Balled & Burlapped, Wire Basket
75mm	2500 - 3500 mm	1500 mm	14	800 mm	Balled & Burlapped Wire Basket

Note: Caliper shall be considered minimum measurements.

.9 Substitutions – All materials shall be supplied as specified, unless the Manager approves substitutions in writing.

2.2 WATER

.1 Free of impurities that would inhibit plant growth.

2.3 STAKES

.1 Wood, pointed one end, 38 x 38 x 2300 mm.

2.4 GUYING COLLAR

.1 75mm wide Jute affixed to stake with 12mm long steel staples.

2.5 MULCH

.1 Shredded wood: varying in size from 25 to 125 mm in length, from coniferous trees or approved equal.

2.6 FERTILIZER

.1 In quantities and ratio as required by soil testing.

.2 Fertilizer containing phosphorus may only be applied subsurface.

.3 Surface application of fertilizer may only be conducted using phosphorus-free fertilizers and scheduled fertilizing may only be conducted using phosphorus-free fertilizers.

2.7 MYCORRHIZA

.1 Powdered form soil additive.
.2 Myke Pro Landscape or approved equal. PremierTech Biotechnologies (800) 606-6926
.3 Application rates as specified by the manufacturer shall be adhered to.

2.8 ROOT BARRIER

.1 450mm & 600mm Root Barrier (i.e. Deep Root U18 & 24, or approved equal).
.2 Constructed of HDPE
.3 To include: 90 degree vertical ribs, ground stabilizing pads and flat double top edge with walking surface.

2.9 WATER BAG

.1 For deciduous trees: 75 litre (20 gal.) capacity slow release water bag (i.e. Treegator Original by Spectrum Products Inc., or approved equal).
.2 For coniferous trees: 56 litre (15 gal.) capacity slow release water bag (i.e. Treegator Jr. Pro by Spectrum Products Inc., or approved equal).

2.10 RODENT GUARD

.1 230mm tall expandable polyethylene with venting holes (i.e. ArborGard Tree Shield by DeepRoot, or approved equal).

2.11 SOURCE QUALITY CONTROL

.1 Approval of plant material shall be obtained from Project Manager prior to planting.

.2 The origin of root stock or seed source may be requested.

.3 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

.4 All trees to retain original nursery tags indicating full botanical name until acceptance inspection.

3 EXECUTION

Trees must be planted under the direct supervision of an individual or professional Landscape Contractor, with Landscape Ontario Certified Landscape Technician (CLT) Designation in Softscape Installation, International Society of Arboriculture (ISA) Arborist or a minimum of 10 years demonstrated tree planting experience in urban tree planting. The Developer/Contractor shall submit the names of the Landscape Contractor and/ or planting supervisor to the Project Manager for approval prior to planting.

It will be the responsibility of the Developer/Contractor to retain a competent, and if required, a licensed Landscape Architect (OALA) or Landscape Ontario Certified Landscape Designer (CLD) to ensure that the current City specifications associated with these guidelines are verified and adhered to in every detail.

3.1 TIME OF PLANTING

.1 For Subdivision Tree Planting: Boulevard tree planting shall not commence until the lot is improved, all underground structures have been installed and the boulevard is finish graded.
.2 Trees shall not be planted when the ground is in frozen condition or during periods of extreme heat.
.3 The City reserves the right to refuse acceptance of any or all trees failing to meet the above timing restrictions.

3.2 PRE-PLANTING PREPARATION

.1 Conduct construction occupational health and safety in accordance with City of Thunder Bay Health and Safety Policies and Procedures.

.2 Ensure all Utility locates are completed and valid, as well as visibly marked on the ground at the time of planting. Copies of all Utility Locate sheets must be at the planting site at all times and have been submitted to the Parks & Open Spaces Section prior to planting for verification.

.3 Ensure plant material acceptable to Project Manager.

.4 Prune damaged roots and branches from plant material. Only remove minimum amount necessary. Pruning shall be done according to accepted horticultural standards and in such a manner as to preserve the natural character of the plants. Leaders shall not be removed. Only clean, sharp tools shall be used. All cuts shall be clean. Branches will be cut at the branch collar, leaving no stubs.

.5 Conduct a full tree planting installation demonstration (mock-up) in conformance with the Parks & Open Spaces Section Guidelines and Specifications in the presence of the Parks Manager or designate prior to the planting of any other trees.

.6 Refer to relevant Engineering Planting Detail(s):
- .1 M-104-1 Deciduous Tree Bare Root Detail
- .2 M-104-2 Coniferous Tree Planting Detail
- .3 M-104-3 Deciduous Tree Planting Detail
- .4 M-104-6 Shrub Planting Detail
- .5 M-104-7 Root Barrier Detail

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 For individual planting holes:
- .1 Stake out location and obtain approval from Project Manager prior to excavating. Soil volume and utility spacing requirements are to be adhered to.
- .2 Excavate to depth and width as indicated. Also, refer to 3.3.3.
- .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
- .4 Scarify sides of planting hole.
- .5 Remove water which enters excavations prior to planting. Notify Project Manager if water source is ground water.

3.4 INSTALLATION OF ROOT BARRIER

.1 The vertical root deflecting ribs shall be facing inwards.

.2 Root Barrier to be installed vertically and panels securely connected.

.3 Location and number of panels as per approved layout drawing.

.4 Install as per manufacturers specifications and use 600mm barrier adjacent to concrete curbs and 450mm barrier adjacent to driveways or concrete sidewalks.

3.5 PLANTING

.1 Trees shall be lifted by the root ball and **not** by the trunk when being moved or set into the planting hole.

.2 Root systems of balled specimens shall be handled with sufficient care so that root balls shall not be broken. Broken balls or balls consisting of loose soil will not be accepted and shall be replaced.

.3 Whenever necessary, remove soil from the top of the root ball to uncover the root collar, which is the point of attachment of root to trunk and coincides with the area of root flare. Depth of planting hole shall be determined based on location of the root collar according to the following criteria:
- .1 In moist, well-drained soils, set the root ball so that the root collar is exactly at finished grade.
- .2 In poorly drained and/or compacted soils, set the root ball so that the root collar is 75-100 mm above the finished grade.
- .3 In very sandy or droughty soils, set the root ball so that the root collar is slight deeper than finished grade.

.4 For bare root stock, place 50 mm backfill soil in bottom of hole. Plant trees and shrubs with roots placed straight out in hole.

.5 For trees that are balled and burlapped or have wire baskets, once the root ball has been set in its final position, cut away and remove the top one half of burlap wrapping, twine and wire basket. Do not pull burlap, rope or wire basket from under root ball.

.6 For container stock, remove entire container without damaging root ball.

.7 Plant stem of tree vertically in locations as indicated.

.8 Orient plant material to both give best appearance and minimize conflicts in relation to structure, roads and walks. Where possible orient plant material so that the main branching direction is parallel to roadways and sidewalks.

.9 Add mycorrhiza around root ball prior to backfilling as per manufacture's recommended application rate.

.10 For trees and shrubs:
- .1 Backfill soil in 150 mm lifts with a mixture of 60% native soil and 40% approved topsoil. Tamp each lift to eliminate air pockets. When two thirds of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.
- .2 Form a soil saucer around tree base as indicated.

.10 Water plant material thoroughly and in such a way as to prevent surface erosion.

.11 After soil settlement has occurred, fill with soil to finish grade.

.12 Remove all twine, flagging tape, and wrap from branches and stem of trees.

.13 Dispose of burlap, wire and container material off site.

3.6 TREE SUPPORTS

.1 Install tree supports as indicated on the relevant Engineering Planting Detail, ensuring that branches are not broken.

3.7 MULCHING

.1 Ensure soil settlement has been corrected prior to mulching.

.2 Spread mulch as indicated on the Engineering Planting Detail.

3.8 WATER BAG & RODENT GUARD

.1 Install rodent guard against base of trunk as per manufactures instructions and ensuring bottom of guard is set firmly into mulch surface.

.2 Install water bag as per manufactures instructions

3.9 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform the following required maintenance operations from time of planting to acceptance by Project Manager.

- .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion. Water bags are to be kept in good repair and filled a minimum of one time per week from May 1st to June 30th and September 1st to October 31st. Water bags are to be filled a minimum of two times per week from July 1st to August 31st.For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
- .2 Remove weeds as required.
- .3 Replace or respread damaged, missing or disturbed mulch.
- .4 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Project Manager prior to application.
- .5 Remove dead or broken branches from plant material. Pruning shall be done in such a manner as to preserve the natural character of the plants and according to accepted horticultural standards. Leaders shall not be removed. Only clean, sharp tools shall be used. All cuts shall be clean and at the branch collar, leaving no stubs.
- .6 Keep tree support in proper repair and adjustment.
- .7 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.10 ACCEPTANCE

.1 Plant material will be accepted by Project Manager 60 days after planting operation is completed providing that plant material exhibited healthy growing condition and is free from disease, insects and fungal organisms.

.2 Plant material installed less than 60 days prior to frost will be accepted in the following spring, 30 days after start of growing season provided that acceptance conditions are fulfilled.

3.11 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Project Manager to end of warranty period, perform the following required maintenance operations.

- .1 Water to maintain soil moisture conditions to a depth of 300 mm min. for optimum growth and health of plant material without causing erosion.
- .2 Water bags are to be kept in good repair and filled a minimum of one time per week from May 1st to June 30th and September 1st to October 31st. Water bags are to be filled a minimum of two times per week from July 1st to August 31st.
- .3 Reform damaged soil saucers.
- .4 Remove weeds as required.
- .5 Replace or respread damaged, missing or disturbed mulch. Ensure mulch depth at end of warranty period is 75mm.
- .6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Project Manager prior to application.
- .7 Apply fertilizer in early spring as indicated by soil test.
- .8 Remove dead, broken or hazardous branches from plant material.
- .9 Keep tree supports in proper repair and adjustment.
- .10 Remove tree supports and remaining species labels and level soil saucers at end of warranty period.
- .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
- .12 Conduct a structural prune as required by a Certified Arborist to the satisfaction of the City Forester at the end of the warranty period.
- .13 Submit monthly written reports to Project Manager identifying:
  - .1. Maintenance work carried out.
  - .2. Development and condition of plant material.
  - .3. Preventative or corrective measures required which are outside Contractor's responsibility.

END OF SECTION

Section 5 APPENDICES

A. City of Thunder Bay Parks & Open Spaces Section Tree Planting Checklist
B. City of Thunder Bay Parks & Open Spaces Section Soil Test Reporting Sheet
C. City of Thunder Bay Parks & Open Spaces Section Utility Locates Summary Sheet
D. City of Thunder Bay Parks & Open Spaces Section As-Planted Tree List Sheet
E. City of Thunder Bay Engineering Standards Detail Drawings
    1. Engineering Standard Drawing M-104-1 Deciduous Tree Bare Root Planting
    2. Engineering Standard Drawing M-104-2 Coniferous Tree Planting
    3. Engineering Standard Drawing M-104-3 Deciduous Tree Planting
    4. Engineering Standard Drawing M-104-4 Tree Protection Barriers
    5. Engineering Standard Drawing M-104-4.1 Tree Root Protection
    6. Engineering Standard Drawing M-104-6 Shrub Planting
    7. Engineering Standard Drawing M-104-7 Root Barrier Detail

Appendix A: City of Thunder Bay Parks & Open Spaces Tree Planting Checklist

Checklist used with Parks & Open Spaces Standards and Specifications, 2016 Edition.
Answers should be '**Yes**' to all questions unless not required.

#1 Approval of Tree Location				
Item	**Yes**	**No**	**Not Required**	**Comments**
a) Subdivision Plant is required or planting plan approved by Parks	☐	☐	☐	
b) Utilities located	☐	☐	☐	
c) Tree locations and extent of root barriers marked and staked for approval	☐	☐	☐	
Approval of Tree Location	Signature:_____ Date:_____			
#2 Approval of Tree Soil Volume and Quality				
Criteria	**Yes**	**No**	**Not Required**	**Comments**
a) Minimum soil volume provided, 15m^3 (all locations other than within municipal parks) inspected prior to backfill	☐	☐	☐	
b) Minimum soil volume provided, 30m^3 (within municipal parks) inspected prior to backfill	☐	☐	☐	
c) Topsoil test submitted	☐	☐	☐	
d) Topsoil test result conforms to specifications, if not amendment plan in place	☐	☐	☐	
e) Myke soil additive used and empty bags submitted for verification	☐	☐	☐	
f) Root barrier sample provided and approved. Installation prior to soil backfill	☐	☐	☐	
Approval of Tree Soil Volume and Quality	Signature:_____ Date:_____			

#3 Approval of Tree Stock and Planting				
Criteria	**Yes**	**No**	**Not Required**	**Comments**
a) Plant material approved prior to planting by City Forester	☐	☐	☐	
b) Plant material provided with original nursery tags	☐	☐	☐	
c) Minimum 14 days notification given prior to planting	☐	☐	☐	
d) Notify City Forester for inspection upon completion of planting	☐	☐	☐	
e) Verification of new planted tree information delivered to each adjacent house owner after planting	☐	☐	☐	
f) Acceptance Inspection done 60 days after completion or 30 days after start of growing season if planted in fall	☐	☐	☐	
Approval of Tree Stock and Planting	Signature:_____ Date:_____			
#4 Warranty Period				
Items	**Yes**	**No**	**Not Required**	**Comments**
a) Plant material maintained during warranty period as per specifications	☐	☐	☐	
b) Unhealthy trees replaced as per specifications	☐	☐	☐	
c) End of Warranty inspection conducted and letter of acceptance provided	☐	☐	☐	
Approval of Warranty Period	Signature:_____ Date:_____			

Appendix B: City of Thunder Bay Parks & Open Spaces Section Soil Test Reporting Sheet

Firm /Contractor: **Project:** **Date of sample taken:**
Job #: **Date of Lab Test:**
Phone:
E-mail: **Project Address:** **Testing Lab:**

Soil Analysis Results:

Required	Soil Texture	Sand %	Silt %	Clay %	pH	Organic Matter %	Bioavail. Nitrogen mg/kg	Bioavail. Phosphorus mg/kg	Bioavail. Potassium mg/kg	Bioavail. Magnesium mg/kg	Bioavail. Sodium mg/kg	Bioavail. Calcium mg/kg	CEC cmol/kg	Salts mS/cm
Analysis														
Guidelines	Loam	40-50	30-40	15-25	6.5-8.0	5-10	20-40	40-50	75-110	100 - 250	< 200	1000 - 4000	> 9	< 2.0
Acceptable Y/N														

Optional	Aluminum mg/kg	Boron mg/kg	Calcium mg/kg	Copper mg/kg	Iron mg/kg	Potassium mg/kg	Magnesium mg/kg	Manganese mg/kg	Sodium mg/kg	Phosphorus mg/kg	Sulfur mg/kg	Zinc mg/kg
Analysis												

Amendment Recommendations:

Nutrients

N		g N /1000 kg soil
P_2O_5		g P_2O_5 /1000 kg soil
K_2O		g K_2O /1000 kg soil
$MgS0_4$		g $MgSO_4$ /1000 kg soil
Ca		g Ca /1000 kg soil
CEC		
Salts		

Comments

pH

Ground limestone		g /m2
other		g/m2

Texture

Add the following:

sand		kg sand/ 100 kg soil
silt		kg silt / 100 kg soil
clay		kg clay / 100 kg soil
organic matter		kg OM/ 100 kg soil

Appendix C: City of Thunder Bay Parks & Open Spaces Section Utility Locates Summary Sheet

Date: ______________________________ **Project:** ______________________________

Contractor: ______________________________ **Job #:** ______________________________

Tree #	**House #**	**Street Name**	**Planting Location** (side/front/ back)	**On1Call Confirmation** #	**S&W** (clear/ (marked)	**TBTel** (clear/ marked)	**Bell** (clear/ marked)	**Hydro** (clear/ marked)	**Shaw** (clear/ marked)	**Telus** (clear/ marked)	**Gas** (clear/ marked)	**Trans Cda Pipeline** (clear/ marked)	**Other** (clear/ marked)	**Status** (complete/ incomplete)	Comments

Appendix D: City of Thunder Bay Parks & Open Spaces Section As-Planted Tree List

Planting Contractor: _____

Start Date of Plant: _____ End Date of Plant: _____

Notes Regarding Variables:

1. Location of Planting: Front - F; Side - S; Back - B; Centre Median - M
2. Common name is composed of Genus + Species + Cultivar (if applicable); eg for Unity sugar maple, the Genus is maple, the Species is sugar and the Cultivar is Unity
3. Botanical Name is composed of Genus + Species + Cultivar (if applicable); eg for *Acer saccharum* 'Unity', the Genus is *Acer*, the Species is *saccharinum* and the Cultivar is 'Unity'
4. Size refers to: caliper (mm) for deciduous trees, height (cm) for coniferous trees, or size (#) of the container for potted trees: eg. 60 mm caliper for a deciduous tree, 150 cm for a coniferous tree or #10 container for a potted tree

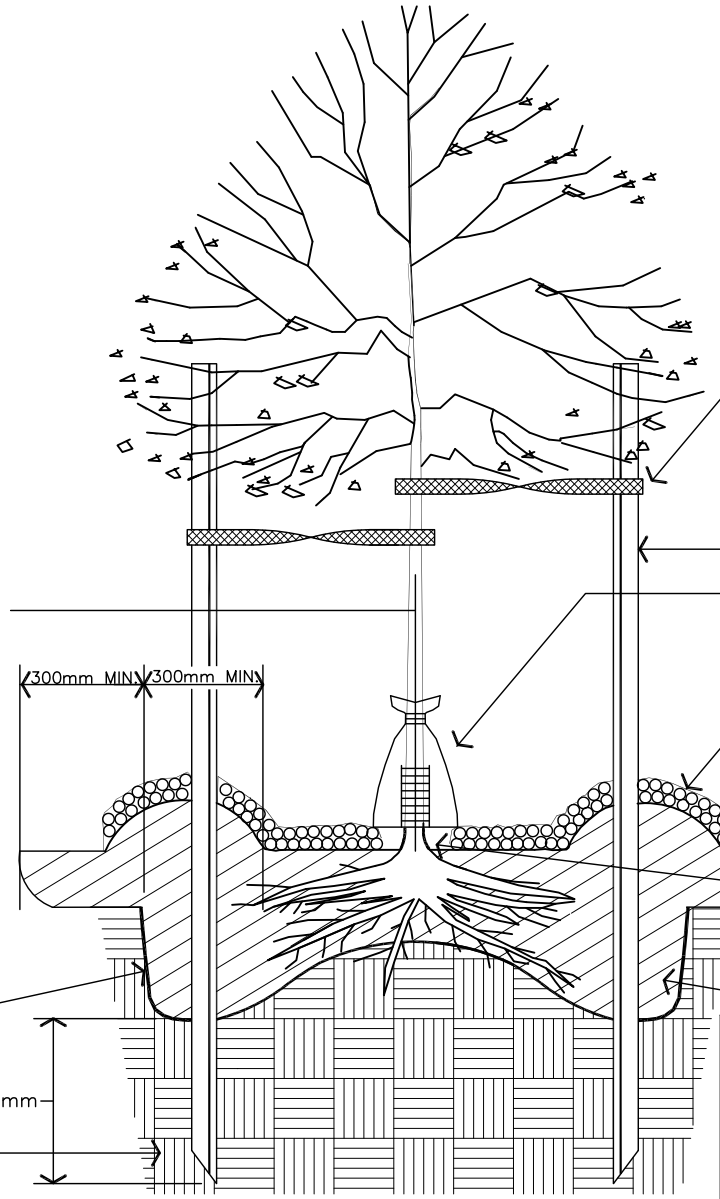
Address		Loc: F,	Common Name			Botanical Name			Size	Nursery	Planting
#	Street	S,B,M	Genus	Species	Cultivar	Genus	Species	Cultivar		of Origin	Date

Appendix E: City of Thunder Bay Engineering Standard Detail Drawings

* THIS DETAIL IS TO BE READ IN CONJUNCTION WITH THE LATEST EDITION OF THE CITY OF THUNDER BAY PARKS & OPEN SPACES SECTION SPECIFICATIONS

NOTES:

- Caliper is measured at 150 mm from soil grade level.
- Prune at planting to carefully remove dead, broken, damaged and interfering branches, double leaders and narrow angle branch unions. Thin head when and where applicable.
- Confirm underground utilities before commencing any excavation.
- Actual hole to be 300 mm wider than around the perimeter of the rootball min.
- Wooden stakes MUST be installed prior to back–filling hole. Hammer stakes into solid footing.
- Spread out roots in hole. Excessively long, broken or frayed roots should be cut cleanly with secateurs. DO NOT curl or jack knife roots in the planting hole.
- In most soils, the tree shall be placed so that the root collar (point of attachment of root to trunk) is exactly at grade. The root collar will coincide with the area of root flare.
- In poorly drained and/or compacted soils, tree shall be placed so that the root collar is 75 – 100 mm above the finished grade. Care should be taken to avoid excessive settlement of roots following planting.
- Remove all labels, twine, flagging tape and wrap from tree.
- All dimensions in millimetres minimum and maximum. Allowances are given.
- All trees to be planted in a min. of 15 m^3 of approved soil. This can be comprised of resident soil, imported soil or a combination of both providing all soils meet topsoil specifications as outlined in section 02921.



75 mm JUTE TIES SECURED AROUND TREE TRUNK. ADJUST JUTE UNTIL DRAWN TIGHT AND STAPLE TO STAKES.

2 (38x38x2300mm) WOOD STAKES SECURED INTO SOLID GROUND AND PLACED ON NORTH & SOUTH ASPECTS OF THE TREE WHENEVER POSSIBLE – MIN. 2000 mm LONG. SET TREE STAKES JUST INSIDE TREE PIT AS SHOWN.

RODENT GUARD AND WATERBAG.

CONSTRUCT 100 mm SOIL SAUCER AROUND TREE BASE & COVER WITH 75 mm APPROVED SHREDDED MULCH. KEEP MULCH 150 mm AWAY FROM TREE TRUNK

FINISHED GRADE

IDENTIFY & EXPOSE ROOT FLARE AT GRADE

APPROVED SOIL TO BE TAMPED AND SETTLED WITH WATER BY PROBING WITH HOSE–END TO ELIMINATE AIR POCKETS.

SCARIFY, IRRIGATE AND FERTILIZE THE INSIDE OF THE TREE PIT PRIOR TO PLANTING

COMPACTED SUBGRADE BOTTOM OF ROOT SYSTEM TO SIT ON UNDISTURBED SUBGRADE

NOTE: CARE SHOULD BE TAKEN TO AVOID EXCESSIVE SETTLEMENT OF ROOTS FOLLOWING PLANTING.

CITY OF Thunder Bay Superior by Nature

ENGINEERING STANDARDS

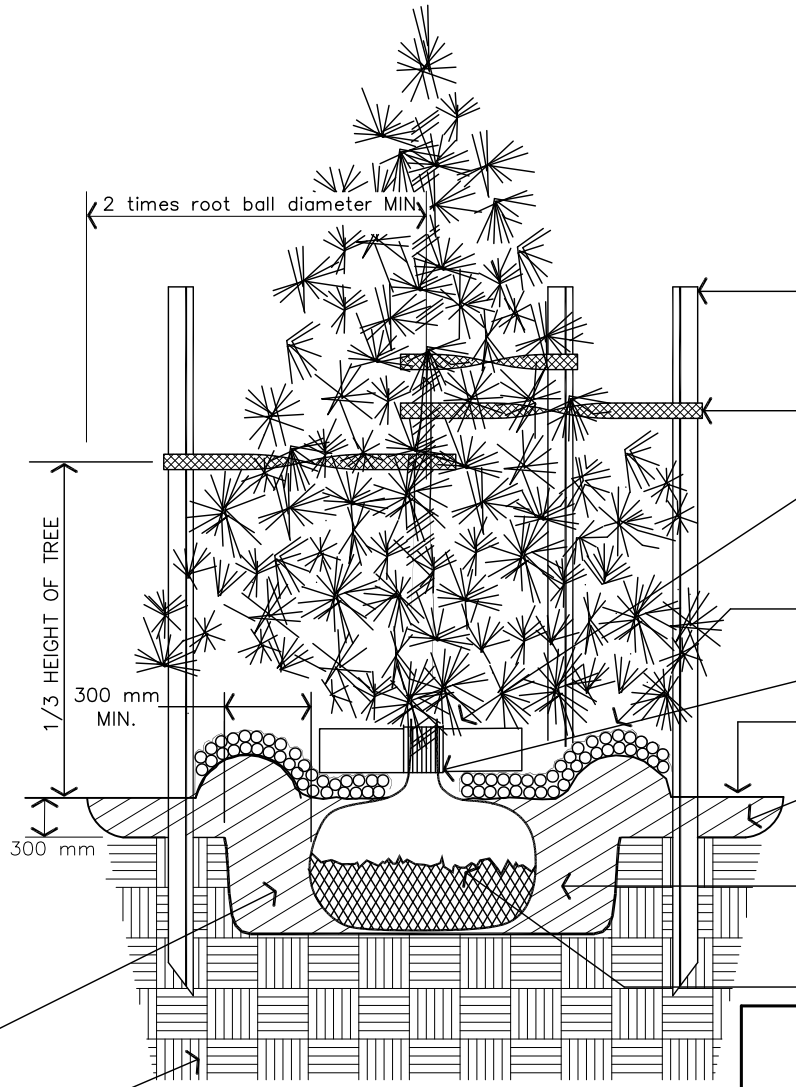
TITLE: DECIDUOUS TREE BARE ROOT PLANTING DETAIL
TYPICAL INSTALLATION FOR 45 mm CALIPER TREES OR LESS
THIS TREE DOES NOT REPRESENT ANY PARTICULAR SPECIES

DWN.	DATE	
M.D.	FEB./02	MANAGER, ENGINEERING DIVISION
REVISED: DEC. 2013		DWG. NO.
SCALE: N. T. S.		M–104–1
Z:\ENG\Standard Drawings\Std Dwgs\M–104–1.dwg		

* THIS DETAIL IS TO BE READ IN CONJUNCTION WITH THE LATEST EDITION OF THE CITY OF THUNDER BAY PARKS & OPEN SPACES SECTION SPECIFICATIONS

NOTES:

- Tree shall be measured to height of previous years growth.
- Pruning at planting shall be limited to the removal of dead or broken branches and double leaders. Maintain original shape of tree, do not prune, cut or damage a healthy double leader branch.
- Confirm underground utilities before commencing any excavation.
- Actual hole to be 300 mm wider than around the perimeter of the rootball min.
- Whenever necessary, remove soil from top of rootball to uncover the root collar (point of attachment of root to trunk). The root collar will coincide with the area of root flare.
- In most soils, the rootball shall be set so that the root collar is exactly at grade.
- In poorly drained and/or compacted soils, the rootball shall be set so that the root collar is 75 – 100 mm above the finished grade. This helps to provide sufficient aeration to fibrous roots in the top of the ball by ensuring gravitational drainage of water.
- Remove all labels, twine, flagging tape and wrap from tree.
- All dimensions in millimetres minimum and maximum. Allowances are given.
- All trees to be planted in a min. of 15 m^3 of approved soil. This can be comprised of resident soil, imported soil or a combination of both providing all soils meet topsoil specifications as outlined in section 02921.



3 (38x38x2300 mm) WOOD STAKES SECURED INTO SOLID GROUND AND EVENLY SPACED AROUND TREE – MIN. 2000 mm LONG. SET TREE STAKES JUST INSIDE EDGE OF BRANCHES AS SHOWN.

75 mm JUTE TIES SECURED AROUND TREE TRUNK. ADJUST JUTE UNTIL DRAWN TIGHT AND STAPLE TO STAKES.

RODENT GUARD AND CIRCULAR WATERBAG.

CONSTRUCT 100 mm SOIL SAUCER AROUND TREE BASE AND COVER WITH 75 mm APPROVED SHREDDED WOOD MULCH. KEEP MULCH 150 mm AWAY FROM TREE TRUNK

IDENTIFY & EXPOSE ROOT FLARE AT GRADE

FINISHED GRADE

LOOSEN SOIL – 300mm DEEP IN AN AREA 4 TIMES DIAMETER OF A ROOT BALL

APPROVED SOIL TO BE TAMPED AND SETTLED WITH WATER BY PROBING WITH HOSE–END TO ELIMINATE AIR POCKETS

CUT AND REMOVE TOP 1/2 OF BURLAP & WIRE BASKET INCLUDING ALL TIE ROPE

SCARIFY, IRRIGATE AND FERTILIZE THE INSIDE OF THE TREE PIT PRIOR TO PLANTING

COMPACTED SUBGRADE
BOTTOM OF ROOT BALL TO SIT ON UNDISTURBED SUBGRADE

CITY OF Thunder Bay Superior by Nature

ENGINEERING STANDARDS

TITLE
CONIFEROUS TREE PLANTING DETAIL
TYPICAL INSTALLATION FOR 2000 mm HEIGHT TREES OR LESS
THIS TREE DOES NOT REPRESENT ANY PARTICULAR SPECIES

DWN.	DATE
M.D.	JAN./02

REVISED: DEC. 2013

SCALE N. T. S.

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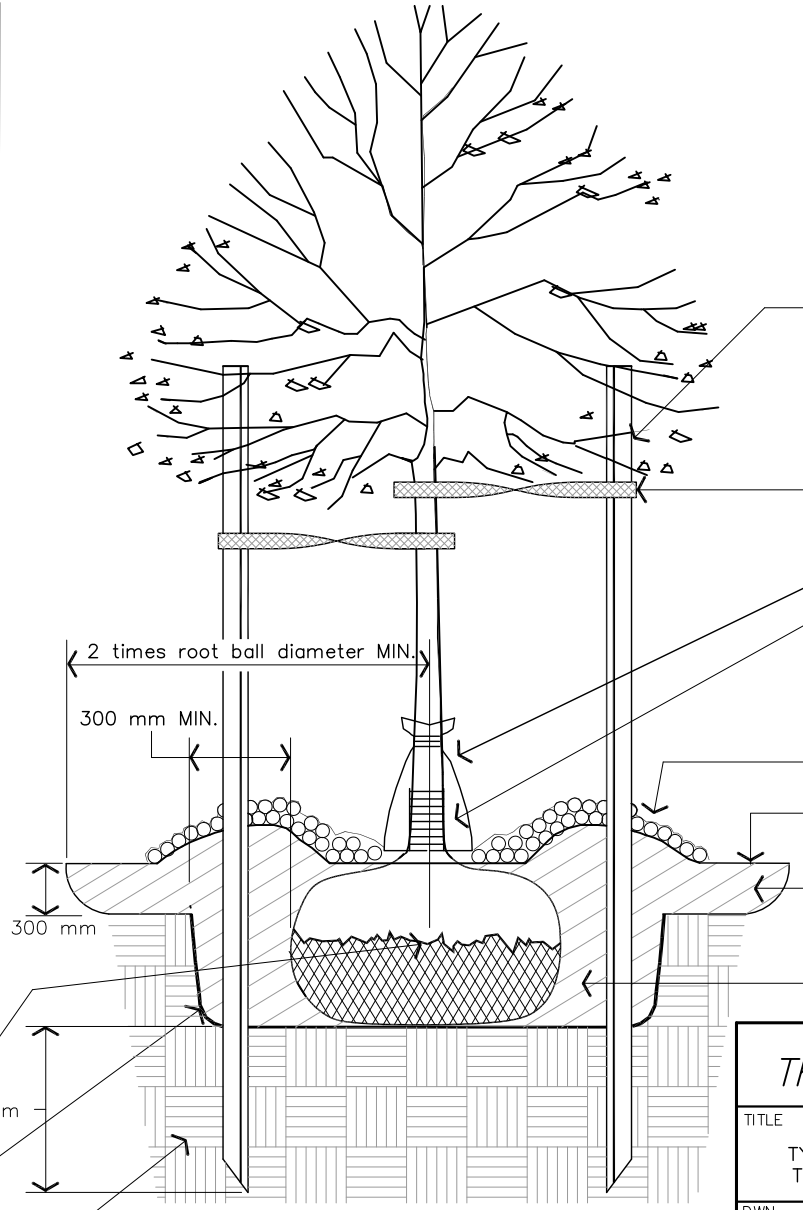
MANAGER, ENGINEERING DIVISION

DWG. NO.
M–104–2

* THIS DETAIL IS TO BE READ IN CONJUNCTION WITH THE LATEST EDITION OF THE CITY OF THUNDER BAY PARKS & OPEN SPACES SECTION SPECIFICATIONS

NOTES:

- Caliper is measured at 150 mm from soil grade level.
- Prune at planting to carefully remove dead, broken, damaged and interfering branches, double leaders and narrow angle branch unions. Thin head when and where applicable.
- Confirm underground utilities before commencing any excavation.
- Actual hole to be 300 mm wider than around the perimeter of the rootball min.
- Whenever necessary, remove soil from top of rootball to uncover the root collar (point of attachment of root to trunk). The root collar will coincide with the area of root flare.
- In most soils, the rootball shall be set so that the root collar is exactly at grade.
- In poorly drained and/or compacted soils, the rootball shall be set so that the root collar is 75 – 100 mm above the finished grade. This helps to provide sufficient aeration to fibrous roots in the top of the ball by ensuring gravitational drainage of water.
- Remove all labels, twine flagging tape and wrap from tree.
- All dimensions in minimum and maximum. Allowances are given.
- All trees to be planted in a min. of 15 m^3 of approved soil. This can be comprised of resident soil, imported soil or a combination of both providing all soils meet topsoil specifications as outlined in section 02921.



CITY OF Thunder Bay — Superior by Nature

ENGINEERING STANDARDS

TITLE: DECIDUOUS TREE PLANTING DETAIL

TYPICAL INSTALLATION FOR 75 mm CALIPER TREES OR LESS
THIS TREE DOES NOT REPRESENT ANY PARTICULAR SPECIES

DWN.	DATE	
M.D.	FEB./02	MANAGER, ENGINEERING DIVISION
REVISED: DEC. 2013		DWG. NO. M–104–3
SCALE: N. T. S.		
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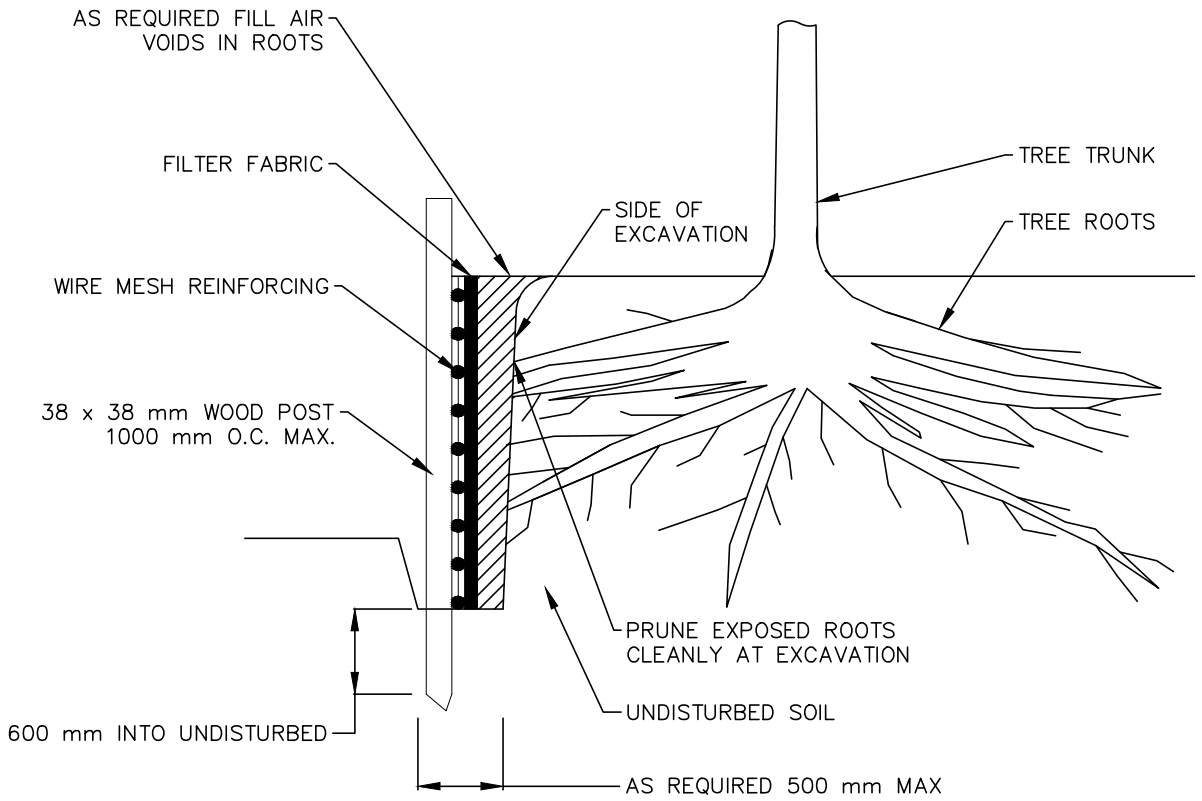

TREE ROOT CURTAIN

–REQUIRED WHEN EXCAVATION EXPOSES ROOTS

NOTE: THE CONTRACTOR WILL BE RESPONSIBLE FOR IMPLEMENTING THE FOLLOWING SPECIFICATIONS IN ORDER TO ENSURE PROTECTION OF EXISTING TREES WITHIN OR ADJACENT TO THE CONSTRUCTION ZONE.

1. FILTER FABRIC TO BE TYPE 1 100% NON WOVEN NEEDLE PUNCHED 2.75 mm THICK, 240 g/m2 MASS.
2. WIRE MESH REINFORCING TO BE MW13.3 X MW13.3 WIRE WITH 152 X 152 mm OPENINGS.
3. RECEIVE APPROVAL OF CITY FORESTER FOR EXTENT OF ROOT CURTAIN.
4. BACKFILL SOIL MATERIAL AS PER SPECIFICATIONS. COMPACTED TO 85% SPD.

CITY OF Thunder Bay Superior by Nature

ENGINEERING STANDARDS

TITLE

TREE ROOT PROTECTION

DWN.	DATE
L.B.	JAN. 2012

REVISED: JAN. 2013

SCALE N. T. S.

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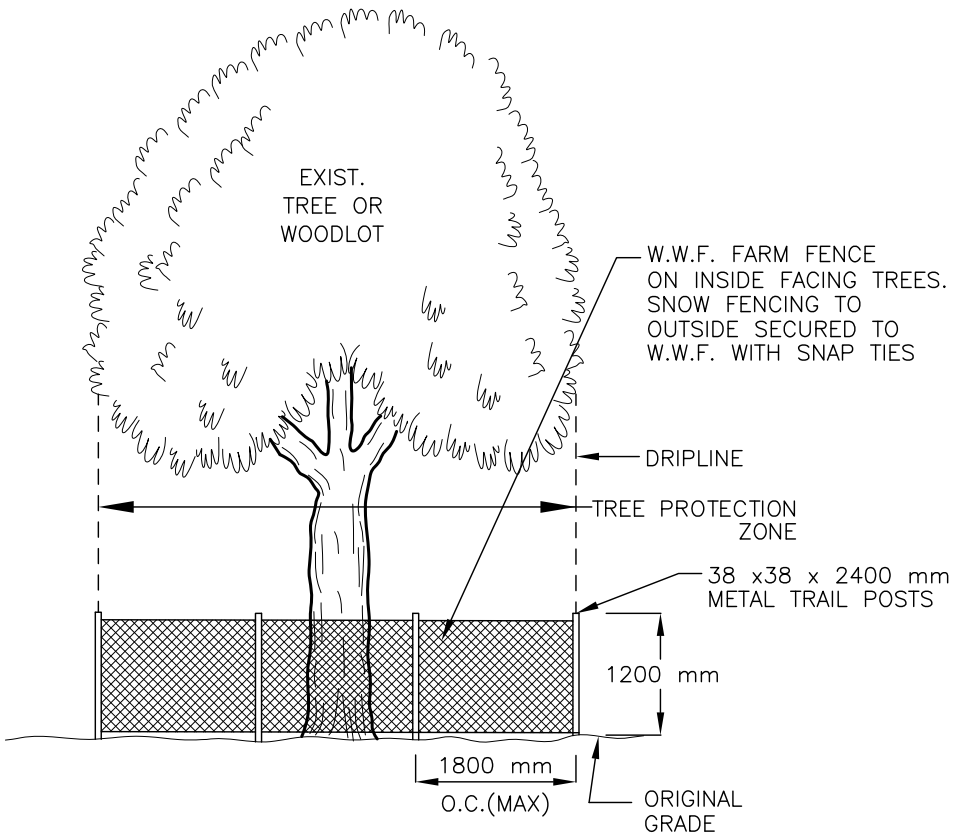
MANAGER, ENGINEERING DIVISION

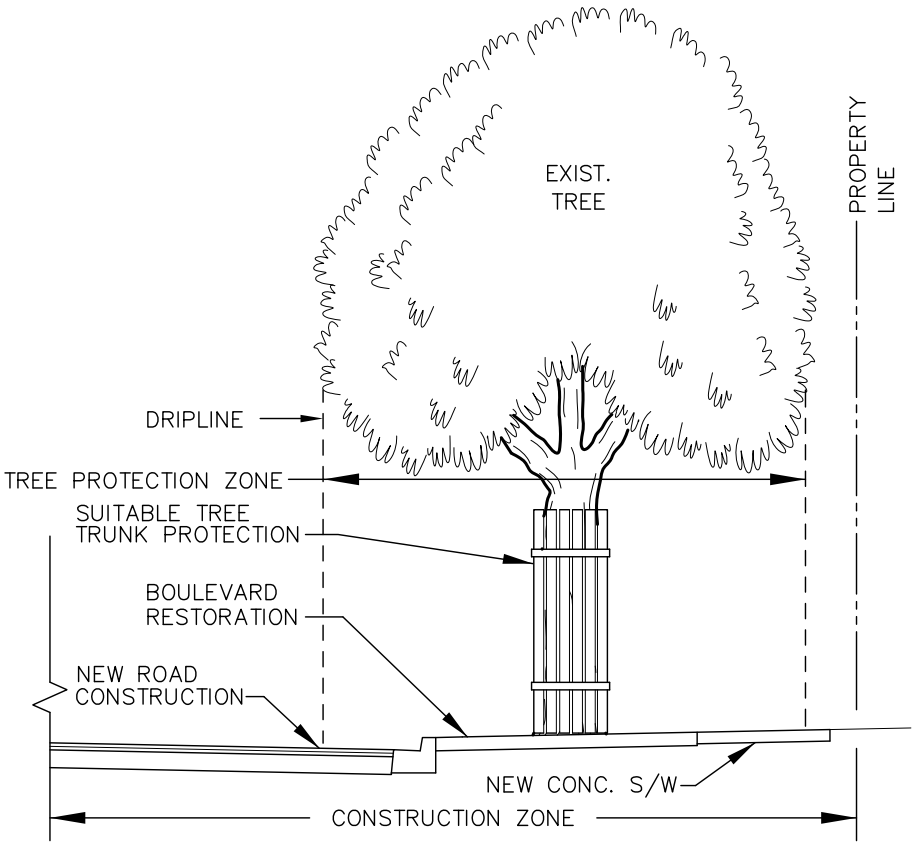
DWG. NO.

M-104-4.1



TREE PROTECTION FENCING

–REQUIRED FOR ALL TREES.



TREE TRUNK PROTECTION

– ALTERNATE PROTECTION METHOD WHEN WORK INSIDE DRIPLINE IS REQUIRED. REQUIRES CITY FORESTER APPROVAL.

NOTE: THE CONTRACTOR WILL BE RESPONSIBLE FOR IMPLEMENTING THE FOLLOWING SPECIFICATIONS IN ORDER TO ENSURE PROTECTION OF EXISTING TREES WITHIN OR ADJACENT TO THE CONSTRUCTION ZONE.

1. THE TREE PROTECTION ZONE IS DEFINED AS AN AREA ON THE GROUND CORRESPONDING TO THE 'DRIP LINE' OF THE TREE OR MINIMUM RADIUS OF 3.0 METRES, WHICHEVER IS LARGER.
2. FINAL LAYOUT OF TREE PROTECTION FENCING TO BE FIELD VERIFIED WITH CITY FORESTER PRIOR TO CONSTRUCTION.
3. WHERE APPROVED, TREE TRUNK PROTECTION SHALL CONSIST OF STRAPPING OR A DOUBLE WRAP OF WOOD SLAT SNOW FENCING, POLYETHYLENE DRUMS OR OTHER SUITABLE WOOD PLANKS STRAPPED TO THE TREE TRUNK TO COMPLETELY PROTECT THE TREE TRUNK FROM IMPACT DAMAGE. THE MINIMUM SIZE OF STRAPPING WILL BE 25 X 150 X 2400 mm.
4. FOR STANDARD TREE PROTECTION NOTES SEE SECTION 3 OF PARKS AND OPEN SPACES SECTION SPECIFICATIONS.

CITY OF Thunder Bay Superior by Nature

ENGINEERING STANDARDS

TITLE

TREE PROTECTION BARRIERS

DWN.	DATE
M.D.	FEB./02

REVISED: JAN. 2014

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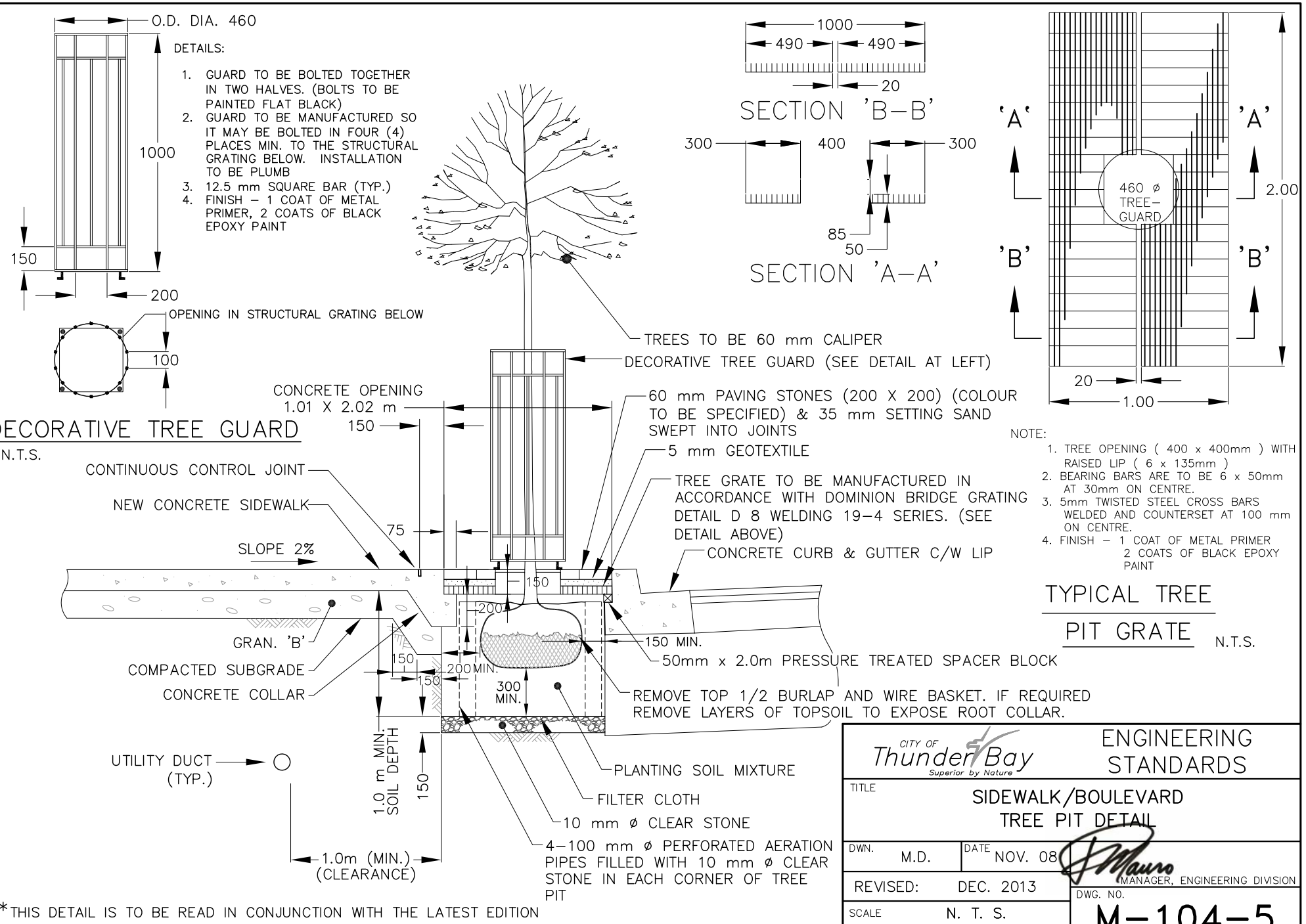
MANAGER, ENGINEERING DIVISION

DWG. NO.

M-104-4



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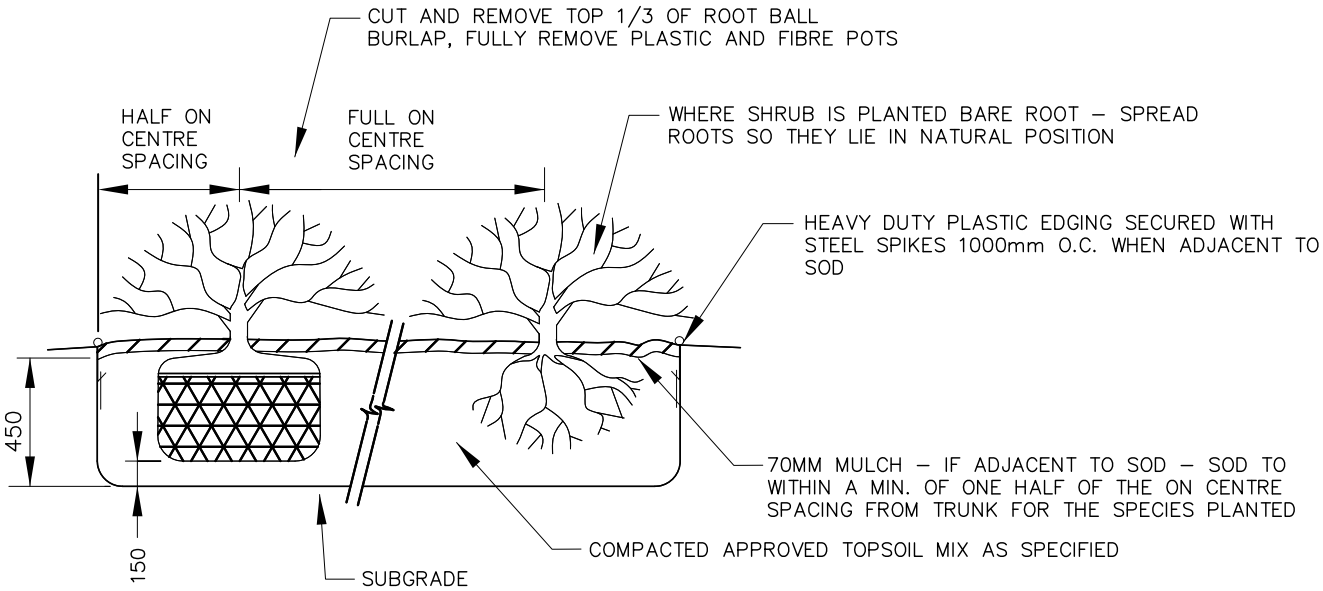

NOTES:

1) THIS SHRUB DOES NOT REPRESENT ANY PARTICULAR SPECIES
2) PLASTIC EDGING: BLACK DIAMOND BY VALLEYVIEW OR APPROVED EQUAL
   MULCH – "SHREDDED MILL HOG FUEL" OR APPROVED EQUAL AS SPECIFIED.
3) SHRUBS SHALL BARE THE SAME RELATION TO FINISHED GRADE AS THEY BORE TO PREVIOUS EXISTING GRADE
4) ALL SHRUBS IN BEDS, NO INDIVIDUAL PITS EXCEPT WHERE INDICATED

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ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED

CITY OF Thunder Bay Superior by Nature

ENGINEERING STANDARDS

TITLE: TYPICAL SHRUB PLANTING DETAIL

DWN.	DATE
M.D.	JAN. 2011

REVISED: DEC. 2013

SCALE: N. T. S.

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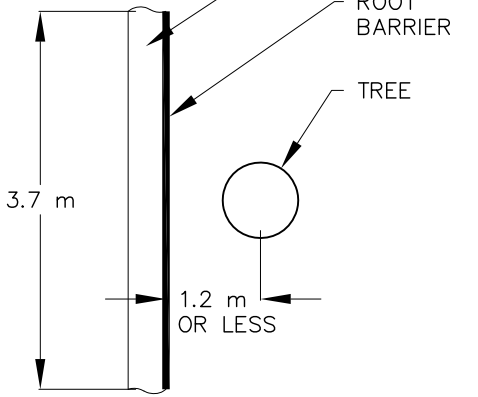
MANAGER, ENGINEERING DIVISION

DWG. NO. M-104-6



PLAN VIEW

NOTES:

1. ROOT BARRIER IS REQUIRED TO PROTECT CONC. CURBS AND SIDEWALKS FROM ROOT UPHEAVAL. TYPICALLY ROOT BARRIER IS REQUIRED AT BACK EDGE OF CONC. CURB AND/OR AGAINST FRONT AND/OR BACK OF SIDEWALK
2. ROOT BARRIER IS REQUIRED WHEN TREE IS WITHIN 1.2 m OF CONC. CURB
3. ROOT BARRIER IS REQUIRED WHEN TREE IS WITHIN 1.2 m OF SIDEWALK OR WITHIN 2.0 m OF DRIVEWAY.
4. ROOT BARRIER TO BE 3.7 m IN LENGTH AND CENTERED ON THE TREE ADJACENT TO SIDEWALK, CURB AND DRIVEWAY.
5. ROOT BARRIER TO BE A DEEP ROOT U18 OR U24, OR APPROVED EQUAL AND BE CONSTRUCTED OF HDPE.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED

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CITY OF Thunder Bay Superior by Nature

ENGINEERING STANDARDS

TITLE

ROOT BARRIER DETAIL

DWN.	DATE	
M.D.	JAN. 2012	MANAGER, ENGINEERING DIVISION
REVISED: DEC. 2013		DWG. NO.
SCALE N. T. S.		M-104-7

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