DIVISION 31 – EARTHWORK

SECTION 31 14 00.99 – SITE CLEARING

PART 1 – GENERAL

1.3 DEFINITIONS

A. Soil: Friable clay loam surface soil containing 4% to 12% organic matter. Soil shall be screened and free of subsoil, clay lumps, stones, rocks, weeds, roots, construction debris, and other unsuitable materials as determined and approved by the Project Representative. Soil should be screened with nothing larger than a 2 inch screen.

B. Construction Fencing: Construction fencing shall be chain link unless otherwise agreed upon and all construction work, parking of vehicles, storage of materials, or related activities shall occur within this boundary fencing.

C. Tree Protection Barricade: Wood rail fencing constructed of 4” x 4” posts at 8 feet maximum on center, and three 2” x 4” (or better) wood rails; lined with at least one 4 foot tall snow fence (or similar approved construction barrier fencing) which meets existing grade and encircles the entire area. Standard height of top rail shall be eight feet (8’); for variations, refer to Tree Protection Diagram.

D. Temporary Path: A zone within the specified protected zone of a tree to enable temporary movement of equipment.

E. Protected Zone: At minimum, one and a half the distance of plant crown drip line outward from the trunk along undisturbed grade.

F. DBH: Tree trunk diameter at breast height.

G. Compaction: Change in soil conditions prior to construction by heavy equipment or concentrated foot traffic.

H. Damages: Damages to campus woody plants shall include any of the prohibited practices listed in Section 1.4 as determined solely by owner.

I. Alternatives: Alternatives refer to any pre-arranged Campus Facilities approved variation to working within the protected zone.

1.4 PLANT PROTECTION

A. Damage to WMU-owned trees, shrubs, and other plant material due to contractor negligence or accident shall be repaired only by the staff of WMU Landscape Services Department, or their designated contractor. Landscape Services shall remove and replace any trees, shrubs, and other plant material determined to be excessively damaged due to prohibited practices. The
costs of all such repairs, removals, replacements, and an amount of value lost will be the liability of the contractor and billed accordingly.

B. The following specific responsibilities are required of WMU Landscape Services Arborists:

1. Tie-back of existing trees and shrubs.
2. Pruning/thinning of existing trees and shrubs.
3. Root pruning and root protection of exposed roots.
5. Removal or relocation that is not specified within the construction documents.

C. The following specific responsibilities are required of the contractor when marked:

1. To protect the immediate portion of tree root zones, no construction equipment or materials; sand, soil, gravel, or any other materials shall be placed, parked, or stored on the surface of any unpaved areas within the radius of one and a half times the drip line (outermost reach of branches referred to as protected zone) of trees. No chemicals, rinsates, or petroleum products, shall be deposited within the protected zones of trees.
2. Tree protection barricades shall be erected to define the protected zones (see Tree Protection Diagram). Failure to install barricades as directed may halt work. Plant damage occurring within installed barricades does not absolve contractor from “damage” assessment. All unpaved area within the zones of each tree in the construction site shall be fenced. The fencing shall be installed by WMU Landscape Services or contractor as specified prior to set-up for construction.
3. It is understood that the proximity of a tree to a worksite may require temporary access to a protected zone. A temporary path may be constructed in these cases with prior approval from the WMU Landscape Services Representative. The path shall be eight to ten inches (8-10”) of wood chips as located by the WMU Landscape Services Arborist or designated representative and wood chips shall be removed immediately upon completion of work in an area. Soil aeration may be required during site restoration.
4. To preserve viable root systems and maintain structural stability, it is required that the contractor bore or tunnel beneath the root systems of trees. Open-cut excavating is allowed only up to the distance from various size trees, as listed below. You must bore or tunnel from trench to trench below the minimum depth indicated for the tree size. The surface area and subsoil directly adjacent to trees shall not be disturbed as follows.
5. Open-Cut Trenching and Boring Specifications:

Specifications are determined by tree size (diameter/inches), minimum undisturbed radius (measured from face of trunk), and minimum depth of tunnel/bore and are listed below:
<table>
<thead>
<tr>
<th>Tree Size (diameter/inches)</th>
<th>Minimum Undisturbed Radius (measured from face of trunk)</th>
<th>Minimum Depth of Tunnel/Bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3”</td>
<td>3 feet</td>
<td>3 feet</td>
</tr>
<tr>
<td>3” through 8”</td>
<td>8 feet</td>
<td>3 feet</td>
</tr>
<tr>
<td>8” through 14”</td>
<td>14 feet</td>
<td>4 feet</td>
</tr>
<tr>
<td>Larger than 14”</td>
<td>20 feet</td>
<td>4 feet</td>
</tr>
</tbody>
</table>

6. A pre-construction site walk-thru will be scheduled with the WMU Landscape Services Representative and contractor prior to any construction project. This meeting will include the construction site superintendent and a representative of WMU Landscape Services.

7. Care shall be taken not to damage trees, shrubs, vines, and perennials within the protected zones. The WMU Landscape Services Department shall be contacted at least three (3) business days prior to the set-up for any construction to discuss problems of overhanging branches which may be damaged. The WMU Landscape Services Representative shall evaluate damage and establish proportional fines up to 100% of the value, regardless of the current disposition of the plant. The replacement value for shrubs, vines, and perennials shall be assessed at current market cost. The replacement value for trees shall be assessed at the current value schedule as follows:
   a. 1-3” caliper $120/inch
   b. 3-6” DBH $180/inch
   c. 6-9” DBH $240/inch
   d. 9-12” DBH $300/inch
   e. 12-15” DBH $420/inch
   f. 15” or more DBH $600/inch

8. All excavation in the protected zone shall be backfilled only with clean, viable soil. If possible, native soil from the site should be returned, and if not possible soil returned should match existing soil profile. No concrete, slurry, gravel, stone, sand, or other such materials shall be used for backfill. Flush backfilled excavations to settle material. Restoration shall be to original grade, unless otherwise specified.

9. Contractor shall immediately contact WMU Landscape Services Representative should protected plants be compromised in violation of agreed upon fencing and limits. Failure to communicate promptly could result in 100% damage assessment of fines.

10. In special cases, alternative plant protection options may be permitted. Alternatives allow for flexibility of requirements where approved specific measures can be implemented in lieu of the standard protection specifications. Measures may include thinning and root pruning; fertilization; aeration; boring and jacking; hand excavation; care and supervision by campus arborist; and seasonal schedule recommendations.
Alternatives would be based on the specific requirements of the plant species in question, as determined by the WMU Landscape Services Arborist.

D. Prohibited Practices:
Practices prohibited by the contractor include breaking of branches, scraping of bark, or unauthorized cutting; nailing or bolting into plants; use of plants as temporary support (cables), chaining, bolting, or cabling equipment to trees, unauthorized filling, excavating, trenching, or augering within protected zone, compaction/driving over the protected zone, storage of any materials or vehicles within the protected zone, dumping of construction waste or material (including liquids), unauthorized removal or relocation of woody plants, execution or pre-emption of WMU Landscape Services Arborist Responsibilities, removal of tree protection barricades or construction fencing prior to completion of project.

PART 3 – EXECUTION

3.1 SOD STRIPPING

A. In most cases, sod stripping will not occur on WMU’s campus. When applicable, stripping sod shall be done under reasonably dry conditions. Secure approval of soil quality in advance from Project Representative to begin sod stripping. Sod removal shall include the entire root system but not an excess amount of topsoil. Contractor shall haul the sod to a predetermined location, as directed for stockpiling.

3.2 TOPSOIL STRIPPING

A. Stripping topsoil shall be done under reasonably dry conditions. Stripping under wet conditions will not be allowed.

B. Contractor shall strip available topsoil to its full depth from within the Contract limits, excluding areas in close proximity to trees designated to remain, unless otherwise specified or directed by Project Representative.

C. Contractor shall stockpile topsoil in a storage pile on the Owner’s property as directed by Project Representative. Storage pile shall be shaped to freely drain surface water. The stockpile shall be protected from soil and sediment erosion as required elsewhere in these Specifications. The stockpile shall be clearly separated from other debris.

3.3 SHRUB/GROUNDCOVER REMOVAL

A. All deciduous and coniferous shrubs/groundcovers noted to be removed on the drawings shall be removed by the selected contractor.

3.4 TREE REMOVAL
A. All deciduous and coniferous trees and stumps noted to be removed on the drawings shall be removed by the selected contractor.

END OF SECTION 31 14 00.99

SECTION 32 84 00.99 - PLANTING IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Piping.
   3. Automatic control valves.
   4. Sprinklers.
   5. Quick couplers.
   6. Drip irrigation specialties.

1.3 DEFINITIONS

A. Lateral Piping: Downstream from control valves to sprinklers. Piping is under pressure during flow.

B. Mainline Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 PERFORMANCE REQUIREMENTS

A. Irrigation zone control shall be automatic operation with controller and automatic control valves.

B. Location of Sprinklers: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.
C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:

1. Irrigation Mainline Piping: 200 PSI.
2. Lateral Piping: 100 PSI.

1.5 SUBMITTALS
A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics and furnished specialties and accessories.
B. Qualification Data: For qualified Installer.
C. Operation and Maintenance Data: For sprinklers, controllers, and automatic control valves to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE
A. Installer Qualifications: Irrigation contractor shall have minimum 5 years experience installing systems of comparable size and complexity.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS
A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without Construction Manager’s written permission.

PART 2 - PRODUCTS

2.1 PIPES, SLEEVING, AND FITTINGS
A. Comply with requirements in the piping schedule for applications of pipe and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.
B. Hard Copper Tube: ASTM B 88, Type L and ASTM B 88, Type M water tube, drawn temper.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

C. PE Pipe with Controlled ID: ASTM F 771, PE 3408 compound; SDR 11.5.

1. Insert Fittings for PE Pipe: ASTM D 2609, nylon or propylene plastic with barbed ends. Include stainless steel worm gear clamps.

D. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedules 40 and 80.

1. PVC Socket Fittings: ASTM D 2466, Schedules 40 and 80.
2. PVC Threaded Fittings: ASTM D 2464, Schedule 80.
3. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket ends.


1. PVC Socket Fittings: ASTM D 2467, Schedule 80.
2. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

2.2 PIPING JOINING MATERIALS

A. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.3 MANUAL VALVES

A. Iron Gate Valves, Resilient Seated:

1. Manufacturers: Red White or Nibco,
2. Description:

   b. Pressure Rating: 600 PSI minimum.
   c. Body Material: Ductile or gray iron with bronze trim.
   d. End Connections: Mechanical joint or threaded joint.
   e. Interior Coating: Comply with AWWA C550.
   g. Operator: Stem nut.
   h. Disc: Solid wedge with resilient coating.

B. Operating Wrenches for Iron Gate Valve Casings: Furnish one steel, tee-handle operating wrench(es) with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut for Project.
2.4 AUTOMATIC CONTROL VALVES

A. Plastic, Automatic Control Valves:
   1. Manufacturers: As noted in the legend on the irrigation plan.
   2. Description: Molded-plastic body, normally closed, diaphragm type with manual-flow adjustment, and operated by 24-V ac solenoid.

2.5 SPRINKLERS

A. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.

B. Plastic, Pop-up, Gear-Drive Rotary Sprinklers:
   1. Manufacturers: As noted in the legend on the irrigation plan.
   2. Description:
      a. Body Material: ABS.
      b. Nozzle: ABS.
      c. Retraction Spring: Stainless steel.
      d. Internal Parts: Corrosion resistant.

C. Plastic, Pop-up Spray Sprinklers:
   1. Manufacturers: As noted in the legend on the irrigation plan.
   2. Description:
      a. Body Material: ABS.
      b. Nozzle: ABS.
      c. Retraction Spring: Stainless steel.
      d. Internal Parts: Corrosion resistant.
      e. Pattern: Fixed, with flow adjustment.

2.6 QUICK COUPLERS

1. Manufacturers: As noted in the legend on the irrigation plan.

B. Description: Factory-fabricated, bronze or brass, one-piece assembly. Include coupler water-seal valve, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

   1. Locking-Top Option: Vandal-resistant locking feature. Include one.

2.7 DRIP IRRIGATION SPECIALTIES

1. Manufacturers: As noted in the Drip Notes section on the irrigation plan.

2.8 BOXES FOR AUTOMATIC CONTROL VALVES

A. Plastic Boxes:
1. Manufacturers: As noted in the details on the irrigation detail sheet.
2. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.
   a. Size: As required for valves and service.
   b. Shape: Round and Rectangular.
   c. Sidewall Material: PE, ABS, or FRP.
   d. Cover Material: PE, ABS, or FRP.

B. Drainage Backfill: Cleaned gravel or crushed stone, graded from 1 inch size.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

B. Provide minimum cover over top of underground piping according to the following:
   1. Irrigation Mainline Piping: Minimum depth of 24 inches.
   2. Lateral Piping: 12 inch.
   3. Sleeves: 30 inches below roadways and drives, 24 inches below walks.

3.2 PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Architect's approval before excavation.

3.3 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. Install piping free of sags and bends.

C. Install groups of pipes parallel to each other, spaced to permit valve servicing.

D. Install fittings for changes in direction and branch connections.

E. Install underground thermoplastic piping according to ASTM D 2774.

F. Lay piping on solid subbase, uniformly sloped without humps or depressions.

G. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

H. Install piping in sleeves under parking lots, roadways, and sidewalks.

I. Install sleeves made of SDR 21, 200 PSI PVC pipe and socket fittings, and solvent-cemented joints.
J. Install transition fittings for plastic-to-metal pipe connections according to the following:

1. Underground Piping:
   a. **NPS 1-1/2 (DN 40) and Smaller:** Plastic-to-metal transition fittings.
   b. **NPS 2 (DN 50) and Larger:** AWWA transition couplings.

3.4 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Copper-Tubing Soldered Joints: Apply ASTM B 813 water-flushable flux to tube end unless otherwise indicated. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

E. PE Piping Joints: Join with insert fittings and stainless steel worm gear clamps according to piping manufacturer's written instructions.

F. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   3. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.5 VALVE INSTALLATION

A. Underground Iron Gate Valves, Resilient Seat: Comply with AWWA C600 and AWWA M44. Install in valve casing with top flush with grade.

   1. Install valves and PVC pipe with restrained, gasketed or threaded joints.

B. Aboveground Valves: Install as components of connected piping system.

C. Pressure-Reducing Valves: Install in boxes for automatic control valves or aboveground between shutoff valves.
3.6 SPRINKLER INSTALLATION
A. Install sprinklers after hydrostatic test is completed.
B. Install sprinklers at manufacturer’s recommendations.
C. Locate part-circle sprinklers to maintain a minimum distance of 6 inches walls and curbs unless otherwise indicated.

3.7 DRIP IRRIGATION SPECIALTY INSTALLATION
A. Install drip tubing as indicated in details on irrigation detail sheet.

3.8 FIELD QUALITY CONTROL
A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
B. Perform tests and inspections.
   1. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
C. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Any irrigation product will be considered defective if it does not pass tests and inspections.
E. Prepare test and inspection reports.

3.9 STARTUP SERVICE
A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer’s written instructions.
   2. Verify that controllers are installed and connected according to the Contract Documents.
   3. Verify that electrical wiring installation complies with manufacturer’s submittal.

3.10 CLEANING
A. Flush dirt and debris from piping before installing sprinklers and other devices.
3.11 PIPING SCHEDULE

A. Install components having pressure rating equal to or greater than system operating pressure.

B. Piping in control-valve boxes and aboveground may be joined with flanges or unions instead of joints indicated.

C. Underground irrigation mainline piping shall be:
   1. SDR 21, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.

D. Lateral piping shall be:
   1. PE, controlled ID pipe; insert fittings for PE pipe; and stainless steel worm gear clamps.

END OF SECTION 32 84 00.99

SECTION 32 92 00.99 - TURF GRASSES

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

4.2 SUMMARY

A. Section Includes:
   1. Seeding
   2. Fertilizer and mulch.
   3. Topsoil.

B. Related Sections include the following:
   1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
   2. Division 31 Section "Earthwork" for excavation, filling and backfilling, and rough grading.

4.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.
B. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

4.4 SUBMITTALS

A. All submittals must be received 30 days prior to installation.

B. Mix labels: For certified seed mixes.

C. Soil test including physical properties.

D. Chemicals and fertilizers to be used (including MSDS)

E. Top soil analysis

4.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

D. Pre-installation Conference: Conduct conference at Project site with WMU Landscape Services Representative.

4.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

4.7 SCHEDULING

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.
4.8 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Sodded Lawns: 60 days from date of Substantial Completion.
2. Seeded Lawns: 90 days from date of Substantial Completion.

   a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

   1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).

   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
   2. Water lawn at a minimum rate of 1 inch (25 mm) per week.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 30 percent of grass height. Remove no more than 30 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

   1. Mow grass 3-31/2 inches high.

E. Lawn Post fertilization: Apply fertilizer after initial mowing and when grass is dry.

   1. A phosphorous free fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to lawn area.

PART 5 - PRODUCTS

5.1 SEED

A. Fresh, clean and new crop seed mixture. Each seed type certified blue or gold tag.

   1. Mixed by an approved method.
   2. Test for germination made within preceding six months. Not to exceed 0.25% weed seed. Seeding rates shall be determined by the percent pure live seed, where PLS = % pure seed x % germination x 100.
   3. Turfgrasses:

      a. Bluegrass / Fescue general purpose grass blend:
1) 35% Kentucky Bluegrass blend
2) 35% Red Fescue blend
3) 30% Perennial Ryegrass blend

4. Obtain the Owner’s specific written acceptance for substitution of seed other than those named above. Proposed substitutes shall have essentially the same characteristics as seed specified in appearance, ultimate height, shape, habit of growth, general soil, and other requirements. Average cost and value of seed specified. Seed of greater value may be accepted without additional cost to the Owner.

5. Seed rate for turf establishment shall be 8lbs/1000sq.ft. of pure live seed.

5.2 MULCH

A. Hydromulch slurry mixture is to be composed of a suitable rate of mulch and water to allow for even coverage of seed that will protect plant growth while allowing necessary light and water to penetrate.

5.3 WATER

A. Free of substance harmful to plant growth.

5.4 TOPSOIL, SOIL MIXES, SOIL AMENITIES

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 3/8 inch or larger in any dimension, and other extraneous materials harmful to plant growth. Soil shall be a loam or sandy loam texture and free of debris.

1. Topsoil Source: Import topsoil from off site sources as necessary. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches deep; do not obtain from bogs and marshes.

B. Lime: ASTM C 602, Class T, agricultural limestone.

5.5 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with the following soil amendments in the following quantities:

1. Ratio of Loose Compost to Topsoil by Volume: 1:3.

5.6 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer for turf seed establishment shall be a starter fertilizer with a ratio of 1:2:1 for NPK.
PART 6 - EXECUTION

6.1 PREPARATION

A. Verify limits of seeding and sodding material with the Owner’s Representative in the field before starting seeding and sodding work.

B. Limit preparation to areas which will be immediately seeded.

C. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

D. Spread topsoil to a depth of 4 inches minimum to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

E. Fine grade to a smooth even surface with no 'bird baths', having loose, uniformly fine texture. Remove trash, debris, stones larger than 1-inches in any dimension, and other objects that may interfere with planting or maintenance operations.

F. Fine grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

G. Apply fertilizers by mechanical rotary or drop type distributor thoroughly and evenly incorporated with soil. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.

H. Restore prepared areas to specified condition of eroded, settled, or otherwise disturbed after fine grading and prior to seeding and sodding.

I. Moisten prepared lawn areas before planting when soil is dry and allow surface to dry before planting.

6.2 INSTALLATION

A. Seeding:

1. Hydroseeding is preferred. If any other method of seeding occurs, the seeded area must be covered with mulch immediately.

2. Seed immediately after preparation of bed. Seed during a period that promotes germination and establishment for the seed blend. Seeding at times other than those locally recognized as acceptable shall be unacceptable.

3. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

4. Evenly distribute seed by sowing equal quantities. Rake seed lightly into top 1/8 inch of topsoil, ensuring good seed/soil contact, and water with fine spray.

   a. Seeding Rate should be 8lbs/1000sq.ft.

   b. Protect seeded areas with slopes less than 1:6 against erosion by spreading mulch after completion of seeding operations and anchor by crimping into topsoil. Spread uniformly at a minimum rate of 2 tons per acre.
5. Apply Commercial Fertilizer 1/2/1 at 200 lbs./acre.

6.3 MULCHING

   A. Hydromulch seeded areas within 24 hours after seeding.
   
   B. Owner will replace mulch displaced before grass has made a growth of 1- to 1-1/2-inch.
   
   C. Provide straw bale checking in ditches or problem swales at intervals required to adequately slow water velocity and impede soil loss or other methods as required by governmental agencies.
   
   D. During germination period, the Contractor shall protect and water seeded areas, maintain top 1/2- to 1 inch soil in a moist condition. Continue watering until turfgrass is established.

6.4 CLEANUP

   A. Any soil, peat or similar material which has been brought onto paved areas by hauling operations or otherwise shall be removed promptly. Upon completion of planting, all excess soil, stones, and debris shall be removed from the site or disposed of as directed by the Owner. All planting areas shall be prepared for final inspection.

6.5 ACCEPTANCE

   A. Inspection to determine acceptance of installed turfgrass will be made by WMU Landscape Services.

      1. New turfgrass areas will be acceptable provided all requirements, excluding maintenance, have been compiled with.
      2. No individual turfgrass area shall have bare spots or unacceptable cover totaling more than 2% of the individual areas requested to be inspected.
   
   B. Planted areas will be inspected at completion of installation and accepted subject to compliance with specified materials and installation requirements.

6.6 CLEANUP AND PROTECTION

   A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
   
   B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

END OF SECTION 32 92 00.99
PART 7 - GENERAL

7.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

7.2 SUMMARY

A. Section Includes:
   1. Seeding
   2. Fertilizer and mulch.
   3. Topsoil.

B. Related Sections include the following:
   1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
   2. Division 31 Section "Earthwork" for excavation, filling and backfilling, and rough grading.

7.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

7.4 SUBMITTALS

A. All submittals must be received 30 days prior to installation.

B. Mix labels: For certified seed mixes.

C. Soil test including physical properties.

D. Chemicals and fertilizers to be used (including MSDS)

E. Top soil analysis

7.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
1. Installer's Field Supervision: Require installer to maintain an experienced full-time supervisor on project site when planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

D. Pre-installation Conference: Conduct conference at project site with landscape services representative.

7.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

7.7 SCHEDULING

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

7.8 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Sodded Lawns: 60 days from date of substantial completion.
2. Seeded Lawns: 90 days from date of substantial completion.

a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water lawn at a minimum rate of 1 inch (25 mm) per week.
D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 30 percent of grass height. Remove no more than 30 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow grass 3-3/2 inches high.

E. Lawn Post fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. A phosphorous free fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to lawn area.

PART 8 - PRODUCTS

8.1 SEED

A. Fresh, clean and new crop seed mixture. Each seed type certified blue or gold tag.

1. Mixed by an approved method.
2. Test for germination made within preceding six months. Not to exceed 0.25% weed seed. Seeding rates shall be determined by the percent pure live seed, where PLS = % pure seed x % germination x 100.
3. Turfgrasses:
   a. Bluegrass / Fescue general purpose grass blend:
      1) 35% Kentucky Bluegrass blend
      2) 35% Red Fescue blend
      3) 30% Perennial Ryegrass blend

4. Obtain the Owner’s specific written acceptance for substitution of seed other than those named above. Proposed substitutes shall have essentially the same characteristics as seed specified in appearance, ultimate height, shape, habit of growth, general soil, and other requirements. Average cost and value of seed specified. Seed of greater value may be accepted without additional cost to the Owner.

5. Seed rate for turf establishment shall be 8lbs/1000sq.ft. of pure live seed.

8.2 MULCH

A. Hydromulch slurry mixture is to be composed of a suitable rate of mulch and water to allow for even coverage of seed that will protect plant growth while allowing necessary light and water to penetrate.

8.3 WATER

A. Free of substance harmful to plant growth.
8.4 TOPSOIL, SOIL MIXES, SOIL AMENITIES

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 3/8 inch or larger in any dimension, and other extraneous materials harmful to plant growth. Soil shall be a loam or sandy loam texture and free of debris.

   1. Topsoil Source: Import topsoil from off site sources as necessary. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches deep; do not obtain from bogs and marshes.

B. Lime: ASTM C 602, Class T, agricultural limestone.

8.5 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with the following soil amendments in the following quantities:

   1. Ratio of Loose Compost to Topsoil by Volume: 1:3.

8.6 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer for turf seed establishment shall be a starter fertilizer with a ratio of 1:2:1 for NPK.

PART 9 - EXECUTION

9.1 PREPARATION

A. Verify limits of seeding and sodding material with the Owner’s Representative in the field before starting seeding and sodding work.

B. Limit preparation to areas which will be immediately seeded.

C. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner’s property.

D. Spread topsoil to a depth of 4 inches minimum to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

E. Fine grade to a smooth even surface with no ‘bird baths’, having loose, uniformly fine texture. Remove trash, debris, stones larger than 1-inch in any dimension, and other objects that may interfere with planting or maintenance operations.

F. Fine grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

G. Apply fertilizers by mechanical rotary or drop type distributor thoroughly and evenly incorporated with soil. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.
H. Restore prepared areas to specified condition of eroded, settled, or otherwise disturbed after fine grading and prior to seeding and sodding.

I. Moisten prepared lawn areas before planting when soil is dry and allow surface to dry before planting.

9.2 INSTALLATION

A. Seeding:

1. Hydroseeding is preferred. If any other method of seeding occurs, the seeded area must be covered with mulch immediately.

2. Seed immediately after preparation of bed. Seed during a period that promotes germination and establishment for the seed blend. Seeding at times other than those locally recognized as acceptable shall be unacceptable.

3. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

4. Evenly distribute seed by sowing equal quantities. Rake seed lightly into top 1/8 inch of topsoil, ensuring good seed/soil contact, and water with fine spray.

   a. Seeding Rate should be 8lbs/1000sq.ft.
   b. Protect seeded areas with slopes less than 1:6 against erosion by spreading mulch after completion of seeding operations and anchor by crimping into topsoil. Spread uniformly at a minimum rate of 2 tons per acre.

5. Apply Commercial Fertilizer 1/2/1 at 200 lbs./acre.

9.3 MULCHING

A. Hydromulch seeded areas within 24 hours after seeding.

B. Owner will replace mulch displaced before grass has made a growth of 1- to 1-1/2-inch.

C. Provide straw bale checking in ditches or problem swales at intervals required to adequately slow water velocity and impede soil loss or other methods as required by governmental agencies.

D. During germination period, the Contractor shall protect and water seeded areas, maintain top 1/2- to 1 inch soil in a moist condition. Continue watering until turfgrass is established.

9.4 CLEANUP

A. Any soil, peat or similar material which has been brought onto paved areas by hauling operations or otherwise shall be removed promptly. Upon completion of planting, all excess soil, stones, and debris shall be removed from the site or disposed of as directed by the Owner. All planting areas shall be prepared for final inspection.

9.5 ACCEPTANCE

A. Inspection to determine acceptance of installed turfgrass will be made by WMU Landscape Services.
1. New turfgrass areas will be acceptable provided all requirements, excluding maintenance, have been compiled with.
2. No individual turfgrass area shall have bare spots or unacceptable cover totaling more than 2% of the individual areas requested to be inspected.

B. Planted areas will be inspected at completion of installation and accepted subject to compliance with specified materials and installation requirements.

9.6 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

END OF SECTION 32 92 00.99

SECTION 32 93 00.99 - PLANTS

PART 10 - GENERAL

10.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

10.2 SUMMARY

A. Section Includes:

1. Plants.
2. Planting soils.
3. Tree stabilization.
4. Landscape edgings.

B. Related Sections:

1. Division 01 Section "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Division 31 Section "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
3. Division 31 Section "Earth Moving" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.

4. Division 32 Section "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

10.3 ALLOWANCES

A. Allowances for plants are specified in Division 01 Section “Allowances.”

1. Perform planting work under quantity allowances and only as authorized. Authorized work includes work authorized in writing by Landscape Architect and WMU Landscape Services Representative.

2. Notify Landscape Architect and WMU Landscape Services Representative of extent of work performed that is attributable to quantity allowances.

3. Perform work that exceeds quantity allowances only as authorized by Change Orders.

B. Furnish trees as part of tree allowance.

10.4 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Division 01 Section "Unit Prices."

1. Unit prices apply to authorized work covered by quantity allowances.

2. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

10.5 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. DBH: Diameter Breast Height

G. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
H. **Fabric Bag-Grown Stock**: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

I. **Finish Grade**: Elevation of finished surface of planting soil.

J. **Manufactured Topsoil**: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

K. **Pesticide**: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and mollusccides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

L. **Pests**: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

M. **Planting Area**: Areas to be planted.

N. **Planting Soil**: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

O. **Plant; Plants; Plant Material**: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

P. **Root Flare**: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

Q. **Stem Girdling Roots**: Roots that encircle the stems (trunks) of trees below the soil surface.

R. **Subgrade**: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

S. **Subsoil**: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

T. **Surface Soil**: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

10.6 **SUBMITTALS**

A. **Product Data**: For each type of product indicated, including soils.

1. **Plant Materials**: Include quantities, sizes, quality, and sources for plant materials.

2. **Pesticides and Herbicides**: Include product label and manufacturer's application instructions specific to the Project.

3. **Plant Photographs**: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an
angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery. Each tree should be marked with a WMU tagging system.

B. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

D. Material Test Reports: For existing in-place surface soil and imported or manufactured topsoil.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

F. Warranty: Sample of special warranty.

G. Maintenance Instructions: Recommended procedures to be established by Landscape Architect for Owner by end of project for maintenance of plants. (i.e. rain gardens, water features, native plantings, rooftop plantings, stormwater structures)

10.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association. Other equivalent memberships may be acceptable.
2. Experience: Five years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
   a. Certified Landscape Technician - Exterior, with installation and maintenance specialty area(s), designated CLT-Exterior.
   b. Certified Landscape Technician - Interior, designated CLT-Interior.
   c. Certified Ornamental Landscape Professional, designated COLP.
   d. MNLA
   e. Other appropriate certifications may be acceptable.
5. Pesticide Applicator: State licensed, commercial.
B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.

1. Comply with a certified soil testing lab.
2. Soil sampling and submittal to testing lab shall be reviewed by Landscape Architect or University Representative.
   a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
   b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants purchased under allowances will be made by WMU Landscape Services, who will tag plants at their place of growth before they are prepared for transplanting.

E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
3. Minimum sizes are 2 inch caliper for shade trees and 6 foot height for evergreen trees.

F. Plant Material Observation: WMU Landscape Services Arborist will observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. WMU Landscape Services Arborist retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site at no cost to the Owner.

1. Notify Landscape Architect and WMU Landscape Services Arborist of sources of planting materials seven days in advance of delivery to site.

G. Preinstallation Conference: Conduct conference at Project site.
10.8 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

C. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball. Plants handled otherwise will be subject to rejection. Balled and burlaped plants which have cracked, broken or loose root balls will be rejected.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.

G. Shipping will be scheduled to minimize on-site storage of plants.

H. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
   1. Heel-in bare-root stock. Air pockets will be prevented when heeling-in. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
   2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
   3. Do not remove container-grown stock from containers before time of planting.
   4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.
   5. No plant material shall sit on-site longer than 24 hours without being completely installed. If not appropriate to install within 24 hours, care must be taken as stated above in numbers 1-4.
   6. WMU Landscape Services Representative will be notified of all delivery times as far in advance as possible.
10.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of each service or utility.
2. Do not proceed with interruption of services or utilities without Construction Manager's or Owner's written permission.

C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: To be determined.

D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

F. Site Conditions, General:

1. Prior to beginning work, the contractor will examine and verify the acceptability of the job site and notify the WMU Landscape Services Representative of any unsatisfactory conditions.
2. All underground utilities will be located by servicing agencies. In the vicinity of utilities, hand excavate to minimize the possibility of damage to underground utilities.
3. When conditions detrimental to plant growth are encountered such as rubble fill, adverse drainage conditions, or obstructions, the WMU Landscape Services Representative shall be notified. Detritus shall be removed before planting as specified.

G. Location and Spacing:

1. Based upon ultimate height and spread at maturity, trees will not be planted in medians which measure less than ten feet between curbing.
2. Shade trees will not be planted within half the distance of their mature canopy from the edge of roadways and driveways or building walls, utility poles, light poles, power lines, or fire hydrants to allow access for line maintenance or service. Anything closer should be approved by WMU Landscape Services.
3. Mature height of trees will not interfere with power lines above.
4. Trees will not be planted within 30 feet from a utility pole, light pole, or fire hydrant in order to allow access for line maintenance or service.
5. At intersections, trees will be sited so that they do not interfere with visibility of cross traffic and not within 30 feet of the point of intersection of curb lines.
6. Trees planted in sites surrounded by concrete, brick paving or asphalt will have a minimum open surface area of 100 square feet.

7. Where formal arrangements or consecutive order of trees or shrubs are shown, select stock for uniform height and spread, and label with number to assure symmetry in planting.

10.10 WARRANTY / INSPECTION

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
   b. Structural failures including plantings falling or blowing over.
   c. Faulty performance of tree stabilization or edgings.
   d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of Substantial Completion:
   a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
   b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
   c. Annuals: Three months.
   d. Bulbs: 12 months

3. Include the following remedial actions as a minimum:
   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
   c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
   d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

10.11 MAINTENANCE SERVICE

A. Inspection: The WMU Landscape Services Arborist may inspect trees and shrubs either at place of growth or at the site before planting, for compliance with requirements for genus, species, cultivar, size and quality. The WMU Landscape Services Arborist retains the right to further inspect trees and shrubs for size and condition of root balls and root systems, insects, injuries, and latent defects, and to reject unsatisfactory or defective material at any time during progress of Work. Rejected trees or shrubs shall be removed immediately from the project site, at no cost to WMU.

B. Provisional Acceptance Inspection:

1. Notify Landscape Architect or WMU Landscape Services Representative in writing of the completion of planting.
2. Within 10 days after notification of completion of Work, the Landscape Architect or WMU Landscape Services Representative will inspect the work and prepare a Notice of Provisional Acceptance, together with a list of items that require completion or correction.

3. Issuance of the Notice of Provisional Acceptance shall constitute the state of the Warranty Period for the portion accepted.

C. Final Acceptance Inspection:

1. The final inspection of all planting or phase of planting work under the contract will be made by WMU Landscape Services, the Contractor and the Landscape Architect.

2. Before final acceptance will be made, the terms of the warranty shall be met, and the site shall be in the condition stipulated in this Section.

D. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

   1. Maintenance Period: 12 months from date of planting completion.

E. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

   1. Maintenance Period: Six months from date of planting completion.

F. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

10.12 SUBSTITUTIONS

A. If specified landscape material is not obtainable, substitutions may be allowed if the Contractor submits written proof on non-availability to the landscape architect and WMU Landscape Services together with a proposal for use of equivalent material. Adjustments will be made at no additional cost to WMU.
B. Plants will be supplied at the sizes specified. Plants of larger size may be used if acceptable to the landscape architect and WMU Landscape Services Representative and if sizes of root balls, roots or containers are increased proportionately. If approved substitutions are downsized, credits to WMU will be based on comparable cost differentials customary for materials and sizes involved.

C. Container plants are discouraged but may be substituted for those designated balled and burlaped if approved by WMU Landscape Services Representative.

PART 11 - PRODUCTS

11.1

11.2 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.

2. All shade or street trees will have comparatively straight trunks, well developed leader, tops and roots, and will be characteristic of the species, cultivar or variety. They will exhibit evidence of proper nursery pruning practices, have acceptable balance between top and root and be free of the above objectionable features that may affect the future form and beauty of the tree. The minimum acceptable shade tree caliper will be 3 inches as measured 6 inches above the ground. Ball size will conform to ANSI Z60.1 specifications.

3. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

4. Plant Material Selection: Prior to digging and shipment by the nursery, plant materials shall be tagged for inspection and approval. At the WMU Landscape Services Representative’s option, tagged plant materials may be inspected for approval prior to digging. Notify the WMU Landscape Services Representative at least four weeks prior to digging. Provide WMU Landscape Services Representative with locations of tagged plant material.

5. All woody plant material shall be grown under climatic conditions similar to those in the locality of the project for a minimum of two years.

6. Plant materials will be subject to final approval by the WMU Landscape Services Representative at the site before installation.

7. Plant material will be from USDA hardiness Zone 5.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

1. Root treatments on all plants will conform to the requirements of ANSI Z60.1. Plants will be dug and prepared in shipment in a manner that will not cause damage to branches, shaper or future development after planting. Regardless of transplant type, baled and burlapped, container or bare root, the root system will be adequately protected against moisture extremes.

   a. Balled and Burlapped (B&B) plants will have firm, natural ball of earth of specified diameter and depth to encompass the fibrous and feeding root systems necessary for full recovery of the plant. Balls will be securely wrapped with burlap tightly bound with twine or wire and not dry. **No synthetic burlap or twine will be accepted.** All binding material needs to be removed prior to planting. Burlap shall be removed from the top half of root ball.

   b. Plants furnished in containers will have the roots well established in the soil mass and will have grown in a container for at least one growing season. Containers will be large enough to provide earth-root mass of adequate size to support the plant tops being grown. Plants, other than ground covers, over-established in the container, as evidenced by pot bound or circling roots, will not be accepted.

   c. Bare root plants will have a root spread sufficient to ensure full recovery and development of the plant. Care will be taken to avoid injury to or removal of fibrous roots. Carefully protect roots with wet straw, moss, or similar materials so that plants arrive and are maintained with their roots in a moist and healthy condition. Broken or injured roots shall be pruned prior to planting.

D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

E. Name, Cultivar and Variety: Plant material provided to WMU will be true to name as confirmed by Manual of Woody Landscape Plants, Michael A. Dirr, Sixth Edition, 2009.

F. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

G. Plant material moved with a tree spade will conform, as closely as possible, to "American Standards for Nursery Stock" (ANSI Z60.1) with respect to caliper-to-ball size ratio.

H. When transporting material in tree spades, protection from wind and drying conditions will be required. When soil conditions are dry, plant material will be watered thoroughly 24 hours before digging.

I. Special Conditions:

1. Plant material requirements in regards to type, size and placement may be modified to address unusual planting situations if it is determined to be in the best interest of the Owner. These situations will be examined in a case-by-case basis and required prior approval of the Owner.
2. The minimum acceptable sizes of all plants shall be measured before pruning and with branches in normal position. Do not prune plant material prior to delivery or planting unless specifically approved by Owner. Unless otherwise designated on the plant list, all plant dimensions shall conform to those listed in "American Standard for Nursery Stock," ANSI Z60.1.

3. Provide ground cover plants established in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.0 for the pot size shown.

4. Plants indicated as "specimen" will be exceptionally heavy, symmetrical and compact, cultured to be unquestionably superior in form, branching and symmetry.

11.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 85 percent calcium magnesium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
   2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
   3. Provide lime in form of ground dolomitic limestone.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

J. Material should be delivered in unopened containers containing manufacturer’s guaranteed analysis.

11.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste as defined in P.A. 641 as amended and shall be in compliance with all federal and state laws.

B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

C. Peat shall meet the requirements of Federal Specification Q-P166E, Type II.

11.5 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 15 percent available phosphoric acid, composed of finely ground phosphate rock as commonly used for agricultural purposes.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

E. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 5-gram tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

F. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

11.6 PLANTING SOILS

A. Planting Soil: Imported topsoil or manufactured topsoil from on- and off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs, or marshes.
1. **Additional Properties of Imported Topsoil or Manufactured Topsoil:** Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

2. **Mix imported topsoil or manufactured topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:**
   
a. **Planting soil mix for shrub beds** shall consist of one-third topsoil, one-third Michigan Peat Humus and one-third sand. Planting soil mix shall have a pH factor in the range of 6.3 to 7.0. A soil test analysis for N, P, K and pH of the soil mix will be provided by the contractor.

b. **Flower and ground cover beds** will receive a minimum 12 inch depth of soil-less planting mix as supplied by Michigan Soil Services, Grand Rapids, and referred to as “33% mix.” Soil-less mix shall contain 33% rice hulls, 33% pine bark, and 33% compost, peat, and sawdust combined. Soil-less plant mix shall have a pH factor in the range of 6.3 to 7.0. Fertilizer added to the container mix shall be Sierra High-End with Osmocote or equivalent, with analysis as determined by Owner.

c. **Weight of Lime per 1000 Sq. Ft.**
d. **Weight of Sulfur per 1000 Sq. Ft.:** Per soil analysis recommendations.
e. **Weight of Iron Sulfate per 1000 Sq. Ft.:** Per soil analysis recommendations.
f. **Weight of Aluminum Sulfate per 1000 Sq. Ft.:** Per soil analysis recommendations.
g. **Weight of Agricultural Gypsum per 1000 Sq. Ft.:** Per soil analysis recommendations.
h. **Volume of Sand Plus 10 Percent per 1000 Sq. Ft.:** Per soil analysis recommendations.
i. **Weight of Bonemeal per 1000 Sq. Ft.:** Per soil analysis recommendations.
j. **Weight of Superphosphate per 1000 Sq. Ft.:** Per soil analysis recommendations.
k. **Weight of Commercial Fertilizer per 1000 Sq. Ft.:** Per soil analysis recommendations.
l. **Weight of Slow-Release Fertilizer per 1000 Sq. Ft.:** Per soil analysis recommendations.

B. **For rain gardens,** direct contractor to use "Biomass Blend" soil mix, as provided by Compost Soil Technologies. Soil mixture contains compost, washed sand, and topsoil. The blend shall not contain more than 5% clay or silt and must have 8% or more organic material. After soil mix has been placed in the rain garden areas, contractor must protect these areas with 4-foot high snow fencing at the boundaries to prevent any compaction by heavy equipment. If any compaction occurs, the responsible contractor will be required to remove and replace the soil at their cost.

1. Schedule a pre-installation meeting with Western Michigan University Landscape Services to discuss project details.
2. Soil mix should contain 50-60% sand, 20-30% topsoil, and 20-30% compost.
3. Soil mixture should be placed 18 inches deep.
4. The bottom of the rain garden should be dug so that it is flat. Bowl shaped is not recommended unless you are planting vegetation that vary in their moisture requirements.
5. Mulch should be placed on top of the soil at 2- to 3-inch depth.
6. Mostly native vegetation due to their better adaptation to the regional climate and root depths. Native grasses are encouraged due to their capacity to absorb water and withstand drought.

11.7 MULCHES

A. Organic/shredded hardwood mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
   1. Type: Shredded pine bark, tub-ground.
   2. Size Range: 95% less 1 inch, no more than 30% less 1/4-inch.
   4. Mulch will be porous, well-aerated and coarse enough that it is not prone to becoming compacted, layered, or caked.

11.8 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction and WMU representative.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer. Approval by owner required.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated. Approval by owner required.

11.9 TREE STABILIZATION MATERIALS

A. Planting Hardware:
   1. Deciduous trees with 4 inch caliper or over, and evergreen trees 6 feet tall and over shall be guyed with wire that is attached to the tree with woven plastic guying straps. Guying with wire that passes through lengths of hose shall not be used. A minimum of three guying stakes per tree, evenly spaced around the tree shall be used in guying.
   2. Stakes shall be sound wood of uniform size, reasonably free of knots and capable of performing their function for at least one growing season. Guying stakes shall be 2-by-2-by-36 inches.
   3. Tree straps are to be of new woven plastic.
   4. Wire for guying shall be pliable galvanized wire not lighter than 12 gauge, installed between woven plastic straps and guy stakes so as not to rub or break bark or branches. Guy wires shall be tensioned to allow 4-5 inches of trunk movement, not so tightly as to prevent all movement.
   5. Flags for marking guys shall be 18- to 24 inch sections of brightly colored weather resistant ribbon a minimum of 1 inch wide and of uniform color throughout the project.
   6. Tree wrap, where used, shall be waterproofed crepe paper not less than 2-1/2-inches wide, made up of two layers of crepe craft paper weighing not less than 30 pounds per ream and cemented together with asphalt.
7. Twine used to secure tree wrap shall be composed of a minimum of two-ply jute material applied just tightly enough to keep paper from sliding down the trunk.

8. All work shall be acceptable to the Owner.

11.10 LANDSCAPE EDGINGS

A. Steel Edging:
   1. Edging Size: 1/8 inch thick by 6 inches deep and 16 feet long.
   2. Finish: green

11.11 MISCELLANEOUS PRODUCTS

A. Wood Pressure-Preservative Treatment: AWPA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.

B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

C. Burlap: Non-synthetic, biodegradable.

D. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

E. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material. Acceptable product PHC Treesaver Plant Health Care Inc.

PART 12 - EXECUTION

12.1 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
   3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

12.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect’s acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Landscape Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting. Product needs to cover underside of leaves.

F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

12.3 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of 4 inches. Remove stones larger than 1/2-inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner’s property.

1. Apply fertilizer directly to subgrade before loosening.

2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.

   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

   b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil to a depth of 12 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

   a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: At time directed by Landscape Architect, broadcast dry product uniformly over prepared soil at application rate per manufacturer's specifications.

12.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter for balled and burlapped, balled and potted, container-grown, and fabric bag-grown stock.
2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
6. Maintain supervision of excavations during working hours.
7. Keep excavations covered or otherwise protected over night or after working hours.
8. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Topsoil removed from excavations may be used as planting soil. Soil must meet topsoil specification prior to placing.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

12.5 TREE, SHRUB, AND VINE PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set balled and burlapped, balled and potted, container grown and fabric bag grown stock plumb and in center of planting pit or trench with root flare 2 inches adjacent finish grades.

1. Use planting soil for backfill.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, water to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing final layer of soil.

D. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

12.6 MECHANIZED TREE SPADE PLANTING

A. Trees may be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.

B. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.

C. Cut exposed roots cleanly during transplanting operations.

D. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.

E. Plant trees as shown on Drawings, following procedures in "Tree, Shrub, and Vine Planting" Article.

F. Where possible, orient the tree in the same direction as in its original location.

12.7 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches and as directed by WMU Landscape Services Arborist. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by WMU Landscape Services Arborist.
C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise directed by WMU Landscape Services Arborist, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

12.8 TREE STABILIZATION

A. Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2 inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension shown on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Stakes shall be wood.

2. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.

3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Staking and Guying: Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 30 inches long, driven to grade.

1. Site-Fabricated Staking-and-Guying Method:

   a. For trees more than 6 inches in caliper, anchor guys to wood deadmen buried at least 36 inches below grade. Provide turnbuckle for each guy wire and tighten securely.

   b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.

   c. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.

   d. Attach flags to each guy wire, 30 inches above finish grade.

2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

12.9 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.
D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturbe the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

12.10 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated. Mulching shall take place within 48 hours of plant installation.

1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 36 inch radius around trunks or stems. Do not place mulch within 6 inches of trunks or stems. Keep mulch off sidewalks, curbs, light standards, and other structures.

2. Organic Mulch in Planting Areas: Apply 3 inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches of trunks or stems.

12.11 EDGING INSTALLATION

A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced per manufacturer's specifications, driven below top elevation of edging.

12.12 PLANT MAINTENANCE

A. Maintenance of plant material shall begin immediately after each plant is installed and shall continue as required until final acceptance at the end of the warranty period. Plants shall be inspected at least once per week by the contractor during the installation period and any needed maintenance shall be performed promptly. A written summary of this activity and any proposed maintenance practices determined by these inspections will be forwarded to the Director of Landscape Services or WMU Landscape Services Representative after each inspection.

B. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Recurring overly dry or wet conditions shall constitute grounds for rejection of plant material. Water shall not be applied with a force that will displace mulch or cause soil erosion and shall not be applied so quickly that it cannot be absorbed by the mulch and soil. Spray or treat as required to keep trees and shrubs free of insects and disease. All insecticides and fungicides applied to control pests and maintain plants in a healthy growing condition shall be approved by the Director of Landscape Services or WMU Landscape Services Representative. MSDS information must be on file with the WMU Department of Environmental Safety and Emergency Management prior to application of approved pesticides.
C. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

D. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

12.13 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with the WMU Landscape Services Representative operations and others in proximity to the Work. Notify WMU Landscape Services Representative before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

12.14 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. When planting in an area has been completed, the area shall be cleared of all debris, soil piles and containers.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

12.15 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 32 93 00.99